Business Relationship Analysis of Startup Ecosystem in Kerala

Thesis

Submitted to the University of Calicut

for the award of the degree of

Doctor of Philosophy in Commerce

Under the Faculty of

Commerce and Management Studies

By

Shabla Mohamed Mustafa

Under the Guidance of

Prof. B. Johnson
Professor (Rtd.)

Department of Commerce and Management Studies
School of Business Studies
University of Calicut
Kerala

October 2024

DECLARATION

I hereby declare that the work presented in the thesis entitled "Business Relationship Analysis of Startup Ecosystem in Kerala" is based on the original work done by me under the guidance of Prof. (Dr.) B. Johnson, Professor (Rtd.), Department of Commerce and Management Studies, University of Calicut and has not been included in any other thesis submitted previously for the award of any degree. The contents of the thesis are undergone plagiarism check using iThenticate software at C.H.M.K. Library, University of Calicut, and the similarity index found within the permissible limit. I also declare that the thesis is free from AI generated contents.

Shabla Mohamed Mustafa
(*Research Scholar*)

Prof. (Dr.) B. Johnson
(*Supervising Teacher*)

Place:

Date:

CERTIFICATE

This is to certify that the thesis entitled **"Business Relationship Analysis of Startup Ecosystem in Kerala"** is a bonafide record of the research work carried out by Ms. Shabla Mohamed Mustafa under my supervision and guidance for the award of Ph.D. degree under the Faculty of Commerce and Management Studies of the University of Calicut and no part of the thesis has been presented before the award of any degree, diploma or other similar title of recognition.

She is permitted to submit the thesis.

Prof. (Dr.) B. Johnson
(Supervising Teacher)

Calicut University
10/2024

Prof. (Dr.) B. Johnson
Professor & Dean (Retired)
DCMS
University of Calicut
Mobile: 8301092862
Email: bensavier01@gmail.com

Certificate

This is to certify that the corrections/modifications suggested by the adjudicator of the thesis entitled **BUSINESS RELATIONSHIP ANALYSIS OF STARTUP ECOSYSTEM IN KERALA** prepared and submitted by the research candidate, **Mrs. Shabla Mohamed Mustafa** under my guidance and supervision has been incorporated in the thesis. Also certify that the contents of the hardcopy and softcopy of the thesis are one and the same.

Prof. (Dr.) B. Johnson
(*Supervising Teacher*)

C.U. Campus
31.01.2025

UNIVERSITY OF CALICUT

CERTIFICATE ON PLAGIARISM CHECK

1.	Name of the Research Scholar	Shabla Mohamed Mustafa	
2.	Title of thesis / dissertation	Business Relationship Analysis of Startup Ecosystem in Kerala	
3.	Name of the Supervisor	Prof. (Dr.) B. Johnson	
4.	Department/Institution	Department of Commerce and Management Studies, University of Calicut	
5.		Non Core	Core
		Introduction/ Theoretical overview/Review of literature/ Materials & Methods/ Methodology	**Analysis/Result/Discussion/ Summary/Conclusion/ Recommendations**
	Similar content (%) identified	2	2
	Acceptable maximum limit (%)	10	10
6.	Software used	**iThenticate**	
7.	Date of verification	27/09/2024	

Report on plagiarism check, specifying included/excluded items with % of similarity to be attached.

Checked by (with name , designation & signature)

Name and signature of the Researcher Shabla Mohamed Mustafa

Name and signature of the Supervisor. Dr. B. Johnson

The Doctoral Committee* has verified the report on plagiarism check with the contents of the thesis, as summarized above and appropriate measures have been taken to ensure originality of the Research accomplished herein.

DR Breesha C.H

Name & Signature of the HoD/HoI (Chairperson of the Doctoral Committee)

**In case of languages like Malayalam, Tamil etc..on which no software is available for plagiarism check, a manual check shall be made by the Doctoral Committee, for which an additional certificate has to be attached.*

Acknowledgement

My profound thanks to each and every person who has assisted me in successfully completing my research project is beyond words.

I would first like to extend my sincere gratitude to my supervising teacher, Dr. B. Johnson, former Professor and Head of the department, Dean and Director of the School of Business Studies at the University of Calicut, for his meticulous guidance, valuable assistance and never-ending support during my doctoral research. Completing the research work has been made possible by his real passion for the subject and his great insight.

My sincere gratitude goes out to the faculties of Department of Commerce and Management Studies, University of Calicut, Dr. P. Mohan (former Pro Vice Chancellor and Professor, DCMS), Dr. B. Vijayachandran Pillai (former Head & Professor, DCMS), Dr. M.A. Joseph (former Head & Professor, DCMS), Dr. K.T. Aboobaker Sidheeque (former Associate Professor, DCMS), Dr. E.K. Satheesh (Registrar & Professor), Dr. Sreesha C.H. (Head & Associate Professor), Dr. Aparna Sajeev (Assistant Professor), Mr. Harikumar C. (Assistant Professor) and Dr. Natasha P. (Assistant Professor) for their genuine support and co-operation.

With great appreciation, I would like to thank Mr. Abdulla Moozhikkal (DCMS former Librarian), Dr. Prasanth M. (DCMS Librarian), Mr. Moytheen Kutty (DCMS former Library Assistant), Mr. Ajith Venmany (DCMS Library Assistant), Ms. Santhi K.J. (DCMS former Section Officer), Mr. Sajeev S. (DCMS Section Officer), Ms. Bindu M.C. (DCMS Assistant Section Office), Ms. Syndya Sundar C. (DCMS Computer Assistant) and Ms. Molley Vargheese (DCMS Office Attendant Higher Grade) for their assistance in finishing my research.

I would like to specially thank all staff and librarians of CHMK library (University of Calicut), IIM (Kozhikode), CUSAT (Kochi) and Kerala University (Trivandrum) for providing me the secondary data needed for the research study.

I express my gratitude to all the teaching and non-teaching staff of C.H.M.K.M. Government Arts and Science College Tanur especially, Mr. Shaheer Babu E.K., Ms. Jesna K Kaniyarakkal and Ms. Jasna O. for all the assistance extended by them for the completion of my research work.

I am extremely grateful of the incubation centre managers and startup founders who took time out of their packed schedules to give me the crucial primary data needed for this study.

Special thanks to my co-research scholars, Dr.Sreedevi E.S., Ms. Muhsina N., Ms. Mubeena C., Dr. Sreekutty K.S., Dr. Arathi Sivaram, Dr. Anjana K., Dr. Parvathy P.R., Ms. Nishna T., Ms. Shafna T., Ms. Navaneetha K., Dr. Binil E., Dr. Rashad P.P., Mr. Amal Sabha, Ms. Ashitha and Mr. Ayoob for their support and assistance during the course of my research work.

My parents and spouse have provided me with unwavering support ever since the beginning of my research. My gratitude towards them cannot be expressed in words. I am sincerely grateful to my father Sri. Mohamed Mustafa, my mother Smt. Sakeena Mohamed Mustafa, my husband Mr. Nishad P.K., my son Adam Mohamed Mustafa, my brother Dr. Shabil Mohamed Mustafa and my in-laws for their continuous patience and support during my research period.

Above all, I am thankful to the ALMIGHTY for his blessing, which provided me the strength and clarity of purpose I needed to complete my research work.

Shabla Mohamed Mustata

Contents

Chapter 6

Components of Business Relationships – Startups................ 217 – 333

Chapter 7

Components of Individual Actors and Business Relationships – Incubators.. 334 – 405

List of Tables

List of Figures

List of Charts

List of Abbreviations

AICTE	-	All India Council of Technical Education
Agtech	-	Agriculture Technology
ARA	-	Actor-Resource-Activity
B2B	-	Business to Business
B2C	-	Business to Customer
B2G	-	Business to Government
CAGR	-	Compound Annual Growth Rate
CFA	-	Confirmatory Factor Analysis
CSES	-	Centre for Strategy & Evaluation Services
DPIIT	-	Department for Promotion of Industry and Internal Trade
EFA	-	Exploratory Factor Analysis
Fintech	-	Financial Technology
GEP	-	Global Entrepreneurship Program
HEI	-	Higher Education Institutes
HNI's	-	High Networth Individuals
HR	-	Human Resource
IBM	-	International Business Machines
IMP Group	-	Industrial Marketing and Purchase Group
IPO	-	Initial Public Offering
IPR	-	Intellectual Property Rights
KSUM	-	Kerala Startup Mission
MVP	-	Minimum Viable Product
NASSCOM	-	National Association of Software and Service Companies

NGO	-	Non-Governmental Organization
SaaS	-	Software as a Service
SEM	-	Structural Equation Modelling
SME	-	Small and Medium Enterprises
TBI	-	Technology Business Incubator
VAT	-	Value Added Tax
VC	-	Venture Capital
VIF	-	Variance Inflation Factor

Business Relationship Analysis of Startup Ecosystem in Kerala

Shabla Mohamed Mustafa
Research Scholar

Prof. B. Johnson
Research Guide

Abstract

A startup ecosystem is an entrepreneurial ecosystem that consists of different actors functioning together to make the ecosystem advantageous for startups to grow and survive. Among these actors, startups and incubators are closely associated with one another. Startups are business enterprises and incubators guide them in solving their problems and prospering. Business relationships developed by startups and incubators are crucial for the development and survival of startups. Understanding these business relationships gives insight about the suitability of the startup ecosystem for different categories of startups. Kerala is one of the leading startup ecosystems in India, with more than 30 active incubators assisting different startups in their success. The strength of business relationships among startups and incubators in Kerala is studied using Actor-Resource-Activity model. Data from thirty eight active incubators in the state and 288 startups associated with them are considered for the study. Business relationships are analysed at two levels: company analysis and relationship analysis. Activity structure, organisation structure and resource collection of individual actors are analysed in company analysis. Activity links, actor bonds and resource ties between two actors are analysed in relationship analysis. The business relationships of startups with other startups and incubators, as well as those of incubators with other incubators and startups are considered for relationship analysis. The perspective of startups and incubators about other supporting actors in the ecosystem, like the state government, investors/funding organisations, universities/ educational institutions and mentors, has also been analysed. The Chi-square test, Fisher's Exact test, Kruskal-Wallis H test, Mann-Whitney U test, Spearman's Rank Correlation and multiple regression analysis using PLS-SEM models are the various statistical tests used for analysis. Following the analysis, it can be understood that the startup ecosystem in Kerala is suitable for startups that use technology and are product oriented. Most technology startups in the state are IT/software based. Service oriented startups and non-technology startups have few opportunities in the state. Bootstrapping is the major source of funding for startups and even today, funding is one of the major problems faced by startups. Actor bonds and resource ties of startups are dependent on one another. Incubators that provide incubation facilities to all categories of startups are few in the state. Incubators have a low level of coordination with each other while performing different activities, but they coordinate well with startups in various incubation activities. Kerala has a great startup ecosystem, but it also has many flaws that need to be addressed to make the ecosystem suitable for all the different categories of startups.

Keywords: Startups, Incubators, Startup Ecosystem, Actor-Resource-Activity Model, Business Relationship

കേരളത്തിലെ സ്റ്റാർട്ടപ്പ് ഇക്കോസിസ്റ്റത്തിന്റെ ബിസിനസ് റിലേഷൻഷിപ്പ് അനാലിസിസ്

ഷബ്‌ല മുഹമ്മദ് മുസ്തഫ
റിസർച്ച് സ്കോളർ

പ്രൊഫ. ബി ജോൺസൺ
റിസർച്ച് ഗൈഡ്

സംഗ്രഹം

സ്റ്റാർട്ടപ്പുകൾ എന്നാൽ നൂതനമായ ബിസിനസ് സംരംഭങ്ങളാണ്. സ്റ്റാർട്ടപ്പുകൾക്ക് വളരാനും നിലനിൽക്കാനും ആവശ്യമായ ആവാസവ്യവസ്ഥയെ സ്റ്റാർട്ടപ്പ് ഇക്കോ സിസ്റ്റം എന്ന് വിളിക്കുന്നു. ഈ ആവാസ വ്യവസ്ഥയിൽ സ്റ്റാർട്ടപ്പുകളുടെ പ്രവർത്തനത്തിന് സഹായിക്കുന്ന നിരവധി ഘടകങ്ങൾ ഉണ്ട്. അവയിൽ സ്റ്റാർട്ടപ്പുകളുമായി ഏറ്റവും അടുത്ത് ബന്ധപ്പെട്ട് കിടക്കുന്നത് ഇൻകുബേറ്ററുകളാണ്. ഇൻകുബേറ്ററുകൾ സ്റ്റാർട്ടപ്പുകളുടെ പ്രശ്നങ്ങൾ പരിഹരിക്കുകയും അവരെ വളർച്ചയിലേക്ക് നയിക്കുകയും ചെയ്യുന്നു. സ്റ്റാർട്ടപ്പുകളും ഇൻകുബേറ്ററുകളും വികസിപ്പിച്ചെടുത്ത ബിസിനസ് ബന്ധങ്ങൾ സ്റ്റാർട്ടപ്പുകളുടെ വികസനത്തിനും നിലനിൽപ്പിനും നിർണായകമാണ്. ഈ ബിസിനസ് ബന്ധങ്ങൾ മനസ്സിലാക്കുന്നത് സ്റ്റാർട്ടപ്പുകളുടെ വ്യത്യസ്ത വിഭാഗങ്ങൾക്ക് സ്റ്റാർട്ട് പ്പിക്കോ സിസ്റ്റത്തിന്റെ അനുയോജ്യതയെ കുറിച്ച് ഉൾക്കാഴ്ച നൽകുന്നു. ഇന്ത്യയിലെ മുൻനിര സ്റ്റാർട്ടപ്പ് ഇക്കോ സിസ്റ്റങ്ങളിൽ ഒന്നാണ് കേരളം. 30 അധികം സജീവമായ ഇൻകുബേഷൻ സെന്ററുകൾ കേരളത്തിലുണ്ട്. കേരളത്തിലെ സ്റ്റാർട്ടപ്പുകളുടെയും ഇൻകുബേഷൻ സെന്ററുകളുടെയും ബിസിനസ് ബന്ധങ്ങളുടെ ശക്തി പഠിക്കാൻ ആക്ടർ-റിസോഴ്സ്-ആക്ടിവിറ്റി മോഡൽ ആണ് ഈ പഠനത്തിൽ ഉപയോഗിച്ചിട്ടുള്ളത്. സംസ്ഥാനത്തെ 38 സജീവ ഇൻക്യുബേറ്ററുകളിലെ 288 സ്റ്റാർട്ടപ്പുകളെ ഈ പഠനത്തിൽ ഉൾപ്പെടുത്തിയിരിക്കുന്നു. ബിസിനസ് ബന്ധങ്ങളെ രണ്ടു തലത്തിലാണ് ഈ പഠനത്തിൽ വിശകലനം ചെയ്യുന്നത് കമ്പനി വിശകലനവും ബന്ധ വിശകലനവും. പ്രവർത്തന ഘടന, ഓർഗനൈസേഷൻ ഘടന, വ്യക്തിഗത ഘടകങ്ങളുടെ വിഭവ ശേഖരണം എന്നിവ കമ്പനി വിശകലനത്തിൽ വിശകലനം ചെയ്യുന്നു. പ്രവർത്തന ലിങ്കുകൾ, ആക്ടർ ബോണ്ടുകൾ, രണ്ട് ഘടകങ്ങൾ തമ്മിലുള്ള വിഭവ ബന്ധങ്ങൾ എന്നിവ ബന്ധ വിശകലനത്തിൽ വിശകലനം ചെയ്യുന്നു. മറ്റ് സ്റ്റാർട്ടപ്പുകളുമായും ഇൻകുബേറ്ററുകളുമായും സ്റ്റാർട്ടപ്പുകളുടെ ബിസിനസ്സ് ബന്ധങ്ങളും മറ്റ് ഇൻകുബേറ്ററുകളുമായും സ്റ്റാർട്ടപ്പുകളുമായും ഉള്ള ഇൻകുബേറ്ററുകളുമായുള്ള ബന്ധവും ബന്ധ വിശകലനത്തിനായി പരിഗണിക്കുന്നു. സംസ്ഥാന ഗവൺമെന്റ്, നിക്ഷേപകർ/ഫണ്ടിംഗ് ഓർഗനൈസേഷനുകൾ, സർവ്വകലാശാലകൾ/ വിദ്യാഭ്യാസ സ്ഥാപനങ്ങൾ, ഉപദേഷ്ടാക്കൾ തുടങ്ങിയ ആവാസവ്യവസ്ഥയിലെ മറ്റ് ഘടകങ്ങളെക്കുറിച്ചുള്ള സ്റ്റാർട്ടപ്പുകളുടെയും ഇൻകുബേറ്ററുകളുടെയും കാഴ്ചപ്പാടും വിശകലനം ചെയ്തിട്ടുണ്ട്. ചി-സ്ക്വയർ ടെസ്റ്റ്, ഫിഷറിന്റെ എക്സാക്ട് ടെസ്റ്റ്, ക്രുസ്കാൽ-വാലിസ് എച്ച് ടെസ്റ്റ്, മാൻ-വിറ്റ്നി യു ടെസ്റ്റ്, സ്പിയർമാന്റെ റാങ്ക് കോറിലേഷൻ, പിഎൽഎസ്-എസ്ഇഎം മോഡലുകൾ ഉപയോഗിച്ചുള്ള മൾട്ടിപ്പിൾ റിഗ്രഷൻ വിശകലനം എന്നിവയാണ് വിശകലനത്തിനായി ഉപയോഗിക്കുന്ന വിവിധ സ്റ്റാറ്റിസ്റ്റിക്കൽ ടെസ്റ്റുകൾ. സാങ്കേതിക വിദ്യ ഉപയോഗിക്കുന്ന സ്റ്റാർട്ടപ്പുകൾക്ക് അനുയോജ്യമായതും ഉൽപ്പന്നങ്ങളെ

അടിസ്ഥാനമാക്കിയുള്ളതുമായ സ്റ്റാർട്ടപ്പുകൾക്ക് കേരളത്തിലെ സ്റ്റാർട്ടപ്പ് ഇക്കോസിസ്റ്റം അനുയോജ്യമാണെന്ന് വിശകലനത്തെ തുടർന്ന് മനസ്സിലാക്കാം. സംസ്ഥാനത്തെ മിക്ക ടെക്നോളജി സ്റ്റാർട്ടപ്പുകളും ഐടി/സോഫ്റ്റ്വെയർ അധിഷ്ഠിതമാണ്. സേവനാധിഷ്ഠിത സ്റ്റാർട്ടപ്പുകൾക്കും സാങ്കേതികമല്ലാത്ത സ്റ്റാർട്ടപ്പുകൾക്കും സംസ്ഥാനത്ത് അവസരങ്ങൾ കുറവാണ്. സ്റ്റാർട്ടപ്പുകൾക്കുള്ള പ്രധാന ഫണ്ടിംഗ് സ്രോതസ്സാണ് ബൂട്ട്സ്ട്രാപ്പിംഗ്, ഇന്നും സ്റ്റാർട്ടപ്പുകൾ അഭിമുഖീകരിക്കുന്ന പ്രധാന പ്രശ്നങ്ങളിലൊന്നാണ് ഫണ്ടിംഗ്. സ്റ്റാർട്ടപ്പുകളുടെ ആക്ടർ ബോണ്ടുകളും റിസോഴ്സ് ബന്ധങ്ങളും പരസ്പരം ആശ്രയിച്ചിരിക്കുന്നു. എല്ലാ വിഭാഗം സ്റ്റാർട്ടപ്പുകൾക്കും ഇൻകുബേഷൻ സൗകര്യം നൽകുന്ന ഇൻകുബേറ്ററുകൾ സംസ്ഥാനത്ത് കുറവാണ്. വ്യത്യസ്ത പ്രവർത്തനങ്ങൾ നടത്തുമ്പോൾ ഇൻകുബേറ്ററുകൾക്ക് പരസ്പരം ഏകോപനം കുറവാണ്, എന്നാൽ അവ വിവിധ ഇൻകുബേഷൻ പ്രവർത്തനങ്ങളിൽ സ്റ്റാർട്ടപ്പുകളുമായി നന്നായി ഏകോപിപ്പിക്കുന്നു. കേരളത്തിന് ഒരു മികച്ച സ്റ്റാർട്ടപ്പ് ഇക്കോസിസ്റ്റം ഉണ്ട്, എന്നാൽ സ്റ്റാർട്ടപ്പുകളുടെ എല്ലാ വിഭാഗങ്ങൾക്കും അനുയോജ്യമായ ഇക്കോസിസ്റ്റം ഉണ്ടാക്കാൻ നിരവധി പോരായ്മകളും ഇതിന് ഉണ്ട്.

പ്രധാന വാക്കുകൾ: സ്റ്റാർട്ടപ്പ്, ഇൻകുബേറ്റേഴ്സ്, സ്റ്റാർട്ടപ്പ് എക്കോസിസ്റ്റം, ആക്ടർ-റിസോഴ്സ്-ആകറ്റിവിറ്റി മോഡൽ, ബിസിനസ്സ് റിലേഷൻഷിപ്പ്.

Chapter 1

Introduction

1.1 Introduction

"All our dreams can come true, if we have the courage to pursue them"

Walt Disney

Entrepreneurship is like a dream that doesn't come true but has to be made true through hard work. It is a combination of entrepreneurship and enterprise. It begins with the entrepreneur, who has the responsibility to bring together the different factors of production like land, labour and capital. An individual always has the option to work for someone else, get into a profession, or else do a business by himself, which leads him to be an entrepreneur. By doing business, a person is not only getting self-employed but is also providing employment to many others. He improves the standard of living for people in society through quality products and services. Entrepreneurs directly and indirectly contribute to the development of an economy. An entrepreneur is one who has a lot of passion for his work and is ready to take any risk to make his dreams come true. As time has progressed, an entrepreneur has evolved from a person who organises the factors of production to someone who solves the problems of society in an innovative way. People no longer need to go to the market to buy products; the entire market is at their fingertips. This evolution is due to the development of technology and entrepreneurial cultures throughout the world.

The concept of an entrepreneur has seen many variations throughout the decades. An entrepreneur is a person who purchases factors of production at a certain price so that they can be sold for an uncertain price in the future. In the 19th century, entrepreneurs were viewed as people with economic motives who did business only for personal gains. Towards the middle of the 20th century, the concept of an entrepreneur as an innovator evolved. By the end of the 20th century, a new form of entrepreneurship emerged based on this concept, where the business is called a startup and the entrepreneur is the startup founder. Entrepreneurs no longer worked with profit motives alone, social responsibility became a major factor that influenced business ideas. Today, entrepreneurship is about finding a problem faced by society and developing an innovative solution for it.

What is a Startup?

Startups are considered to be newly formed business concerns that aim to solve a problem that is faced by their target customers. Startups are small and have limited resources in their initial phase. Startups are innovative in nature; they come up with products that are either new without any substitutes or will be a disrupted version of a product that already exists in the market. Startups are risky because success is uncertain and they face a lot of difficulties in getting established. They grow quickly once they find traction. The term startup is said to have originated in the US and was used as a term for an emerging business concern for the first time in Forbes magazine in 1976 and again by Business Week in 1977. But the term started to be widely used during the late 1990s as a part of dot.com bubble, when a large number of internet based companies were formed worldwide and failed miserably. Because of this, the term startup is often associated with technology based concerns. But there is no such rule that only technology concerns should be called startups. What differentiates a startup from other forms of business is not the use of technology but the innovativeness of the idea and solution. Towards the end of the millennium, startups gained popularity globally. Startups in different sectors started to disrupt the traditional way of doing business. Today, every other person wants to begin a startup, even when they have no idea what a startup is or how it functions.

Startup Ecosystem and Elements

Every business is influenced by the business environment in which it operates. For startups, this business environment is called the startup ecosystem in which they exist. The environment in which startups function and the support they get from various elements of the ecosystem are highly important in determining the survival of the business due to the high risk factor involved. It consists of different factors, including the government, educational institutions, investors and financial institutions, large corporations, mentors, customers, human resources and others, who directly and indirectly influence the functioning of startups. Startup ecosystem is mostly a geographical concept where an area, which can be a single town, a state, a country, a continent, or the entire world in itself, can be taken as a single ecosystem. All the different elements of an ecosystem function together and in coordination with one another. The main objective of developing such an ecosystem is to ensure the growth and survival of startups within the system. All the support needed for the startups should be received from the system. If any element of the ecosystem is not functioning adequately, then that will adversely affect the startups. Suppose startups are not able to find investors to fund them; then they may have to end the business. Likewise, if government policies and tax regulations are not in favour of startups, then no entrepreneur will think of starting one. Similarly, conflicts within the startup team can lead to the dissolution of the business. So in order to know whether a startup ecosystem is really supportive of startups, it is important to analyse various elements of the ecosystem through startups.

Startups, Incubators and Business Relationships

"Business incubators are institutions that support startups in terms of physical space, capital and investment, administrative services and networking connections to allow them to survive the critical startup phase" (Gstraunthaler, 2010). Among the different elements that form a part of a startup ecosystem, incubators function closest to startups by guiding and nurturing them. The existence of incubators is solely related to the growth and development of startups. Connections among entrepreneurs, between entrepreneurs and incubators and those among incubators are the most crucial ones among the different connections that exist in an entrepreneurial ecosystem (Motoyama & Watkins, 2014). Connections between organisations are established through the transactions and interactions that lead to business relationships and business relationships in turn lead to interdependencies between organisations. Connections and interdependencies explain how organisations exist in a business network (Hakansson & Snehota, 1995). The functioning of startups and incubators in the startup ecosystem can be explained by analysing their business relationships in the ecosystem.

Actor-Resource-Activity (ARA) model is a conceptual model developed by the Industrial Marketing and Purchase Group (IMP Group) for analysing interactions and relationships in a business network. This model was further modified by Hakan Hakansson and Ivan Snehota (1995) as a part of their research on exploring business networks and relationships. According to the ARA model, each element in a business network is considered as an actor and business relationships are explored at three levels: company analysis, relationship analysis and network analysis. Company analysis is done by analysing activity structure, organisation structure and resource collection of business organisations. Analysing the relationship between two actors (a dyadic relationship) is called relationship analysis. Dyadic relationships are analysed through activity links, actor bonds and resource ties between two actors. Network analysis is the analysis of relationships between three or more actors. An analysis of the business relationships of startups and incubators using the ARA model will provide a better understanding of their functioning in the startup ecosystem. All types of startups should receive ample opportunities and support to survive in the ecosystem. A startup ecosystem should not be biased towards any particular category of startups and should be supportive of all alike. Only then can we say that a startup ecosystem is favourable for all types of startups. Understanding the interactions and operations of different startup categories will be aided by an examination of the business relationships of startups and incubators.

1.2 Significance of the Study

Startups are considered vital for the development of an economy. This is because of the innumerable possibilities of innovation, employment and the latest technologies that startups can bring into a system. Every economy is thriving to create a startup ecosystem, which will help them cultivate their own startup culture, through which more entrepreneurs can be motivated to come forward with their own ideas. For this, it is important that entrepreneurs and interested parties are well aware of the different possibilities for startups within an ecosystem. Many people don't know what support will be available to them through the government and other organisations for their venture. The meaning of a startup and the concept of the startup ecosystem itself are vague among people. This implies the significance of studies with regard to the startup ecosystem and its elements so as to create more knowledge among people about the concept. This research study analyses the business relationships of startups and incubators, which will help to understand how various categories of startups and incubators are functioning in the ecosystem. This will help potential entrepreneurs and young minds realise the various possibilities and difficulties for startups in Kerala. The study also looks into the role of other supporting actors that are crucial for the functioning of startups and incubators. Once more, this aids in comprehending the circumstances in which startups operate. Hence, this study is significant for imparting knowledge about the startup ecosystem, which will be helpful for entrepreneurs and related people. This study can also be used by authorities to understand the difficulties faced by different categories of startups and formulate policies that will benefit all. Hence, understanding and awareness about a startup ecosystem can be improved through these types of studies, which are relevant for the economy.

1.3 Scope of the Study

The scope of this study is intended to examine those startups that are associated with the active incubators in Kerala. Startups associated with the incubators can be incubatees as well as coworking startups. Incubatees are startups that are part of the incubation programme provided by incubators and coworking startups are startups that only use the physical space of incubators for rent. Scope of the study also includes 38 active incubators in the state. Startups included in the study can be classified into different categories based on their registration status in DPIIT and KSUM, stages of the startup life cycle, nature of business, type of technology, nature of output, status in incubators, legal status, sector of business, business model and office space.

Incubators in the study can also be classified into various categories based on their supporting authority/organisation, stage from which startups are admitted for incubation programmes, nature of business and nature of the output of startups associated with them. The study intends to analyse the business relationships of startups and incubators in the startup ecosystem of Kerala. This makes it easier to comprehend how various types of startups and incubators are operating within the ecosystem and whether there are any notable differences in how they do so. For this purpose, startups are selected from incubators actively functioning in the ecosystem throughout the state by geographically dividing the state into the north, central and south regions.

1.4 Statement of the Problem

Kerala is one of the best performing startup states in India (Department for Promotion of Industry and Internal Trade, 2022). The process of developing a startup ecosystem within the state is helmed by the state government itself. Since the formation of Technopark, Thiruvananthapuram, in 2002, Kerala has made efforts to foster a suitable environment for startups. These efforts have been accelerated since 2014 due to measures like 'Startup India' and 'Make in India' taken by the central government. In 2015, the Kerala Startup Mission was formed as the nodal agency for looking into the growth and development of startups. As a result, well organised and structured startup activities emerged in the state, providing wide opportunities for startups. Today, through the efficient functioning of KSUM under the guidance of the state government, there is an active startup ecosystem in Kerala.

There are different categories of startups that function in the startup ecosystem of Kerala. But startup development efforts in Kerala are mainly focused on technology based startups. The nodal agency Kerala Startup Mission provides registration only to technology based product startups and most of the startup development programmes of the government of Kerala are done through KSUM. The Kerala Technology Startups Policy of 2014 is exclusively for supporting the technology startups. We have

Technology Business Incubators (TBI's), technolodges and research centres for catering to the needs of technology and product oriented startups. In the case of supporting actors like incubators, investors, mentors, educational institutions, government, etc., there can be differences in how the assistance of these actors is accessible and available to different types of startups. Among all the different supporting actors, incubators function closest to startups by providing them with training and assistance. To understand better how different categories of startups are functioning, it is also important to know how various types of incubators function. The business relationships of startups and incubators in the Kerala startup ecosystem are the area that lack sufficient literature. Startups within the same ecosystem may have different opportunities and difficulties depending on the reach and impact of different elements of the ecosystem on them. Technology based startups may get more support and assistance than non-technology based startups. Product based startups may get more relevance and mentoring than service based startups. Sources of funding may be different for startups based on the nature of their business. Therefore, elements of the same ecosystem can have different impacts on various categories of startups. Hence, to understand whether the startup ecosystem of Kerala is favourable for all types of startups, it is quite appropriate to analyse the business relationships of startups and incubators and also understand their perspectives about other supporting actors in the ecosystem.

1.5 Research Questions

The research questions investigated in the study are the following:

1. Does the activity structure, organisation structure and resource collection of various categories of startups differ from one another?

2. Do the activity links, actor bonds and resource ties of various categories of startups with other startups and incubators differ from one another?

3. Is there any interrelationship between activity links, actor bonds and resource ties of startups?

4. What is the activity structure, organisation structure and resource collection of various categories of incubators?

5. Do incubators have activity links, actor bonds and resource ties with other incubators and startups?

6. What is the perspective of startups and incubators about the role of other supporting actors in the startup ecosystem?

1.6 Objectives of the Study

1. To examine the startups based on their activity structure, organisation structure and resource collection using Actor-Resource-Activity model.

2. To examine the business relationships of startups with other startups and incubators based on activity links, actor bonds and resource ties using Actor-Resource-Activity model.

3. To analyse the interrelationship between activity links, actor bonds and resource ties of startups with other startups and incubators.

4. To examine the company analysis and relationship analysis of incubators using Actor-Resource-Activity model.

5. To understand the role of supporting actors functioning in the startup ecosystem.

1.7 Hypotheses

The hypotheses formulated in the study are the following:

1. **H_0:** There is no significant difference in the activity structure of various categories of startups.

2. **H_0:** There is no significant difference in the organisation structure of various categories of startups.

3. **H_0:** There is no significant difference among various categories of startups with regard to the sources of funding, human resources employed and business knowledge of the startup team.

4. **H_0:** There is no significant difference among various categories of startups with regard to their activity links with other startups.

5. **H_0:** There is no significant difference among various categories of startups with regard to their actor bonds with other startups.

6. **H_0:** There is no significant difference among various categories of startups with regard to their resource ties with other startups.

7. **H_0:** There is no significant difference among various categories of startups with regard to their activity links with incubators.

8. **H_0:** There is no significant difference among various categories of startups with regard to their actor bonds with incubators.

9. **H_0:** There is no significant difference among various categories of startups with regard to their resource ties with incubators.

10. **H_0:** There is no significant correlation between activity links, actor bonds and resource ties of startups with other startups.

11. **H_0:** There is no significant correlation between activity links, actor bonds and resource ties of startups with incubators.

12. **H_0:** There is no significant difference in the perspective of various startup categories about the role of different supporting actors in the startup ecosystem.

1.8 Methodology

The research work focuses on the analysis of business relationships of startups and incubators in the Kerala startup ecosystem. The study of incubators is a population study and that of startups is a sample study. The research has been carried out following a descriptive and exploratory research design. Stratified random sampling technique is used for the sampling process. Data is collected from 38 incubators and 288 startups. Pre-tested interview schedules are used for collecting data from the respondents. The Chi-square test, Fisher's Exact test, Kruskal-Wallis H test, Mann-Whitney U test, Spearman's Rank Correlation and multiple regression analysis using PLS-SEM models are the different statistical tests used for analysing the collected data. IBM-SPSS 21.0, Smart PLS 4 and MS Excel (2010) are the softwares used for analysing data.

1.9 Operational Terms and Definitions

Operational definitions of important terms associated with the study are as follows:

1. **Startups:** Startups are business concerns that focus on providing innovative solutions to problems faced by the target customer. Startups are disruptive in nature and have a scalable business model.

2. **Startup Ecosystem:** Startup ecosystem is an entrepreneurial ecosystem that consists of different elements such as incubators, mentors, investors, government, universities, research organisations, etc. that function together for the growth and success of startups. Startup ecosystems are confined to a geographical area, which can be a country, state, district or town.

3. **Incubators:** Incubators are supporting organisations that provide incubation facilities to startups. They mentor and guide startups to make their ideas commercially viable and successful.

4. **Active Incubator:** An incubation centre where at least one startup is actively incubated.

5. **Business Relationship:** Relationship established between business organisations through different transactions, interactions and the sharing of resources.

6. **Actor:** An organisation that is part of a business network.

7. **Resource:** A tangible or intangible substance used by an organisation.

8. **Activity:** A function or task performed by an organisation.

9. **Activity Structure:** List of activities performed by an actor.

10. **Organisation Structure:** Hierarchy, positions and communication in an organisation for performing activities and achieving goals.

11. **Resource Collection:** Collection of various tangible and intangible resources used by an organisation for performing their activities.

12. **Activity Links:** Level of coordination between actors while performing various activities.

13. **Actor Bonds:** Structural, economic and social relationship developed between actors through business interactions and the performance of activities.

14. **Resource Ties:** The relationship developed between actors through resource sharing.

15. **Bootstrapping:** Arranging funds needed for business from family and friends.

16. **Dyadic Relationship:** A business relationship between two organisations or actors.

17. **Supporting Actors:** The various actors in the startup ecosystem, like the state government, investors, universities/educational institutions and mentors, who provide vital support to the functioning of startups.

18. **Perspective:** Attitude of startups and incubators about the role of supporting actors in the startup ecosystem.

1.10 Synoptic View of the Thesis

The thesis has been organised as described below:

Chapter 1: Introduction

This chapter gives an introduction to the topic of research work. It also describes the significance of the study, the scope of the study, the research problem, the research questions and the objectives of the study. Hypotheses formulated in the study, methodology, definitions of operational terms used and descriptions of the chapters included in the thesis are also included in this chapter.

Chapter 2: Review of Literature

The review of literature taken from different sources, such as journals, periodicals, books, reports, conference proceedings, research theses, etc., related to the topic of the study, is included in this chapter. Research gaps identified through the review of literature is also explained in the chapter.

Chapter 3: Theoretical Framework

Explanation of the various theories and concepts used in the study is included in this chapter. Detailed description of startups, entrepreneurial ecosystems, the startup ecosystem and its elements, Actor-Resource-Activity model and different variables used in the study are given in the chapter.

Chapter 4: Research Methodology

The methodology used to carry out the research work is narrated in the chapter. Information regarding research design, sample design, sources of data, variables of the study, conceptual framework, method of data collection, instrument used for data collection, designing of interview schedules, pilot study, validity and reliability of data, normality of data, softwares and tools used for data analysis are provided in the chapter.

Chapter 5: Components of Individual Actors - Startups

An analysis of various categories of startups as individual actors is included in this chapter. Activity structure, organisation structure and resource collection of different startup categories are analysed throughout the chapter.

Chapter 6: Components of Business Relationships - Startups

Activity links, actor bonds and resource ties of various categories of startups with other startups and incubators are analysed in the chapter. The interrelationship between activity links, actor bonds and resource ties of startups is also analysed in this chapter.

Chapter 7: Components of Individual Actors and Business Relationships – Incubators

This chapter analyses incubators as individual actors through their activity structure, organisation structure and resource collection. This chapter also explores the activity links, actor bonds and resource ties of various categories of incubators with other incubators and startups.

Chapter 8: Role of Supporting Actors

The perspective of startups and incubators about the role of other supporting actors like the state government, investors, universities/educational institutions and mentors in the startup ecosystem is analysed in this chapter.

Chapter 9: Summary, Findings and Conclusions

A summary of the research work, along with the findings of the statistical analysis, implications of the study, contributions of the study and conclusions derived from the study, are included in this chapter.

Chapter 10: Recommendations

This chapter consists of recommendations derived from the findings, limitations faced while conducting the study and scope for future research.

1.10 Chapter Summary

An introduction to the research work that has been carried out is given in this chapter. Why and for what purpose the research is conducted can be understood from the chapter. The significance of the study, scope of the study, research problem, research questions, objectives, hypotheses formulated, methodology, explanation of operational terms used and summary of different chapters in the thesis are the various contents included in the chapter.

Chapter 2

Review of Literature

2.1 Introduction

The purpose of a literature review is to collect available studies related to our area of research and identify gaps in the field of study. A literature review also helps us identify the research problem and the different variables that form part of the study. This chapter contains studies and reports that discuss the entrepreneurial ecosystem, startup ecosystem and its components, Indian startup ecosystem, global startup scenario and different aspects of the Actor-Resource-Activity model that explains about analysing a business relationship. The chapter is divided into five different sections so that it is easier to understand and evaluate the literature. The first section of the chapter is about the entrepreneurial ecosystem and its various dimensions. Different studies evaluating the entrepreneurial ecosystem, its formation, various elements forming part of it and how important it is for the entrepreneurial development of a region are included in this section. The second section is about the startup ecosystem and its various components. The startup ecosystem is part of the entrepreneurial ecosystem and has its own distinctive features. Different elements of the startup ecosystem play their own separate role in the development of startups. So this section consists of studies that point out the relevance of different elements of the startup ecosystem to the establishment and growth of startups.

The third section includes studies that discuss the Indian startup ecosystem by giving more focus on the growth drivers that motivate startups and the various challenges faced by startups in India. India has a dynamic startup ecosystem that is studied from different angles and these studies help us understand why certain startups survive while the majority turn into failure in India. Which factors are more vital for startups and which areas need more support can be understood by evaluating these studies. This section also helps us to understand the various dimensions in which the Kerala startup ecosystem has already been studied and identify the gap for further study. The depth and volume of existing studies regarding the Kerala startup ecosystem can be understood from this section. The fourth section of this chapter contains studies about the startup ecosystem from a global perspective. Studies have been conducted about the startup ecosystem in different parts of the world. The nature and features of the elements of a startup ecosystem may differ from country to country. The factors that are relevant for startup growth in one part of the world may be different from another. With the change in culture, political conditions, investor preference, customer consumption pattern, income and many other factors, we can see a wide difference in how startups are influenced by different elements in different countries. So this section will consist of studies that will explain how the startup ecosystem and its elements function in different parts of the world.

Finally, studies that explain the different dimensions of the ARA model are included in the last section. This section looks into the literature that is related to how ARA can be used for studying business relationships and networks. It also gives an insight into the important variables used in the study. The studies covering these five sections will give us a good idea of what aspects of the startup ecosystem have been studied so far, how these studies have been conducted, how deep business relationships have been previously studied and to what extent the ARA model has been used to understand business relationships, finally leading to the determination of research gaps and problems.

2.2 Entrepreneurial Ecosystem

Christine Volkmann et al. (2009) in the report on entrepreneurial education, it is stated that an entrepreneur is the individual, entrepreneurship is the process, entrepreneurial indicates the attitude, skills and behaviour and the entrepreneurial ecosystem is the role of society. Entrepreneurship thrives only in an ecosystem where different factors collaborate and form partnerships with each other. Government, academic institutions, entrepreneurs and existing business concerns should be interlinked with each other in an entrepreneurial ecosystem.

Daniel Isenberg (2011) discusses entrepreneurial ecosystem strategies, as there are policy mistakes involved in the way these strategies are conceived and implemented (with respect to Ireland). Low public priority towards entrepreneurship, lack of clarity in entrepreneurship objectives, diverse consequences of educational programmes leading to brain drain, unintended repulsion of investors and entrepreneurial aspirations getting weakened are considered the result of mistakes in conceiving and implementing strategies. Six principles are developed in the study through which these mistakes can be rectified: 1) to distinguish between self-employment, SME and entrepreneurship and give more focus to entrepreneurship; 2) to give high public priority to entrepreneurship; 3) to intervene from a comprehensive ecosystem perspective; 4) to focus more on concentrated and specific geographies; 5) to establish a temporary organisation with a 'sell-by' date to manage the ecosystem; and 6) to set the target for one high-potential venture every year, which can employ 50,000 to 1,50,000 people. The study has identified six major domains of an entrepreneurial ecosystem, such as policy, finance, markets, culture, human capital and support organisations. Finally, it is concluded that strategies should be formed to support entrepreneurship and ensure success. Implementation of strategies without an ecosystem perspective will have a negative impact on entrepreneurship.

Colin Mason & Ross Brown (2014) study about entrepreneurial ecosystems states that to create more high-growth firms, a mere supportive environment is not sufficient. Creating a favourable startup environment alone will not ensure the creation of high-growth firms, for that ecosystem should also be supportive of ambitious entrepreneurs. Large established enterprises, entrepreneurial recycling, an information-rich environment, culture, the availability of startup capital, the presence of universities and service providers are stated as the distinctive features of an entrepreneurial environment. It is identified in the study that an ecosystem operates through the combination of different factors and despite some common features, each ecosystem is different. The basic and economic factors of an ecosystem alone are insufficient for the growth of startups; therefore, policies should be formulated to bring about significant changes in an ecosystem. Entrepreneurial ecosystems need to be created and cultivated.

Erik Stam & Ben Spigel (2016) did a critical investigation of the current literature on entrepreneurial ecosystems. An entrepreneurial ecosystem is defined as "As a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship within a particular territory." It was found that most of the current studies on entrepreneurial ecosystems are based on superficial generalisations and success stories from Silicon Valley; these studies are highly underdeveloped. The shortcomings of the prevailing entrepreneurial approach are also discussed in the study. The entrepreneurial ecosystem approach is said to be tautological, where it is repeated that it is a system that produces successful entrepreneurship. This approach mainly focuses only on the different elements of the ecosystem without establishing a cause and effect relationship. Finally, it is not clear as to which level of analysis this approach is aiming for; an ecosystem can be geographically a region, a city, or even a country. The ecosystem model developed in the study divides entrepreneurial activities into two categories: systematic conditions and framework work conditions. Networks, leadership, finance, talent and knowledge support services are considered systematic conditions. Formal institutions, culture, physical infrastructure and demand are taken as framework conditions.

Philip T Roundy (2017) examines the entrepreneurial ecosystems in small towns because studies are always conducted based on the ecosystems of urban cities. Entrepreneurial ecosystems in small towns are significant for economic development; thus, this study provides a framework for understanding the startup ecosystem of small towns. Entrepreneurship in small towns is considered to be part of an ecosystem. They lack many components compared to the ecosystems in large towns, but they can still formulate different strategies that will help them overcome their deficiencies. People who focus on developing entrepreneurship in small towns should be entrepreneurial in the way they formulate strategies and attract resources towards the ecosystem. The study has identified three strategies that can be used by small towns to overcome their limitations over large ecosystems with respect to size, resource and location. The first strategy is that small towns should focus on their general features that differentiate them from large towns, such as less congestion, low labour cost and low housing costs. Secondly, define their borders broadly without limiting them to the geographic boundaries, so that resources can be acquired even from outside the physical boundaries. Finally, social networks in small towns are denser and stronger when compared to large cities, which can be beneficial.

Ishraga Khattab (2017) states that the increase in unemployment, the advancement of technology and recent social changes have motivated many countries to come up with better development policies and set up a better entrepreneurial environment. This study discusses different entrepreneurship models and different factors forming an entrepreneurial ecosystem to show how an integrated model of an entrepreneurial ecosystem can be formed. The study identifies entrepreneurship as a strong force for economic development and it needs an enabling environment to grow and develop. Startups need a legal and regulatory system that can ensure them fair competition, protect their property rights and reward their initiatives. So for a sustainable entrepreneurial ecosystem with financial, legal, educational and other support, there must be a robust political environment in the country.

GIZ (2018) prepared a guide for mapping entrepreneurial ecosystems. According to the guide, the concept of an entrepreneurial ecosystem consists of two words: entrepreneur and ecosystem. An entrepreneur is the individual who starts the business and ecosystems consist of a group of interconnected elements that interact with one another through their environment. So entrepreneurial ecosystems also consist of different elements, like individuals, organisations, communities, institutions or groups that are interconnected with one another. As per this guide, the three elements of an entrepreneurial ecosystem are: 1) business environment and investment climate; 2) different actors interacting with each other; and 3) entrepreneurial culture and attitude towards entrepreneurship. Investment climate is a broader concept and the business environment forms part of it. Investment climate can be differentiated in seven domains: financial markets, rule of law, labor markets, political situation, economic predictability, infrastructure, HR and skills. The business environment consists of legal, political, institutional and regulatory framework that governs the activities of a business.

David B Audretsch et al. (2018) discusses the term ‘ecosystem’ by reviewing the available literature and focusing on the existing inconsistencies in the usage of the term ‘ecosystem’. Along with that, the various economic, societal and technological dimensions of an entrepreneurial ecosystem are also summarized in the study. An entrepreneurial ecosystem should generate value for the ecosystem and distribute this value among its various members. The economic impact of an entrepreneurial ecosystem is that it supports regional development, increases capital wealth and contributes to human capital as well as other resources in the economy. Technological entrepreneurial ecosystems can lead to regional innovation, technology transfer and the conversion of innovative ideas into new products and services. Entrepreneurial ecosystems can have a societal impact by bringing products that can solve social problems and are beneficial to society. The study concludes that the major problem with an entrepreneurial ecosystem is defining its boundaries. A better understanding of the boundaries is necessary to study the technological, economic and societal impact of entrepreneurial ecosystems.

Edward J Malecki (2018) reviewed the various literatures on entrepreneurial ecosystems and states that the usage of the word ‘ecosystem’ in social science rather than as an ecological concept started after the work of James.F.Moore in 1993, where he termed the business ecosystem as the firm’s external environment. It can be understood from the bibliographical evidence that the term ‘entrepreneurial ecosystem’ has overtaken all other related terms. The discussions on entrepreneurial ecosystems have always been focused on their different elements, but the process of combining these elements into a system is ignored. The major constraint of an ecosystem is that it is a system. Even though entrepreneurial ecosystems are local in nature, they are always identified at the national level. The study has stated that universities are the most frequently identified element of an entrepreneurial ecosystem after entrepreneurs. Entrepreneurial ecosystems are dynamic and help evolve different groups of firms, but it is not yet clear whether entrepreneurial ecosystems as a concept are useful to all regions. It is more useful in regions that have a sufficient number of firms. The study recommends that more studies are essential on entrepreneurial ecosystems at their different stages of development.

Erik Stam & Andrew Van De Ven (2019) have developed an Entrepreneurial Ecosystem Index after studying and measuring the different elements of an entrepreneurial ecosystem using a systems framework. The aim of this study is to examine the interrelationship between the various factors within an ecosystem and to understand how entrepreneurship is produced within economies. The different elements of an ecosystem are divided into two categories: resources and institutional arrangements. Resources include physical infrastructure, demand, intermediaries, talent, knowledge, leadership and finance. Institutional arrangements include formal institutions, networks and culture. The output of an entrepreneurial ecosystem is productive entrepreneurship. The results of this study show that all the elements of an entrepreneurial ecosystem are interdependent and they evolve together in a territory. The strongest correlation can be seen between three clusters of elements. First, between talent, entrepreneurial support and culture; then, between knowledge and leadership; and finally, between physical infrastructure and demand. So it is concluded that an entrepreneurial ecosystem should be treated as a whole system and not as ten different elements because the overall quality of the ecosystem is positively related to entrepreneurial output.

2.3 Components of Startup Ecosystem

Andy Lockett et al. (2002) argued that the role of universities as incubators of high tech startups is neglected because of the wide range of facilities provided by formal business incubators. This study discusses the role universities can play in business incubation without being formal incubators. The study insists that universities should be seen as incubators 'without walls' while incubating spin-out companies to bring technology transfer. Universities provide many services provided by formal incubators, but they are not confined to clearly defined walls. Universities need to provide the range of resources that are needed by companies to grow and flourish;

social capital is one such important resource. Therefore, universities should either connect with individuals who can either provide the necessary social capital or build it over time.

Roger Sorheim (2005) explains the role of business angels as facilitators for future finance and their value added contributions to startups. The study is done through an in-depth analysis of five experienced business angels. The study has found that, apart from financial support, strategic advice and networking are the value-added contributions of business angels. The previous track record of business angels affects how they contribute further finance to startups. Active business angels are an asset for startups and they can be included in the entrepreneurial team. Industry-specific business angels will help establish connections with various strategic partners and regional business angels can bring contributions from other business angels through their networks. But compared to regional business angels, it is industry specific business angels who can bring venture capital funds to a portfolio of firms.

Veland Ramadani (2009) discusses who business angels are. The study mentions that business angels invest a small part of their wealth in any new enterprise so that if they lose their money, it won't drastically affect them. They are basically people with a university diploma or professional degree, but angels who have a postgraduate degree or doctorate are rare. Most of the business angels are male, who are 40–65 years old. Most business angels have either held leading positions or have managed their own businesses. So the study concludes that business angels are private investors who have gained wealth and experience through their work lives and are ready to invest in small and medium enterprises. They bring a significant amount of knowledge and expertise to the business. The fact that business angels invest in personal assets differentiates them from other high risk institutional investors. Further, they also encourage other wealthy people to become business angels.

Michael Schwartz (2011) says that it is a common assumption that incubators help in the growth of a firm even after they have graduated from the incubation centres, but there are no studies on the performance of startups after they have completed graduation and left the incubator. So an investigation was conducted on 324 graduated startups from five German business incubators to evaluate the long term development of startups, i.e., their performance up to seven years after completing graduation. Employment and sales are considered as the performance measures of startups in the study. According to the study, startups show a positive development in terms of the number of employees and sales revenue generation during the incubation process. But the long term contribution of graduated firms to employment generation is limited. Except for some outstanding startups, the majority of the graduated startups have a negative impact on the labour market. Findings of the study indicate that there is strong firm growth in the initial incubation period, but from deep analysis, it can be understood that only a few graduates show strong performance after finishing graduation. The study argues that graduation does not mark the starting point for sustainable growth in startups.

Creso Sa & Hana Lee (2012) studied the formation of networks in technology business incubators. The study focuses on the efforts taken by technology business incubators to form interorganisational networks and how these networks are conceived by the incubated firms. The results of this study indicate that incubators directly and indirectly influence the networking strategies of incubatee startups; workshops, seminars and events help the incubatees form new connections. It is also mentioned that the connection of incubators with local universities will give them access to knowledge, skills and research facilities. Different types of networks are developed within a business incubator, but what is important is to capitalise on these interactions for the purpose of business. The study also suggests that the networking strategies of incubatees should be fostered through incubator networks only to a certain extent.

Eric Stokan et al. (2015) analysed whether incubators can produce any differential effect on growth firms. The study was conducted by surveying 294 incubated and 395 non-incubated startups. A similar group of incubated and non-incubated firms was formed through the matching technique to analyse the impact of incubators on the growth of employment in firms. It was found that incubators have a significant positive impact on the growth of job opportunities in startups. The study says that startups belonging to the technology, manufacturing, professional/scientific, information technology or research sectors are more likely to be accepted by incubators. Startups from urban regions also have good chances of getting incubated. The study concludes that incubated startups get five times more business services than their non-incubated counterparts. Startups become more successful when they get assistance from business incubators, because incubators help to develop networks and provide business services to startups.

Deepak Agnihotri (2016) discusses what makes a great startup ecosystem and how it can be improved for the entrepreneurs who function within that ecosystem. According to the study, entrepreneurship is a global phenomenon that demands interconnected landscapes and consumers who accept new technology faster. The study has identified capital, know-how (engineers, designers and technology) and rebellion (search for something new) as the three important elements whose combination can lead to the success of an economy. These three elements are combined in seven different ways in the study: capital only, capital and know-how, know-how only, know-how and rebellion, rebellion only, rebellion and capital and finally, capital, rebellion and know-how. The implications and consequences of each combination are very well explained in the study. The absence of any one of these three elements is said to create chaos in the economy. Talent, culture, density, capital and a regulatory framework are concluded to be the five factors that can form the right startup ecosystem. While mentioning the Indian startup ecosystem, it is said that there are a lot of growth opportunities for startups in India, but there is still a lack of the right ecosystem for startups and the startup ecosystem in India is still developing.

Geoffrey Graybeal & Amy Sindik (2016) examine how entrepreneurs and university partners are using interorganisational connections for the success of startups in an ecosystem. The study suggests that the connection between educational institutions and professional facilities helps to bring greater entrepreneurial success within the ecosystem. Increased legitimacy, increased networking and greater regional identity are the benefits of an interorganisational relationship. Working in close proximity with business incubators and accelerators can motivate universities to make such mentoring arrangements within their educational system and it will also help the talents in universities to remain within the ecosystem rather than leaving for another place to establish businesses. So, the interrelationship between entrepreneurial facilities (accelerators, incubators, co-working spaces, etc.) and universities and other education institutions is very relevant for the startup ecosystem.

Christian Kjer Monsson & Soren Berg Jorgensen (2016) studied how the characteristics of an entrepreneur will influence the benefits they receive from business incubators. Entrepreneurs are classified on the basis of their experience, stage of startup development and logic based on their thinking. It has been found that novice entrepreneurs get more benefit from business incubators than experienced entrepreneurs because they get a lot of knowledge and advice from incubators. Therefore, novice entrepreneurs are more open to advice than experienced entrepreneurs. Entrepreneurs who have had startups for more than two years give more importance to office facilities than startups at their early development stage. Incubatees give more importance to networking with other incubatees within the incubator than any other facility. This highlights the importance of informal relationships. Entrepreneurs with predominant causational logic need more assistance in planning and analysis, whereas entrepreneurs with effectual logic need assistance in networking and partnerships. Incubation managers are said to have a moderately positive influence on incubatees. So the study concludes that incubation programmes need to be tailor made for each entrepreneur, depending on their characteristics, for them to be effective.

Alexander Vekic & Jelena Borocki (2017) prepared a paper to highlight the most important supporting institutions and their role in the startup ecosystem. They have mentioned startups as very fragile and young business concerns, so a high level of caution is needed with regard to them. Startups are very unpredictable entities, so the role of supporting institutions is important because they help startups become permanent entities with predictable business models. Research institutions, educational institutions, support organisations (accelerators/incubators), corporations, government institutions, community and funding organisations are identified as the major elements of a startup ecosystem in the study. The study has further classified the support given by various institutions to startups as broad, functional and financial. The role of each supporting institution is very well explained in the paper and special mention is given to the European policies for startup development. The paper concluded by mentioning that the role of institutes in supporting startups will be increasing significantly.

Nirnaya Tripathi et al. (2018) conducted a multi-vocal literature study based on technical articles, white papers and internet articles about the startup ecosystem in order to identify the definition and different elements of the startup ecosystem. Out of 18,310 articles, 65 were finally selected for the study. Out of these 65 articles, more than 50% were concluded to be relevant to the startup ecosystem and 34 were opinion-based studies. The study has identified four definitions and eight elements of the startup ecosystem. Finance, demography, market, human capital, education, technology, entrepreneurship and support factors are the various elements of the startup ecosystem. The study has concluded that the current knowledge about startup ecosystems is mainly from non-peer reviewed studies, so it calls for more systematic and empirical literature on startup ecosystems.

Silvia Rita Sedita (2019) discusses the impact of incubation on the innovation performance of startups. The study was conducted based on startups under incubation in the manufacturing as well as service sectors. The innovation performance of startups is measured based on the return on sales of products that are new to the market or innovative. The results of the study suggest that incubation is very important for improving the innovation performance of ventures. A networked business incubation model is highly effective because it can help the incubatees to increase their networking abilities and be open to innovation. The investment in incubation structures for improving their internal capabilities and networking will be very helpful in developing innovative startups. Therefore, it is highly recommended that policymakers support the formation of such incubation centres and also closely evaluate the various services provided by them.

Hamed Ojaghi et al. (2019) conducted a systematic literature review of 63 records to identify the formation of an innovation ecosystem. According to the findings of the study, incubators, accelerators, companies, financial suppliers and universities are the key actors in an ecosystem. The study identifies that more interaction between the various actors leads to a more active ecosystem, but these interactions are effective only when they improve the performance of the ecosystem. Interaction between the actors is important for forming the structure of the ecosystem, infrastructure facilities and networking. The three important mechanisms for innovation ecosystem formation are: 1) the genesis mechanism 2) survival and growth mechanisms; and 3) innovation and development mechanisms. According to the genesis mechanism, startups should have innovation capability from the beginning itself. After that, startups should be supported for their growth and survival. As startups grow, they may lose their innovative capabilities, so innovation development measures need to be taken at this stage.

2.4 Indian Startup Ecosystem

NASSCOM & Zinnov (2014) prepared a report on the Indian startup ecosystem. The report covers the digital landscape in India, technology focus areas and white spaces, venture capital and private equity investment trends, angel investor's ecosystem in India, startup support ecosystem in India and key expectations of startups. The report states that there is a sharp increase in technology startups in India and the whole ecosystem is evolving and becoming more and more vibrant. According to the report, the Indian middle class is becoming a voracious customer of digital solutions. Some of the key findings of the study indicate that scaling up and growth are the priorities of startups and they are able to hire best-in-class talent by offering average compensation. Funding for startups is maturing in terms of deal value and diversity of focus areas. It is highlighted that merger and acquisition activities have also increased in India. The study concludes by pointing out that there is a high demand for supportive government policies and that the latest technologies like IoT, SaaS, mobile solutions and data analytics have a great future in India.

Government of Kerala (2014) has published ‘Kerala Technology Startup Policy'. The preamble of the policy states that a lot of talented youth in Kerala are leaving the state in pursuit of better entrepreneurial opportunities. In order to reduce this and provide a world class technology ecosystem, it is essential to have a policy for technology startups. It is mentioned that Kerala is the first state where 1% of the state annual budget is earmarked for entrepreneurship development activities. The policy is formulated with the mission of making Kerala the number one destination for startups and being among the top five startup ecosystems in the world. There are eight specific objectives for the policy and a startup is defined as an innovation based technology startup registered under the Companies Act within 3 years of incorporation. The policy is split into nine key portions: infrastructure, incubators and accelerators, human capital development, funding, state support, governance of policy, public-private partnerships, scaling of existing and establishing new incubators and the startup-bootup-scaleup model for fast moving ideas. All nine portions are very well explained and they form the major part of the policy.

NASSCOM & Zinnov (2015) discussed the momentous rise of the Indian startup ecosystem. The objective of the report is to analyse the current scenario and emerging trends across the various dimensions that define the Indian startup ecosystem. The report mentions six reasons why India can be called a startup nation and the contributions made by startups to the Indian economy. The report focuses on the need for better government policies and the demands made by startups with regard to policy formulation. The report mainly discusses the startup landscape of India, in which a similar pattern is followed as in their previous reports. Still, the report is useful because it provides up-to-date information regarding the startup ecosystem in India.

N K Nikhil et al. (2015) studied the problems and prospects of startups in Kerala with special reference to the Kerala Startup Village. Data for the study was collected from 30 startups that functioned in Startup Village. It was found in the study that there was a gender disparity with regard to startup ownership; the majority of the owners were male. Most of the startups were in B2B business and startups took at least one year to come up with a feasible product-market fit. Out of different methods of funding, startups mainly depended on their own funds. Lack of return on funds, poor mentoring and poor product market fit are the major challenges faced by startups. Funding and infrastructure facilities were identified as the least concerns of startup founders. A study has concluded that entrepreneurs form startups mainly with ‘service’ motto. Economic objectives, social gains, national importance and ecological aspects come only after the service motto.

Akansha Dutta (2016) studied the various government policies and programs formulated by the government for the enhancement of startups based on the ‘Startup India Initiative’ that was introduced by the central government in 2016. As per the study, initiatives taken by the Indian government are a great support for startups. It can help with rapid business approval, easy exits, tax rebates and faster patent registrations. The study also attempts to understand the reasons for starting a startup and the author has identified 18 different reasons. Prominent among these reasons are monetary gains, secured jobs, personal decisions and recognition. One of the objectives of the study was to identify the important problems faced by startups, but the researcher has failed to give a detailed insight into the same in her study. The study is based only on the 19-point action plan of the central government, which was formulated as part of the ‘Startup Indian Initiative’.

Abhrajit Sarkar (2016) made a literature survey analysis on the challenges and prospects of Indian startups with regard to various startup policies by the Indian government. The study is mainly based on the ‘Startup Action Plan’ by the government of India and what benefits Indian startups can reap from them. Financial incentives, mentoring support, tax exemptions and an easy and faster exit policy are some of them. The study states that India has declared 2010–20 the decade of innovation and has emphasised the need for more policies in the field of science and technology. The various challenges for startups have not been mentioned systematically in the study. It is concluded that startups require a lot of support and encouragement in the initial phase and the growth phase until they find a firm root.

Amit Kapoor & Sankalp Sharma (2016) have prepared a “State Innovation Index,” which ranks the different states of India based on their innovation and competitiveness. Maharashtra is the state with the highest point (49.32) and Jharkhand is the state with the lowest point (21.42). The innovation index of Kerala is 37.40, which is average. The index of other South Indian states is: Tamil Nadu 45.62 (high), Karnataka 40.35 (above average) and Andhra Pradesh/Telungana 35.43 (average). States are also analysed based on factors of production, demand conditions, industries, innovation and entrepreneurship and social and political institutions. In all the above parameters, Kerala has an average performance, while neighbouring states like Tamil Nadu and Karnataka have an above average or high performance. The study gives you facts and figures, but detailed analysis of each state separately is not given; that would have made the report more useful.

Nipun Mehrothra et al. (2016) conducted a survey study on how startups have redefined India’s economic growth. The study points out that even though India has an entrepreneurial culture, the startup ecosystem in India has not reached full maturity and many startups die in their infancy. The study mentions that India has the youngest entrepreneurs, with an average age of 28 and around 80,000 jobs are created in the Indian technology startup business. Major findings of the study state that 90% of startups in India fail in the first 5 years and the main reason for this failure is a lack of innovation. 3/4th of surveyed business leaders agree that ecosystems can help accelerate innovation and 80% of surveyed executives from established companies say that collaboration with startups accelerates new ideas. The study concludes with recommendations for the established business community, startup community, higher education community and government, which they have to follow for the development and success of the startup ecosystem in India. The study gives useful insights into the reality of Indian startups and the startup ecosystem.

Harish H V et al. (2016) reviewed the startup ecosystem in India. The study provides various definitions for a startup based on different criteria. According to the study, there are three stages of the startup life cycle: the pre-startup stage, the startup stage and the growth stage. The study mentions important components of the startup ecosystem as support organisations, big companies, universities, research organisations, service providers and funding organisations. The study also classifies startup funding in India into four stages: the first stage is funding by family and friends; the second stage is funding by angel investors and seed capital; the third stage is venture capitalists and banks; and the fourth stage is public and private equity. The study gives a detailed analysis of the Indian startup ecosystem, including the challenges and scope of growth for startups in India. The challenges faced by startups in India are classified by the study as financial, sustainability, technology, culture and awareness, regulatory and social. The study has also incorporated the World Bank report "Doing Business 2016" to point out where India stands among global nations in terms of innovation and ease of doing business across the border. But the study doesn't evaluate the different sectors of the Indian startup ecosystem separately. That would have made the study complete.

Suniti Chandiok (2016) studied the Indian startup ecosystem with the objective of understanding the life cycle and raising awareness about startups with respect to their recent history. The study has identified three stages of the startup life cycle: pre-startup (discovery and validation), startup (efficiency and scale) and growth (maintenance and scale/renewal). It is stated that the growth of startups in India depends on initiatives like easy and faster registration, zero inspection for three years, self-certification for legal requirements, funding for patents and protection of patents. Even though the study is claimed to be a survey based study, no details of survey data are presented in it. Including survey data would have increased the credibility of the study.

S V Ramana Rao & Lohith Kumar (2016) discusses the role of angel investors in the Indian startup ecosystem and government initiatives to support startups. In India, there are commonly two types of angel investors: pure angel investors, who are full-time investors and super angel investors, who are entrepreneurs turned investors. Since 2006, angel investments have steadily increased in India. Delhi and Bangalore are the top cities, which are funded mostly by angel investors. The study states that the Indian angel network supports 16 different sectors and 42% of total investment goes to the information technology sector. Support from angel investors is very significant for startups, but issues like the high gestation period of projects can lead to high collateral requirements. For angel investors, it is important that the risk meet the reward.

Harminder Singh & Manpreet Kaur (2016) studied the details of the Indian startup ecosystem, including the scope of growth and challenges faced by the startups. According to the study, funding is the major concern for startups. Startups find it difficult to convince investors and banks alike. The study concludes by mentioning that there is a growing trend toward small initial investments in early stage startups rather than investing in bigger startups. The opportunities and challenges for startups mentioned in the study are the same as those in studies conducted by established organisations and don't give new insights.

NASSCOM & Zinnov (2017) discuss the Indian startup ecosystem and the objective of the report is to analyse the current scenario and emerging trends that define the Indian startup ecosystem. The study also discusses India's position as a global startup hub and the role played by investors, incubators/accelerators, government and corporations in nurturing the startup ecosystem. According to their report, India is the third largest startup ecosystem in the world. Every year, more than a thousand startups get added to the Indian startup ecosystem and the total number of technology startups in India varies between 5000 and 5200 in 2017. The report states that the healthtech, fintech and e-commerce sectors are growing. The study points out that there is a rapid rise in the B2B startup landscape, 40% of total startups are from the B2B sector. The advanced tech sector in India is growing at a rate of 30% CAGR. The year-to-year growth rate of fintech in India is 31%, healthtech is 28% and e-commerce is 13%. According to the study, Bengaluru, Delhi NCR and Mumbai are the key startup hubs in India; 20% of startups are from Tier II and III cities. The study concludes by mentioning the success stories of startups in India.

NASSCOM & Zinnov (2017) prepared a report about the accelerators and innovators in India and how they are driving the growth of the Indian startup ecosystem. The study points out that there are more than 140 incubators and accelerators in India. Compared to 2016, there was a 40% growth in the number of incubators and accelerators in 2017. According to the study, 40% of incubators and accelerators in the country are situated in Bengaluru, Delhi NCR and Mumbai. More than 30 new academic incubators were established in 2016 and corporate accelerated incubators have seen 35% year-to-year growth. It is mentioned that India is just behind China and the USA in the number of incubators and accelerators. The difference between an incubator and an accelerator is very well explained in the report, along with the support they provide to startups. Opportunities and challenges faced by incubators/accelerators in the country are also discussed in detail. The study mentions the initiatives that have to be taken by the Indian government to support incubators/accelerators. The report concludes with a case study of the Kerala Startup Mission (KSUM) and its success.

Kamaldeep Kaur A P (2017) made a study that explored the various opportunities and challenges faced by start-ups in India. The study has stated that funding is the most important challenge for startups. Further, it is mentioned that the development of business greatly depends on the directions given by the government, where age-old methodologies and customs make it extremely hard for young entrepreneurs to work in India. The various tax charges, like Octroi and VAT, make starting a business extremely difficult. In a country like India, where diverse cultures and flavors exist, it is difficult to identify a specific area to do business. Lack of proper mentorship is also identified as a challenge for startups. The young population of the country, huge foreign investments and growth of the online business sector are mentioned as opportunities for startups. This study is not well structured and most of the challenges are common to all business concerns rather than being specific to startups.

Tarakeshwar Pandey (2017) mentions the various challenges faced by startups: the culture of looking up to failure, mentoring, hiring of the right employees, capital, policies, patents, taxation, third party growth decelerators, lack of a good branding strategy, attempting to be a Silicon Valley replica, fragmented market, dearth of domain knowledge and struggle to reinvent constantly. The study tried to evaluate the challenges faced by startups in India by connecting them to the 'Startup India' initiative by the Indian government. The study states that value-based products and services should be provided by startups to customers and the focus should be on customer convenience.

C Shekar Upadhyay & Priyanka Rawal (2017) conducted a descriptive study about the growth of startups in India and the challenges faced by them. The majority of startups in India are IT based and they are largely urban-centric. Startups are mostly providing those products/services that the founder feels are necessary or urgent. A young, dynamic and highly motivated class of entrepreneurs are forming successful startups in India. Lack of experience in running businesses, poor planning and implementation, poor research, mismanagement of resources, lack of funds, poor consultation, poor marketing and lack of a sincere team are mentioned as the important challenges faced by startups in the study. It is concluded that startups are game changers for the Indian economy, but a startup culture needs to be developed in the country for its better development.

Abraham T S (2017) conducted a study on the business incubators in Kerala based on the level of satisfaction of startups who graduated from the Technology Business Incubators (TBI's) and Startup Village. The study has found that business incubators in Kerala have a prominent role in commercialising technological innovations of startups. They provide assistance with regard to the basics of business: networking activities, marketing assistance, helping with financial management, internet access, access to investors, mentoring, technology commercialisation, regulatory compliance and many other facilities. But all incubators are not the same; the services and facilities provided by incubators should match the requirements of startups. The study mentions that applying for an incubator can be a long process and it should be reduced so that more startups can approach incubators.

P Noufal & K V Ramachandran (2017) discuss the prospects for entrepreneurship and business startups in the economy of Kerala. The discussion of prospects for startups is mainly based on the 'National Policy for Skill Development and

Entrepreneurship' initiated by the central government in 2015. 'We Mission Kerala' formed by the Kerala State Industrial Development Corporation, the formation of the Kerala Startup Mission and Technology Innovation Zones are also explained in the study. So, the study is mostly an explanation of existing government policies and measures. The business friendly atmosphere in Kerala and ease of entry and exit encourage entrepreneurial activities within the state. It is concluded that innovative startups have high potential for growth in Kerala; still, a focused approach is needed to ensure innovation, skill development and the growth of entrepreneurship in the state. Steps should be taken by the state government to nurture entrepreneurial skills, acquire new capacities and promote research and development.

Kerala Startup Mission (2017) published their report on "Kerala's vibrant startup ecosystem." According to the report, there are more than 750 technology startups in Kerala, of which more than 51% belong to the software or IT sector. The majority of technology startups in Kerala belong to Ernakulum district, followed by Thiruvananthapuram district, as per the report. The report states that according to the entrepreneurial culture of Kerala, there is no failed entrepreneur; there is only a failed enterprise. This concept is to support the risk-taking attitude of the young crowd; failure is not considered an end but rather a learning experience where entrepreneurs learn from past mistakes. The report mentions the five most important dimensions for the development of a vibrant startup ecosystem. They are creating a culture of entrepreneurship and innovation, ensuring accessibility to knowledge and making the right ideas fly, incubation and acceleration, enabling funds and finally taking sustainability measures for enterprise development. The entire report is divided into five sectors based on these key dimensions and each section describes where the Kerala startup ecosystem stands in each dimension. This is a very extensive report that gives an almost clear picture of the Kerala startup ecosystem.

Gopaldas Pawan Kumar (2018) studied the challenges faced by Indian startups and the reasons for their failure. Financial resources, poor revenue generation, team members, lack of supporting infrastructure, creating awareness in the markets, exceeding customer expectations, tenacity of founders, regulations, growth decelerators, lack of mentorship, lack of a good branding strategy and replicating Silicon Valley are considered to be the major problems faced by Indian startups. The reasons for startup failure are explained in the study based on the survey conducted by Griffith in 2014 and they are similar to the challenges explained in this study, with lack of market for the product being the major reason. The large population of India, the changing mindset of the working class and huge investments in startups are taken as opportunities for Indian startups.

Sarika Sharma et al. (2018) conducted a study on 57 startups to understand the various challenges faced by Indian startups. They classified the challenges into three categories: marketing challenges, financial challenges and other challenges. Competition from local vendors, branding of the company, unorganised and fragmented market and creating real businesses are the major marketing challenges. Difficulty to get finance and working capital in the later stages of business and producing quality products while maintaining low costs are stated as the important financial challenges. Lack of technology infrastructure, skilled talent unwilling to join startups, regulatory issues, leaps in technology and lack of cultural awareness are stated as the other challenges that startups often face. Apart from the identification of different challenges, the study lacks a detailed discussion on these challenges, due to which it is not serving its purpose.

Ganesaraman Kalyanasundaram (2018) did a case study of four startups, two successful and two failed ones, in Bangalore to understand how failed startups can be differentiated from successful ones and what can be learned from the failure of startups. Further, the study also analyses different modes of exit that are adopted by startup founders while winding up the startup. It was found that all the startup founders had a professional degree and all of them had a passion for technology products. Successful startup founders had an early start in business; they are financially stable and have good expertise in their field. Successful startups made their prototype and generated revenue within 6 months of business formation; they focused largely on product market fit. So the study concludes that time taken to form a minimum viable product and revenue generation, founders complementary skill set, founders domain expertise, financial independence and willingness to take mentorship are the important factors that differentiate a successful startup from a failed one. But this is based only on four startups, so more factors can be identified if the study is expanded to more numbers.

Surabhi Jain (2018) points out that the greatest problem faced by Indian markets is that they are unorganised and fragmented. There is also a lack of an unambiguous and transparent policy, communication sources, knowledge and exposure. The study concludes by stating that to build an entrepreneurial environment in India, the government, big corporates and educational institutions should come forward. The study is relatively small and does not provide any relevant information about the Indian startup ecosystem.

Neeraj K Pandey (2018) studied the various factors that influence the initial funding of startups and suggested a regression model of funding that can be helpful for startups. The study is based on data collected from the four metropolitan cities of India: Mumbai, Delhi, Bangalore and Chennai. For the purpose of the study, funding was taken as the dependent factor and education, experience, gender, institute and type of funding were taken as independent factors. The study found that 'types of funding' (seed funding and private equity) have more influence on the funding received by the startups compared to the other factors taken into consideration. There is a lesser impact on gender, institute and education of founders in the initial funding of startups. Out of four metropolitan cities, Bangalore has a better startup ecosystem than others, as per the study. The study could have been more relevant for startups if better and more factors were taken into account for the purpose of the study.

Shivakumar S Malagihal & Dhritiman Hazarika (2018) studied the Indian startup ecosystem with respect to various challenges faced by startups and major reasons for startup failure. The study states that there are many policies and plans formulated by the central and state governments for startups, but startups are not able to take advantage of these policies due to the tedious and tiresome procedures for application and registration. This is considered to be an important challenge faced by Indian startups, along with other common ones. The lack of proper funding and the bearish attitude of investors are the important reasons for startup failures, as per the study. Along with that fragile business model, lack of proper targeting of products/services and failure to solve actual problems faced by customers are leading to a fall in profitability and the failure of startups. The large number of startups addressing the same problem is another important reason why most startups don't make it to survival. Most of them try to be copycats rather than innovative.

Department of Industrial Policy and Promotion (2018) has ranked the 29 states and 7 union territories of India based on the performance of their startup ecosystem. As a result of startup initiatives by the central government, there are more than 14,600 recognised startups, 270 business incubation and acceleration programmes, over 200 global and domestic venture capital firms, 231 angel investors and 8 angel networks in India at that point in time. India is the third-largest unicorn community in the world. Startup ecosystems of different states are analysed based on seven pillars of a framework: startup policy and implementation, incubation support, seed funding support, funding support - angel and venture funding, simplified regulations, easy public procurement, awareness and outreach. After analysis states and union territories are classified into Best Performers, Top Performers, Leaders, Aspiring Leaders, Emerging States and Beginners.

Gujarat is ranked as the best performer (100 percentile) and ahead of all other states with regard to the development of a startup ecosystem. Kerala, Karnataka, Orissa and Rajasthan are the top performers, having taken strong initiatives for building an innovative ecosystem in their jurisdiction, with a score of more than 85 percentile. The objective of this ranking is to encourage the states and union territories to take better initiatives to develop a robust startup ecosystem. According to the report, government policy, regulatory framework and infrastructure, funding and finance, culture, mentors, advisors and support systems, universities as catalysts, education and training, human resources and workforce and local and global markets are the major elements of a startup ecosystem.

Kerala Startup Mission (2018) prepared a report evaluating the growth of the startup ecosystem in Kerala. The study aims to analyse the existing policies and schemes for startups in the ecosystem and the functioning of various supporting organisations in the state. The report mentions that unlike Bangalore or Mumbai, which were already business centres and later grew into a startup ecosystem with little government effort, the growth of Kerala as a startup ecosystem was mainly helmed under the state government. 'Young Innovators Programs' in schools and Entrepreneurial Development Centres in technical colleges ensure to nurture a young generation of entrepreneurs in the state. More focus is now given to building startups with solutions for societal problems. As of 2018, there are around 1400 registered startups in KSUM and 35% are providing IT services. Close to 60% of startups are incubated and a disclosed funding of 38 million dollars has been received by startups in 2018. As a report, it analyses the facts of the Kerala startup ecosystem systematically. But it mentions only those startups that are registered in KSUM and fails to study the ecosystem from the perspective of startups.

Shiwangi Singh et al. (2019) used Twitter analytics to analyse the startup ecosystem in India. This paper has examined 53,115 tweets from 15 startups in different industries using descriptive analysis and content analysis techniques in social media analytics. The most common Twitter hashtags for the Indian startup ecosystem are AIForIndia, AIBigData, BitCoin, DigitalIndia, Aadhar, Brexit, Budget and AbHarWishHogiPoori. From the analysis of retweets, it was found that tweets by e-payments, e-commerce and online review-based startups get the most retweets. Geographical analysis shows that Delhi has the most robust startup ecosystem compared to other metropolitan cities in India. An analysis of the sentiments of the tweets of startups has shown that most of the tweets have positive sentiments, followed by neutral and negative sentiments. Positive sentiments are about digital technologies and negative sentiments are about government policies like GST and other tax policies. So it is concluded that the Indian startup ecosystem is more inclined to digital technologies, with concern for the planet, people and profit. Infrastructure, information and resources act as factors boosting the startup ecosystem.

Sabrina Korreck (2019) has done a detailed study on the Indian startup ecosystem to gain an understanding of the various growth factors and challenges faced by startups. This study gives a comprehensive view of the development of the Indian startup ecosystem and the various supporting factors in it. Even though the primary focus in the Indian ecosystem is on technology startups, the study identifies that non-technology, social and micro enterprises also contribute to the ecosystem through innovative ideas. Characteristics of the Indian market, technological changes, political willingness and government support, companies engaging in open innovation and changing perceptions towards innovation are the important growth drivers of the Indian startup ecosystem. Difficulties in building and scaling a startup, hiring qualified employees, diversity among people, a complex regulatory environment, taking products to market and low willingness to pay are the important challenges faced by Indian startups. The study identifies incubators and accelerators as the core supporting actors of the startup ecosystem because they help startups by providing office space, networking facilities and opportunities to raise funds. The study concludes that even with all the available assistance and investments the Indian startup ecosystem still lacks resources.

Ministry of Human Resource Development (2019) has formulated 'National Innovation and Startup Policy 2019 for Students and Faculty', which acts as a guideline for Higher Education Institutes (HEI's) in the nurturing and growth of student as well as faculty startups. This policy will help to inculcate the culture of entrepreneurship in All India Council of Technical Education (AICTE)-approved educational institutions. In India, innovation is still not the focus of education. This policy aims to provide a framework for educational institutions using which they can encourage the entrepreneurial efforts and innovation of students and faculties. The guidelines for developing an entrepreneurial agenda, technology licensing, managing Intellectual Property Rights (IPR), equity participation in startups by students and faculties are included in this policy. Developing an 'Innovation and Startup' culture in higher educational institutes becomes easier with such policies.

Satya Ranjan Acharya & Tonisha Dixit (2019) studied the role of central and state governments in the development of Indian startups. They have identified that the policies formulated by the central and state governments have brought significant change to the startup landscape of the country.

S.M.Boothem (2019) published a magazine article based on the ‘Seeding Kerala’ investor’s conference held in Cochin, Kerala, during 2019. The conference was organised by the Kerala Startup Mission in association with the investment platform LetsVenture. It was stated in the conference that Kerala is using a ‘Fund of Funds model’ to bring angel and VC investment into the state, facilitating the holding of a portfolio of investment funds rather than individually investing in shares and other securities. The Kerala government, on their part, annually invests Rs. 15 crore in startups. It was also mentioned that startups need decentralised operations. Startup ecosystems need to be developed on multiple levels; for that, startups need to be created, talent needs to be created and funding opportunities should be brought to these startups. The conference was attended by more than 40 HNIs (High Networth Individuals) promising Rs. 300 crore investment in Kerala by 2021–22.

Berry Holaday M G (2019) did research to understand the role of business incubators in accelerating the growth of startups in Kerala and also studied the government policies that support startups. For the purpose of the study, incubators were divided into central government supported, state government supported, private incubators, research & development, academic and others. According to the study, incubators positively influence the well-being of startups. The study also found that government policies implemented through KSUM play an important role in the development of startups.

Kerala Startup Mission (2019) annual report on the Kerala startup ecosystem, mentions that there are 2200 startups registered in Kerala under KSUM, of which 36% are in Kochi and 23% are in Trivandrum. 13 startups are funded and a total fund of 44 million US dollars was raised in the year 2019. KSUM has launched the Integrated Startup Complex in Kochi; it has a 1.80 lakh sq. ft. area with facilities for startups in different technology sectors. As per the report, there are more than 40 incubators, 4 accelerators, 11 co-working spaces, 80 investors, 10 venture capital firms and 230 innovation and entrepreneurship development centers in Kerala. 27% of startups focus on IT services and 38% of startups focus on both products and services. The startup launch growth rate in Kerala has been 17% since 2012, but there is a drastic fall of 12 percentage points in the launch of new startups in 2019 compared to 2018. Only 40% of registered startups are incubated and 32% of startups have both B2C and B2B operations in their business model.

World Bank (2020) Ease of Doing Business Report states that 115 economies out of 190 have made it easier to do business and developing countries are catching up with developed countries in ease of doing business. One notable country that has shown improvement in ease of doing business is India, along with Nigeria, Saudi Arabia, Bahrain, Jordan, Pakistan, Tajikistan, Kuwait, China and Togo. India is one of the 10 economies that have made reforms for doing business easier with better measures for starting businesses, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency. India ranks 63rd in the *Ease of Doing Business* ranking with 71 points. The Ease of Doing Business Report is about the ease of opening a business, getting a location, accessing finance, dealing with day to day operations and operating in a secure business environment.

Ranjini S Nambiar (2020) studied the startup policy initiatives of the Kerala government. The study has found that it is difficult to sustain non-IT startups in Kerala. Difficulties related to external finance, skilled labour and GST delay the growth of startups. Startups need more assistance in the marketing of products and they need a more direct channel for communicating with higher officials.

Department of Industrial Policy and Promotion (2022) released the state startup ranking for 33 states and union territories in India. The ranking was based on areas such as institutional support, a road map to a sustainable future, capacity building for enablers, fostering innovation & entrepreneurship, access to markets, funding support and incubation & mentoring support. Kerala is mentioned as one of the states following best practices in funding support by arranging funds of more than 20 crore for more than 150 startups and providing soft loans to women entrepreneurs. Kerala ranks as one of the top performing states, along with Gujarat, Karnataka, Tamil Nadu and Himachal Pradesh.

Startup Genome (2022) published the global startup ecosystem report and it mentioned Kerala as the leading performer in Asia. The report also mentioned that Kerala is number one in Asia in terms of affordable talent.

Muhammed Rafi P (2023) conducted a study about the problems and prospects of IT service startups in Kerala. Lack of management skills, failure in leadership, inability to manage risk, poor knowledge of financial management and labour turnover are the important problems faced by IT service startups. They do not have a positive perception about the schemes and policies of central and state governments.

Kerala Startup Mission (2023) report evaluating the startup ecosystem of Kerala identifies communities, state/central government, industrial partners, research centres, technology incubators, technology innovation zones, young entrepreneurs, students and mentors as startup ecosystem enablers. According to the study, there are more than 4000 startups in Kerala and 95% of those startups were launched in 2016 or afterwards. Since 2015, 551 million rupees in venture capital have been raised across 109 deals. Fintech and SaaS startups are leading the funding charts in Kerala. 2 out of 5 startups funded in Kerala belong to SaaS sector. Hardware startup funding is also higher in Kerala compared to other states. KSUM policies for startups are focused on student entrepreneurs, women entrepreneurs, public procurement and investment. The major startup investors in Kerala are the state government, venture capitalists, corporates and accelerators/incubators. KSUM also provides 360 degree support to startups through mentorship, association with academic institutes, seed fund support and go-to-market assistance.

Nikhil S (2023) studied the insights and implications of startup mission in Kerala and found that inadequate infrastructure, limited funding, regulatory bottlenecks, lack of skilled talent and limited market access are the challenges faced by startup mission in Kerala. But the startup mission has significantly contributed to job creation, innovation and growth of women entrepreneurs in Kerala.

Roy & Salwan (2023) conducted a study for Deloitte and NASSCOM about the emerging startups in Tier-2 cities in India. The two prominent cities of Kerala that found place in the list were Kochi and Thiruvananthapuram. Talent, infrastructure, risk and regulatory environment, startup ecosystem and social and living environment are five pillars based on which 26 Tier-2 in the country was studied. Excellent real estate attractiveness, inter & intra city connectivity and availability of science and management graduates are some of the factors due to which Kochi and Thiruvananthapuram stood out in the study. The total talent pool in Thiruvananthapuram is better than that of Kochi and the real estate availability of Kochi is better than that of Thiruvananthapuram. According to the study, Kochi is ranked 11th and Thiruvananthapuram is ranked 19th as the preferred startup destination in India.

2.5 Global Startup Scenario

Christine Tamasy (2007) evaluates the role of technology business incubators in Germany as a policy instrument. Empirical studies have suggested that TBIs fail to support entrepreneurship, innovation and regional development, thereby failing to fulfill their role as a policy instrument. According to the findings of this study, technology business incubations are a costly policy instrument. They have a low motivation effect and do not stimulate people to start a business; they do not increase the likelihood of a firm’s survival, innovation and growth. TBIs have only a modest contribution towards regional development and the cost of incubators is positively correlated with the level of funding they receive. So the conclusion is that technology business incubators should be run as private organisations without public funding because it is not legitimate to use public funds for incubation development. This study gives a view of incubators that is different from the commonly seen studies that support their role in economic development. But since the study was conducted in Germany, the results may be applicable only to that country.

Thomas Gstraunthaler (2010) did a critical evaluation of business incubators in Lithuania to understand whether these incubators are formed to fulfill the demand of growing startups or to serve political goals by meeting the demands of their stakeholders. Business incubators often have to face pressure from their shareholders and adopt certain strategies to meet their expectations. The study found that most incubation managers see themselves as intermediaries between science and the business world. They mention that there is very little initiative from researchers to come forward with new innovations. Individuals have limited abilities and not all entrepreneurs are skilled enough. Business incubators have more applicants than they can accommodate and most of the startups are just a copy and paste of already successful ideas. Incubators that function close to a university are more likely to take a student startup. Capital is the biggest problem faced by startups in Lithuania; the ecosystem is surviving because of the public money from the European Union. Incubation centres are abandoned by their public stakeholders because they gradually lose interest in them and private stakeholders are interested only in rents.

Omer Cagri Ozdemir & Yasin Sehitoglu (2013) conducted a study on the impact of technology business incubators based on the Technology Development Centres of Turkey. It is an accepted fact that business incubators help startups build their businesses in the early stages, but studying the effectiveness of business incubators is difficult because there is no accepted method for measuring their performance. So the study concludes that systematic evaluation is needed to understand the effectiveness of business incubators in a startup ecosystem, especially in developing countries. Along with supporting startups, incubators also aim at creating jobs, fostering innovation, regional economic development and creating an entrepreneurial community. These factors can directly impact the growth of a developing economy by indicating the importance of business incubators.

Yasuyuki Motoyama & Karren K Watkins (2014) conducted a case study to examine the connections within a startup ecosystem in St. Louis. The study analysed the connections between entrepreneurs, connections between support organisations, connections between entrepreneurs and key support organisations and finally miscellaneous support connections. Data for the study is collected from 20 startups that have won Grant Arch's (non-profit organisation) annual business plan competition and support organisations mentioned by them. The study states that the startup ecosystem has an element of an entrepreneurial ecosystem. The study has concluded that the connection between the support organisations has definitely helped the development of the startup ecosystem in St. Louis by providing all necessary facilities to startups. This study successfully throws light on the relevance of why entrepreneurs and supporting organisations should stay connected to each other. When most studies focus only on identifying the different elements of the startup ecosystem, this study took the effort to study the interconnections between the various elements.

Robertson K Tengeh & Prominent Choto (2015) discussed the relevance and challenges of business incubators with regard to survivalist entrepreneurs in South Africa. The study was conducted among survivalist entrepreneurs and business incubators in the Cape metropolitan area. Survivalist entrepreneurs in the study included entrepreneurs who enrolled and completed the incubation programme, entrepreneurs who enrolled but did not complete the incubation programme and entrepreneurs who didn't enroll in any programme. The results of the study shows that 55.1% of survival entrepreneurs who enrolled in incubation programmes benefited from them and 44.9% of entrepreneurs said that they didn't benefit from the incubation programme. Benefits include office facilities, access to finance, networking facilities and physical resources. 57.1% of incubators surveyed mentioned that lack of finance is the biggest problem faced by them due to the fact that they are not able to provide necessary facilities to incubatees. Other problems faced by incubators include a lack of support from other stakeholders and uncommitted clients.

Michael Sheriff & Moreno Muffatto (2015) conducted a case study on the present state of the entrepreneurial ecosystem in four African countries; Egypt, Ghana, Botswana and Uganda. The entrepreneurial ecosystem plays a major role in the development of the economy, job creation and poverty alleviation in Africa. This study divides the actors in the entrepreneurial ecosystem into two; government departments/agencies and private organisations/institutions. The private sector rarely engages in creating entrepreneurial ecosystems; it is government actors and institutions that play the key role in developing an entrepreneurial ecosystem. Absence of entrepreneurial policies and strategies, lack of coordination among various government programmes for entrepreneurship, lack of entrepreneurial education, inadequate infrastructure, insufficient financial schemes for entrepreneurship, lack of engagement of the private sector, unavailability of mentors and creating an entrepreneurial society are the major challenges faced by different actors in the entrepreneurial ecosystem. It is concluded that these challenges can be overcome by adopting the cluster initiative developed by the World Bank since entrepreneurial ecosystems resemble clusters in many aspects. The study also identifies the role of government as pivotal for the creation of entrepreneurial ecosystems.

Amelia Lewis (2016) did a case study on the startup community, Kansas Startup Village (KCSV), to understand how social networks are beneficial for startups and entrepreneurs. A social network is developed through relationships between entrepreneurs, supporting organisations and other individuals in the community. The study mentions that social relationships are developed in a community through 'Collisions'. Collisions mean the chance in which entrepreneurs, investors and other personalities of the industry can meet and communicate. The study says that entrepreneurial communities should be inclusive and they should become the positive force that brings everyone a part of it together. The study concludes by stating that Kansas Startup Village is a successful entrepreneurial community and entrepreneurs like to pivot their own business ideas, they like to consider failure as a learning experience.

Aidin Salamzadeh & Hiroko Kawamorita Kesim (2017) studied the entrepreneurial community and startup ecosystem of Iran by surveying 65 tech startups. The study mentions that entrepreneurial communities are rapidly forming inside Iran, which leads to the creation of a mature startup ecosystem within the country. The entry of more foreign companies into the country, the shaping up of new startup communities, support provided by private accelerators and venture capitalists, Iranian entrepreneurs returning to the country and more foreign investors, mentors and businessmen visiting the country are considered to be the factors influencing the growth of the startup ecosystem in Iran. The study identifies that each startup is different in size, type, form and domain; still, they all have to go through similar stages in their formation. Ideation/opportunity recognition, shaping entrepreneurial intention, preparation, networking, entry, value creation and exit are considered to be the stages of startup formation in the study. It is also found in that intense competition with other firms, lack of legal support, securing intellectual property rights, lack of organising skills, gap between technical and market teams, lack of enough capacity to respond to market demand and lack of IPO opportunities are the major limitations faced by startups in Iran.

J D Harrison & Siobhan Gorman (2017) discusses about the startup communities of 25 American cities and their readiness to shift to a digital economy. The study has introduced a new term called 'Next Wave Startup', which are early stage technology based startups coming up with innovative solutions for the most complex challenges faced in the industries of health, energy, education and smart cities. Startups are increasingly tackling the challenges of the next wave and capital increasingly flowing into civic startups is considered a recent trend. Lack of support from other stakeholders like the government, mentors etc. and lack of a strong bond between startups and local businesses are considered the main obstacles faced by startups. Capital, connectivity, density, culture, industry specialisation and talent are pointed out as the relevant factors for forming a vibrant and successful startup ecosystem.

Marijn A Van Weele et al. (2017) studied the startup communities in Sydney, Melbourne and Canberra, Australia. The study was intended to clarify the concept of startup communities since there was ambiguity concerning the geographical scale and membership of startup communities. The study has used Communities of Practice (CoP) Theory to give a better understanding of how a startup community works. From the study, two different startup communities are derived: workplace communities and regional communities. Four different conceptualisations were formed based on entrepreneurs and supporters in the workplace and regional community. From the analysis, it was concluded that communities confined to a workplace resemble CoP theory. Workplace communities are more formal, direct and have top-to-bottom facilitation, whereas regional communities are more indirect, self-emerging, self-organising and have bottom-to-top facilitation activities.

Sammer Mumtaz et al. (2017) did a study on the role of technology business incubation centres in cultivating entrepreneurial culture and supporting startup ventures. It is a survey study based on five universities in Pakistan. The main goal of business incubators is to support and grow startups by providing them with technical and financial support. Incubators provide a conducive environment for startups to develop their businesses, especially in their early stages. The study concludes that lack of managerial skills, technology, finance and marketing channels are the main hurdles faced by a startup owner and incubators are relevant to startups for supporting them. It is recommended that more universities form business incubators and the network between educational institutions and industry should be strengthened through these business incubators.

Startup Genome (2018) conducted a study on the global startup ecosystem and it analyses all the aspects of the system in detail. The study identifies that the value creation of the startup economy from 2015 to 2017 has reached 2.3 trillion dollars, which is a 25.6% increase from the 2014–2016 period. The study reviews each startup sector in detail and points out four growing sectors of today's age, which are advanced manufacturing & robotics, agtech & new food, blockchain and artificial intelligence and big data & analytics. According to the study, Silicon Valley, London and New York continue to be the top startup hubs in the world in almost every sector. The study also points out that in the past six years, funding for the Asia-Pacific region has grown and that for the US has declined. It is also mentioned that it is important to pay attention to each sector in an ecosystem instead of seeing the technology ecosystem as a whole. This is important to make the ecosystem competitive.

Startup Genome (2019) annual study on startup ecosystems around the globe mentions that there are going to be at least thirty new cities that will become the 'Next Silicon Valley' instead of just one or two. New York, London, Beijing, Boston and Shanghai are getting as much venture capital investment as Silicon Valley and they are the top startup ecosystems in the world after Silicon Valley. Indian startup city Bangalore is ranked 18th among the top thirty startup ecosystems in the world. Mumbai is included in the 'Challenger Startup Ecosystem' list, among the 30 cities that have the possibility of being in the top 30 within the next five years. The study states that only 1 out of 12 entrepreneurs succeeds in creating a successful business. It has been discovered that one of the important reasons why startups fail is because their inner dimensions get ahead of their outer dimensions; this is also called premature scaling. Startups that scale prematurely are inconsistent. Among the various policy measures taken by various governments for startup development, extending funds to startups is the most common measure. The areas where the least action is taken by governments are bankruptcy, diversity, inclusion and procurement.

Startup Genome (2023) studied the global startup ecosystem in 2023 and a report published by them states that the top three startup ecosystems in the world are Silicon Valley, New York and London. All the important Chinese ecosystems have dropped in ranking and Singapore entered the top ten for the first time. Mumbai, Bengaluru and Delhi are the Indian cities included in the ranking.

2.6 Actor-Resource-Activity Model

Hakan Hakansson & Ivan Snehota (1995) have studied in detail the interorganisational relationships in the industrial market. Business relationships are developed through transactions and interactions. Adaptations, routinisation, corporation and conflict and social interactions are involved in the process of developing business relationships. According to the book, the performance of a business concern is dependent on their business relationships. In terms of technology, knowledge, social relations, legal ties and administrative routines and systems; business concerns are interdependent. Actors perform activities and activities consume resources. Dyadic relationships between two actors are established through activity links, actor bonds and resource ties between the business organisations. They are interrelated as well as interdependent in a business relationship. Activity links are the administrative, technical, commercial and other activities of a business that are linked to the activities performed by their partners in different ways. Connections between the actors lead to actor bonds and resource ties develop through the sharing of various tangible and intangible resources between the business concerns.

Maria Holmlund & Jan Ake Tornroos (1997) continuous interactions and exchanges between at least two actors in a business network lead to business relationships. A relationship or bond between two actors can be described in three dimensions, such as structural, economic and social. The structural dimension indicates links, ties, connections and institutional bonds. Economic bond is related to investments and other financial bonds. A social bond is about commitment, trust, attraction, atmosphere, etc.

William Gartner et al. (2004) Arranging financial support, hiring, organising a team, preparing a business plan, developing prototypes, purchasing raw materials, leasing or purchasing machinery, attending workshops, marketing products, applying copyright, trademarks and patents and generating income are some of the business activities performed by startups.

Oliver Gassmann & Barbara Becker (2005) say that knowledge, services, intellectual properties and other intangible resources flow from parent organisation to incubators and from incubators to startup ventures.

Moody et al. (2006) a set of actions that deliver the value of a business is known as business activity. Business activities involve people communicating, cooperating and collaborating in order to achieve predetermined goals. These activities require a planned set of actions and resources.

Barbara Cater (2008) mutual personal friendship in business relationships indicates a social bond. It is the human side of a business relationship. It includes trust, liking, attachment, commitment, personal contact and confidence.

Elsebeth Holmen (2009) every business starts with a single activity that is connected to a chain of other activities and every activity requires one or more resources as input for performance.

Peter Lenney & Geoff Easton (2009) ARA is a model used for conceptualising B2B relationships and networks. Actors, resources and activities are the three concepts used for understanding B2B relationships in the ARA model. Actors act or perform activities along with other actors. While carrying out activities, resources are transferred from one actor to another. Activities can be anything performed at the individual as well as organisation level. An actor can be individuals, groups, departments, organisations or networks of organisations that work towards achieving predetermined goals. Resources can be tangible, intangible, stable or unstable depending on their nature. Who are the actors, what are their activities and what are the resources they use? are questions to be answered while analysing a business relationships using the ARA model. Commitment is a powerful and complex concept that is intimately related to the ARA model and is a part of actor bonds.

Juliette Wilson et al. (2010) say that the ARA model provides a valid framework for conducting empirical research regarding the business relationships of small and medium enterprises in innovative and creative industries.

David Ford et al. (2010) Interactions are the communication that happens between companies that changes and transforms various aspects of their activities and resources. Characteristics of actors, activities they perform and resources they use are all results of the interactions in business relationships. The greater the participation of a company in an interaction, the greater will be the effect on their activities and resources.

Hanadi Al Mubaraki & Michael Busler (2011) conducted an effective feasibility study on incubators. Selecting an appropriate faculty, selecting staff, working towards a graduate company that is self-sustainable, identifying partners from other organisation, sustaining board member relations, educating the community and investing in professional development are some of the critical activities performed by incubators.

Ramona Todericiu et al. (2014) human resources are the most vital intangible resource in an organisation. Employees are one of the most important factors with regard to the future of a business concern. Only motivated employees work for the organisation and it is the responsibility of the manager to make sure that employees are properly motivated at work.

Sabine Gebert Persson et al. (2014) business relationships are developed through mutual interactions between committed parties. The ARA model describes the substance of a business relationship through three interdependent layers, such as the activity layer, actor layer and resource layer. Functions of business relationships are described through activity structure, organisation structure and resource collection for a company; activity links, actor bonds and resource ties in a dyadic relationship; activity pattern, web of actors and resource constellation in a business network.

Gholam Ali Ahmady et al. (2016) argue that organisation structure indicates the formal relationships and channels of communication within the business organisation. It determines the different positions of people working within the organisation. Organisation structure is affected by strategy, environment, goals, technology and organisation size. Organisation structure consists of hierarchical, functional and inclusion dimensions.

Lukas Durda & Aleksandr Kljucnikov (2019) conducted a study among 450 startups in the Czech Republic and found that startups are one of the most vulnerable small and medium business enterprises. The quality of social relationships developed by startups impacts their access to different types of resources. Friends, business angels and business partners are the key and most useful groups in networking for startups. Incubators play an important role in helping startups network with external partners.

Marijn A Van Weele et al. (2019) physical resource, financial capital, business knowledge, network and legitimacy are the resources provided by incubators to startups. Physical resources and financial resources are tangible in nature and the other three are intangible. Physical resources include office space and other tangible facilities like meeting rooms provided by incubators. Financial capital is the amount of capital needed by startups to run businesses that is arranged by incubators through grants, loans, government support, direct funding, etc. Business knowledge is imparted to startups through coaching and training by incubators. The business network indicates both internal and external networks. The internal network is the network among startups in the same incubator and the network of incubators with outsiders like angel investors, mentors, governments, professionals, etc. indicates their external network. Legitimacy denotes the track record of incubators based on the performance of incubated startups. The track record of an incubator can be good, neutral, bad or have no track record yet.

2.7 Research Gap

While studying the startup ecosystem, it is very important to understand entrepreneurial ecosystems because the startup ecosystem is a component of the entrepreneurial ecosystem. Studies on entrepreneurial ecosystems are mainly based on the elements of the system alone and are highly underdeveloped. Most of the studies are limited to large and successful cities like Silicon Valley and ignore the contribution of startups in small cities to the economy. Government policies, support organisations like incubators, culture, universities/educational institutions, human capital, technological changes and investors are some of the important actors in a startup ecosystem. But most of the studies focus on the role of a single element of the ecosystem and do not discuss how the different elements are connected with one another. Relationships and interdependence of different elements in an ecosystem play a crucial role in how startups survive within the system and that aspect of the ecosystem is hardly studied. Globally, there are very few discussions about the interconnection between different elements in the ecosystem. Empirical studies based on primary data, which provide reliable information about the Indian startup ecosystem, are seriously limited. Startup ecosystems have not been considered as a serious topic of research by individual scholars yet and that is why we don’t have many thesis papers on this topic. There are no reports or studies that indicate how favourable the ecosystem of Kerala is for different types of startups. The studies about the startup ecosystem in Kerala are limited to the impact of incubators like startup village, government policies and the challenges faced by startups in Kerala. The relationship between different elements in the ecosystem of Kerala has not been studied yet. ARA model is a very popular method used for analysing the business relationships. But there are no Indian or Kerala-based studies where ARA model is used to study the different dimensions of business relationships. Based on the review of available literature, the following research gap has been identified:

- Studies that discuss the interconnection between the different elements in the startup ecosystem are very few from a global, Indian and Kerala perspective.
- Actor- Resource-Activity model has not been used to study business relationships within the Kerala startup ecosystem.
- The business relationships of startups with other startups and incubators with other incubators is discussed in a limited manner in the literature.
- The business relationships of different categories of startups and incubators in Kerala have not been studied before.

2.8 Chapter Summary

The objective of this chapter is to review the available literature on startup ecosystems to understand the gap existing in the field of study and to explain how the variables of the study were arrived at. For this purpose, the chapter is divided into five separate sections and each section explains the gaps in existing studies and how this work becomes relevant. It has been identified that interdependence between different elements in the startup ecosystem lacks literature and the business relationships of startups in general are not discussed in detail. The relationship that startups share with other startups and incubators share with other incubators has not been given much attention in the previous studies. Kerala has a startup ecosystem that is growing at a fast rate, but studies analysing the favourability of the ecosystem towards different categories of startups based on their business relationships are not there.

Chapter 3

Theoretical Framework

3.1 Introduction

The last chapter discussed the various global, national and state level literatures associated with the research topic. This chapter includes the theoretical framework of the study, where the different variables, their relationships and related models are discussed. The theoretical framework helps to understand the various underlying concepts in the path of the research study. This research work is an analysis of the business relationships of different categories of startups and incubators within the startup ecosystem using Actor-Resource-Activity model. Even though startups are a very common form of business today, the term startup and the ecosystem relevant to its survival are still alien concepts to many. From the literature review, it can be understood that the startup ecosystem and its different elements deserve more detailed study, as the concept is still vague for many people. This chapter intends to explain about startups, incubators, startup ecosystems and different elements of the ecosystem, ARA model and various other concepts as well as models related to them. This chapter is divided into four sections. The first section includes a detailed description of startups, their features, different stages of the startup life cycle and different types of startups. The second section deals with the concept of an entrepreneurial ecosystem and various models related to it. The third section is about the startup ecosystem and various elements that form part of it. Finally, the last section is about Actor-Resource-Activity model that is used for analysing the business relationships of startups and incubators. Through this, how the different variables and concepts are linked to one another can be precisely understood.

3.2 Startups: Definition and Concept

Startups are business concerns developed by a team to find an innovative solution to a problem faced by society that involves high risk and uncertainty. But actually, there is no universally accepted definition of what a startup is. Startups are defined by different entrepreneurs and organisations as follows:

"A startup is a temporary organisation designed to search for a repeatable and scalable business."- Steve Blank, Silicon Valley entrepreneur and Lecturer of Entrepreneurship at Stanford.

"A startup is a company working to solve a problem where the solution is not obvious and success is not guaranteed." – Neil Blumenthal, co-founder and co-CEO of Warby Parker.

"Startup is a state of mind. It's when people join your company and are still making the explicit decision to forgo stability in exchange for the promise of tremendous growth and the excitement of making immediate impact."- Adora Cheung, co-founder and CEO, Homejoy.

"A startup is the living embodiment of a founder's dream." – Will Schroter, co-founder and CEO, startups.co.

"A startup is an innovative and unproven venture, often looking to disrupt an industry through the leverage of new technologies." – Cobuild Lab, Software and Technology Management Company.

In the present context of the study, we consider the definition given by the Department of Promotion of Industry and Internal Trade (Ministry of Commerce and Industry), which has defined a startup as follows in their notification dated 19th February 2019:

(a) An entity shall be considered as a startup:

  (i) Up to a period of ten years from the date of incorporation/registration, if it is incorporated as a private limited company (as defined in the Companies Act, 2013) or registered as a partnership firm (registered under sec.59 of the Partnership Act, 1932) or limited liability partnership (under the Limited Liability Partnership Act, 2008) in India.

(ii) Turnover of the entity for any of the financial year since incorporation/ registration has not exceeded one hundred crore rupees.

(iii) Entity is working towards innovation, development of products or processes or services, or if it is scalable business model with a high potential of employment generation or wealth creation.

Provided that an entity formed by splitting up or reconstruction of an existing business shall not be considered a "startup".

Therefore, startups are emerging concerns with their own distinctive features and you cannot consider them a smaller version of a large company. They are also different from small and medium business concerns. Even though the term startup is commonly related to technology concerns, since the DPIIT definition doesn't mention technology specifically, business concerns with a non-technology background matching the definition given by DPIIT are also considered as startups in India.

➢ **Uniqueness of a Startup**

Features of a startup venture are as follows:

1. **A newly formed company:** A startup is a company that is newly formed and is considered young until it achieves the milestone of revenue generation or completes a certain number of years since incorporation.

2. **Startup team:** Startups always begin with a team of founders and one or two supporting members working together in a small space and later, with the growth of business, they expand the team by recruiting more members. A startup team is normally a combination of members who are strong on both the technical and management sides.

3. **Structure of startup:** During the initial stage of a startup, it will not have any formal hierarchal structure and will be unstructured. Startup members work as a team to develop the product and market it without any functional division. Only with the growth and expansion of a startup into a company does it get structured.

4. **Solution to a problem:** The objective of any startup is to find a solution to a problem that exists among its customers. Their product/service provides a solution to the problem and the success of the startup depends on how well they can develop a product/service that will cater to the needs of the customer. What makes a startup unique is how it makes this solution available to customers differently from others.

5. **Serves a targeted customer group:** The products and services of a startup are always focused on a target group of customers. The important aim of the startup is to find a solution to the problem faced by the target group and develop a product that will be useful to them. At every stage of planning, product development and marketing; the needs and requirements of the target group are taken care of.

6. **Innovative products:** Startups always come with products that are innovative in nature and that are different from other products available in the market. Innovation is an important factor in determining the success and failure of startups. Studies have mentioned that 90% of startups in India fail in their first five years due to lack of innovation (IBM, 2017). Without an innovative product, startups can never establish themselves among customers and it takes different stages of iteration to develop such a product.

7. **Fast growing concern:** Startups are concerns that grow at a faster rate. Once their products find traction, startups grow at a pretty fast rate. According to Paul Graham (co-founder of Y Combinator), a startup is a "company designed to grow fast," which encourages the founders to measure the growth rate constantly. The growth rate is influenced by many internal and external factors because every business concern, market and economy is different from one another.

8. **Disruptive in nature:** Along with being innovative, startups are also disruptive in nature. When something is done differently from how it is traditionally done, it is called disruption. Startups come with products and different services that change the traditional buying habits of consumers and make them try new products. This kind of disruption is mostly seen in the service sector. The disruption in the financial sector is one of the most relevant examples of this. Today, everything

from paying bills to transferring money is done through fintech mobile applications and not through banks.

9. **Limited resources:** Startups always begin on a small scale and with limited resources. Resources for a startup are both tangible (financial, physical and organisational) and intangible (human capital and social networks) in nature. Limitations are mainly seen in tangible resources. The startup team often works together in some hired or incubation space. From the number of members in the team to the infrastructural facilities, everything will be very limited. Only when startups grow into companies do they expand with more resources.

10. **Adaptability:** Startups can easily adapt to changes in their environment because they are mostly unstructured and have limited resources. They don't have a formal and rigid structure like other companies. So even though technological, political and many other changes keep happening, startups always find it easy to change their operations accordingly.

11. **High Risk and Uncertainties:** Startups are highly risky and that is mainly due to the uncertainty regarding their chances of success. Like every other entrepreneur, a startup owner should also be ready to face the risks with respect to his business and be prepared to face anything. Instead of getting disheartened when things go wrong, a startup owner should try to understand where he went wrong and bounce back after correcting his mistake.

- **Startup Life Cycle**

Like any other form of business, startups also have a definite life cycle that they go through. A life cycle indicates the various stages an entity goes through from its origin to end. The Department for Promotion of Industry and Internal Trade, in their "States' Startup Ranking 2018" report, has identified five stages of a startup. They are:

1. **Concept or Idea Stage:** This is the first stage of a startup, where the entrepreneur identifies a problem and forms an idea to solve it. At this stage, a founder thinks about planning the business and mentoring is highly important at this stage. Even

though a large amount of funding is not required at this stage, founders use bootstrapping (self-financing) techniques to arrange whatever money is needed.

2. **Pre-Seed or Validation Stage:** At this stage, the business idea is validated by forming a 'prototype' or a model of the product and conducting a market test among a small population of customers. The feedback received will be used to make modifications to the prototype and after a series of changes, the Minimum Viable Product (MVP) will be ready. At this stage, support from incubators is highly important for startups. Even at this stage, startups highly depend on bootstrapping for funds, but some of them manage to get funding from investors and government grants for making prototypes. At this stage, startups also try to fix a product-market fit.

3. **Seed or Early Traction Stage:** During early traction, startups begin to find demand for their products. They will start getting customers and with the help of mentors, they will learn to manage their business. Investors will be keener to invest in the business and government grants through incubators will also be allocated to startups. Modern funding techniques like crowd funding and peer-to-peer lending platforms are also being experimented with by many startups for raising funds. Those startups that succeed in accelerating their product demand will start generating revenue.

4. **Growth or Scale-up Stage:** A startup is already an established firm with a customer base at this stage. Now they will look for more opportunities to grow and expand the business to new geographies. Many startups go for product modification by adding new features to attract more customers. At this stage, more institutional investments and funding from venture capitalists will be available to the startups.

5. **Maturity or Exit, IPO Stage:** When a startup reaches maturity, some founders look for an exit policy and will sell the business entirely. Such startups will be purchased by bigger companies through deals. Some founders will go for an initial public offer in order to raise public finance and expand the business further by acquiring shareholders.

➢ Categories of Startups

There is no scientific way of classifying startups, but on the basis of their nature of existence and products, we can classify them as follows:

1. On the Basis of Registration Status:

- **DPIIT Registration:** DPIIT is a department in the Ministry of Commerce and Industry. It was formed in 1995 as the Department of Industrial Policy and Promotion. Later in 2000, it was merged with the Department of Industrial Development and renamed as the Department for Promotion of Industry and Internal Trade. Under the Startup India initiative, startups can get registered with DPIIT. Startups will get access to numerous advantages upon receiving recognition from DPIIT, such as simpler compliance, tax advantages, quicker IPR applications, etc. This will reduce the number of regulations that entrepreneurs must comply with, allowing them to concentrate on their primary business operations. Based on DPIIT registration, startups can be classified as those registered or not registered with DPIIT.

- **KSUM Registration:** Kerala Startup Mission is the nodal agency for promoting and developing startups in the state. It was formed in 2006 as Technopark – Technology Business Incubator and later rebranded as KSUM in 2015. They promote products and solutions that are technology based and guide young minds to become successful entrepreneurs. Every product oriented technology startup can register with KSUM, providing them access to a wide range of activities carried out by KSUM to support startups in Kerala. DPIIT registration is compulsory before a startup gets registered in KSUM. Based on KSUM registration, startups can be classified as those registered or not registered with KSUM.

2. On the Basis of the Use of Technology:

- **Technology Startups:** These are startups that use the latest technologies, like artificial intelligence, the Internet of Things, augmented reality, virtual reality, biotechnology, food science, robotics, etc., to develop their products and services. Products offered by them can be applications, chemical solutions, electronic devices, processed foods, etc.

- **Non-Technology Startups:** Those startups that don't use any advanced technology or software for developing their products are non-technology startups. Their products and services are not technology based. They manufacture their products, promote them and sell them through their websites or other social media platforms.

- **Both technology & non-technology Startups:** When startups have both technology and non-technology products and services in their business, they become both technology and non-technology startups.

3. On the Basis of the Type of Technology Used:

- **IT Startups:** IT startups are those that are solely focused on building software and leverage IT-based technology in their operations.

- **Non-IT Startups:** Non-IT startups are those that concentrate on other kinds of technology, such as biotechnology, electronics, robotics and other non-IT related technologies.

- **Both IT & non-IT Startups:** Startups that deal with both non-IT and IT technologies are classified as both non-IT and IT startups.

4. On the Basis of the Nature of Output:

- **Product oriented**: Those startups that manufacture tangible and visible products, including computer applications, can be considered as product oriented startups.

- **Service oriented:** Those startups that provide any kind of service to other companies, the general public, or any other user are considered as service oriented startups.

- **Both product & service oriented:** Some startups are into providing both products and services. For example, startups providing financial services often provide it through their own applications, which makes them both product & service oriented startups.

5. **On the Basis of Business Model:**

- **Business to Business (B2B):** Startups offering products and services to other business concerns.

- **Business to Customer (B2C):** Startups offering products and services to the general public.

- **Business to Government (B2G):** Startups making products and services to support government functions.

- **Hybrid model:** Startups that follow a combination of any two or all three of the above business models. For example, many startups have both B2B and B2C business models. Similarly, B2B and B2G, B2C and B2G and all three models together (B2C, B2B and B2G) are other examples of hybrid models.

6. **On the Basis of the Purpose of Existence:**

- **Lifestyle Startups:** These startups are founded by the owner to fulfill their passion or dream. Suppose a person is a good singer, then he can come with an application that helps the user to learn music. So it's turning one's passion into a business.

- **Buyable Startups:** These startups are basically formed with the intention of selling them off at some point. Since it has become cheaper to create an application, different innovative applications are made by technology experts, which will be later sold to technology giants.

- **Social Startups:** These startups are found for some social purpose or for finding problems with social issues. The main objective of such startups will not be to earn profit. They need not be a non-profit concern, but their main objective will be based on some social purpose.

- **Scalable Startups:** Scalable startups are those that have huge potential to grow. Those are mainly technology startups that will have a large customer base and attract huge investments.

7. Based on Status in the Incubators

- **Incubatee Startups:** Startups that have enrolled in the incubation programme provided by the incubator for a specific period are called incubatee startups.

- **Coworking Startups:** Startups that use the office space provided by incubators for rent and are not part of the incubation programme provided by the incubator are called coworking startups.

➢ **Major Startup Sectors**

There are different sectors where startups actively function. They have disrupted many traditional business sectors and introduced innovative ways of doing business. Some of the important sectors where startups are highly active include the following:

- Healthcare/Life science
- Education
- Finance
- Agriculture
- Consulting
- IT services
- E Commerce
- Retail
- Environment Protection
- Data Analytics
- Electronics/Robotics
- Others

3.3 Entrepreneurial Ecosystem

An entrepreneurial ecosystem is the combination of various elements that will help the enterprises within the ecosystem grow and flourish. It contains the various social, political, economic, technological and cultural factors that will impact the performance of enterprises. The most important element of an entrepreneurial ecosystem is the entrepreneur himself, who starts the business and an ecosystem reflects the role of society in helping an entrepreneur build his enterprise.

An explanation of who is an entrepreneur, what the meaning of entrepreneurship is and entrepreneurial and entrepreneurial ecosystems are well explained in the report prepared by the World Economic Forum.

Figure 3.1

Entrepreneur, Entrepreneurial, Entrepreneurship and Entrepreneurial ecosystem (World Economic Forum, 2009)

- **Structure of the Entrepreneurial Ecosystem**

An ecosystem consists of various elements or actors that are interrelated and interconnected. The entrepreneurial ecosystem consists of many actors that form a part of it and influence the formation and functioning of enterprises. Different models of entrepreneurial ecosystems are suggested under various studies conducted by research scholars, government bodies, global organisations etc. Some of these models are discussed below.

➢ Gnyawali and Fogel's Entrepreneurial Process Model (1994)

In their research study about the implications and dimensions of entrepreneurial ecosystems, Gnyawali and Fogel developed a model of entrepreneurial ecosystems linked to the venture creation process. They have stated five core elements of an entrepreneurial ecosystem. Those five core elements are: government policies and procedures; social and economic conditions; entrepreneurial and business skills; financial assistance; and non-financial assistance. Details of each element are elaborated on in the below figure:

Figure 3.2

Entrepreneurial Ecosystem Model (Guyawali and Fogel,1994)

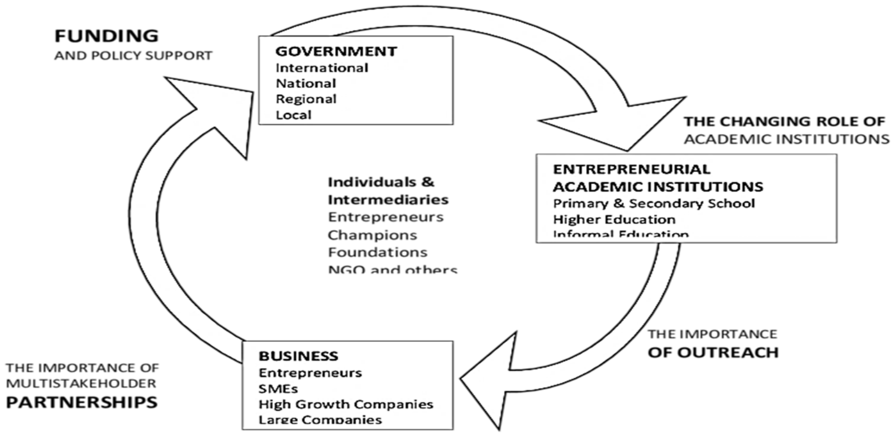
Government Policies and Procedures	Restrictions on imports and exports Provision of bankruptcy laws Entry barriers Procedural requirements for registration and licensing Number of institutions for entrepreneurs to report to Rules and regulations governing entrepreneurial activities Laws to protect proprietary rights
Socioeconomic Conditions	Public attitude toward entrepreneurship Presence of experienced entrepreneurs Successful role models Existence of persons with entrepreneurial characteristics Recognition of exemplary entrepreneurial performance Proportion of small firms in the population of firms Diversity of economic activities Extent of economic growth
Entrepreneurial and Business Skills	Technical and vocational education Business education Entrepreneurial training programs Technical and vocational training programs Availability of information
Financial Assistance	Venture capital Alternative sources of financing Low-cost loans Willingness of financial institutions to finance small entrepreneurs Credit guarantee programs for start-up enterprises Competition among financial institutions
Non-Financial Assistance	Counseling and support services Entrepreneurial networks Incubator facilities Government procurement programs for small businesses

➢ Entrepreneurial Ecosystem by World Economic Forum, 2009

The World Economic Forum, in their study about 'Educating the Next Wave of Entrepreneurs', 2009, has proposed a model of entrepreneurial ecosystem that is as follows:

Figure 3.3

Entrepreneurial Ecosystem (World Economic Forum, 2009)

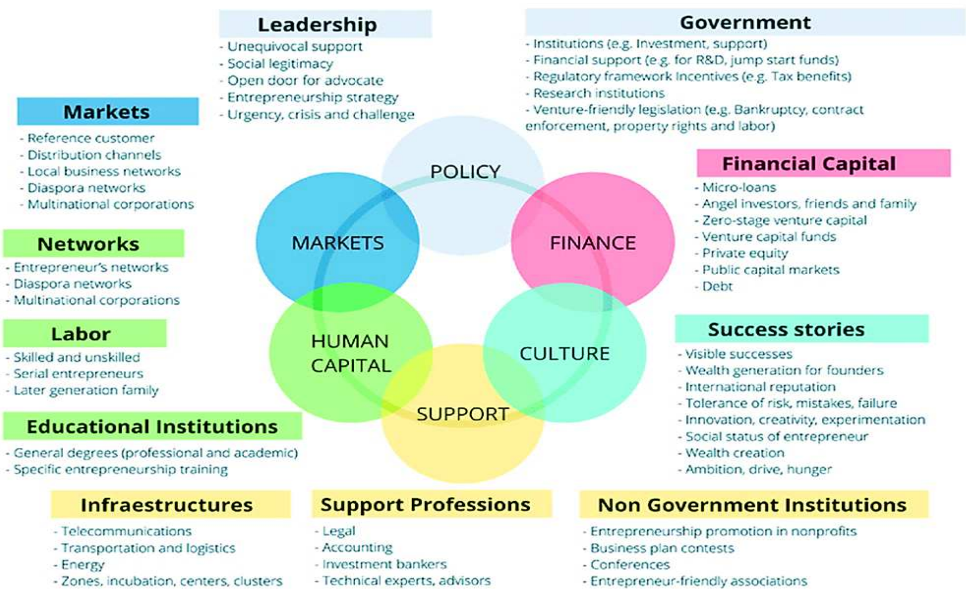


➢ Isenberg's Entrepreneurial Ecosystem Model

Daniel Isenberg, in his study about entrepreneurship ecosystem strategy, has proposed an ecosystem model with six different domains that are relevant in an ecosystem and various factors that are necessary to support these domains. The six domains identified by Isenberg are policy, finance, culture, markets, human capital and support organisations. Isenberg's model of the entrepreneurial ecosystem is as below:

Figure 3.4

Isenberg's Model of Entrepreneurial Ecosystem



➢ Entrepreneurial Ecosystem by World Economic Forum, 2013

In their summary report about 'Entrepreneurial ecosystems around the globe and growth dynamics, the World Economic Forum proposed another model of entrepreneurial ecosystem with eight pillars, as depicted below:

Figure 3.5

Entrepreneurial Ecosystem (World Economic Forum, 2013)

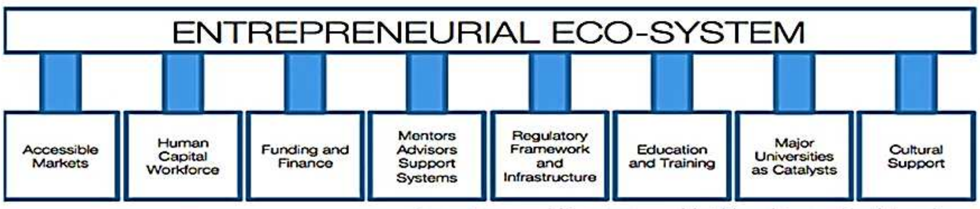
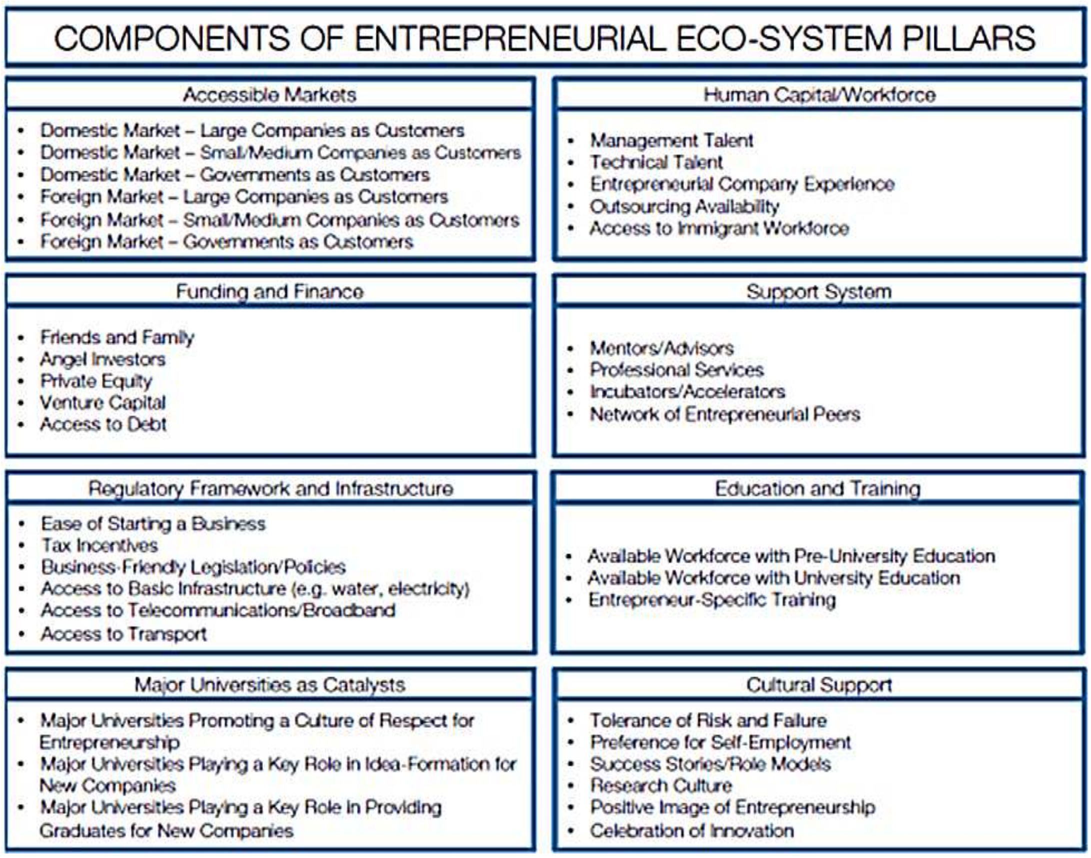


Figure 3.6

Components of Entrepreneurial Ecosystem Pillars (World Economic Forum, 2013)

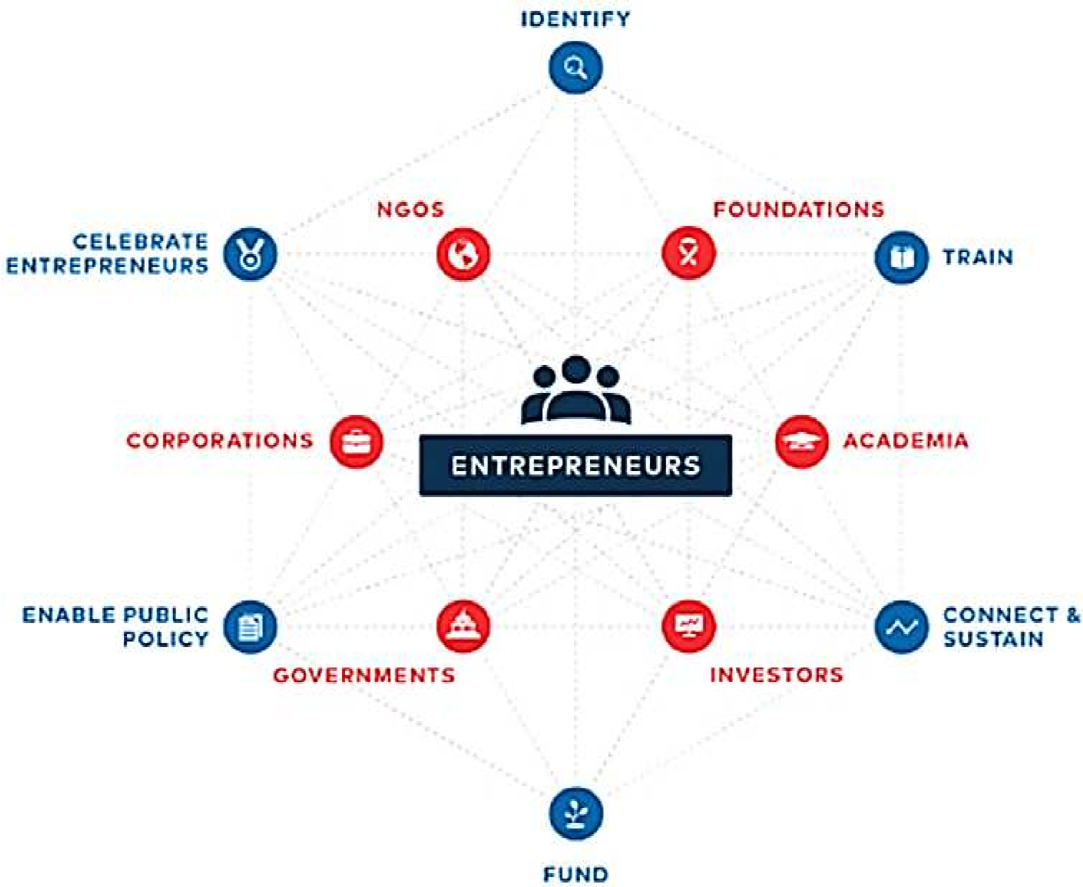


➢ Koltai's Six + Six Ecosystem Model

Steven Koltai, an expert in the international entrepreneurial ecosystem and who has managed the Global Entrepreneurship Program (GEP) for the U.S. Department of State, has developed a Six + Six entrepreneurship ecosystem model. He explains that no single factor alone can run an entrepreneurial ecosystem. Only when multiple factors work together can there be an efficient environment for enterprises to function. In his model, there are six actors and six pillars that support those actors. Six actors are the government, investors, corporations, NGOs, foundations and academia; the six pillars are train, connect and sustain; identify, fund, celebrate entrepreneurs; and enable public policy. This model emphasises on the interaction between these actors and pillars, which is essential for developing a productive ecosystem. The model can be represented as follows:

Figure 3.7

Six+Six Entreprenuerial Ecosystem (Koltai, 2014)



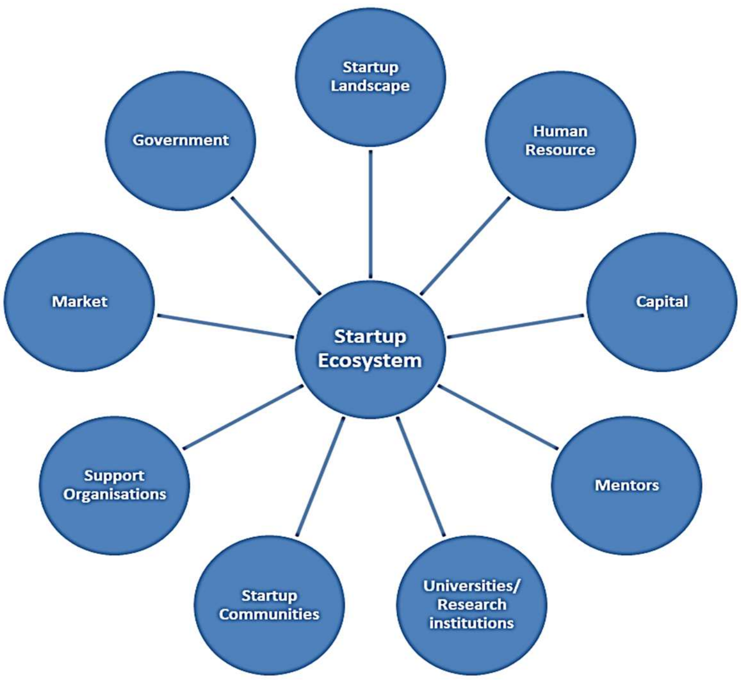
3.4 Startup Ecosystem and Elements

The startup ecosystem is part of the entrepreneurial ecosystem. It is the combination of various startups, supporting organisations, the government, different communities, funding organisations, universities/educational institutions and other factors that function together for the development of an environment in which startups can grow and prosper. Each element of this ecosystem has a significant role in its development. Even if one element is not properly functioning in the ecosystem, that can adversely impact startups. Only if the ecosystem is efficient will startups be able to function successfully.

The startup ecosystem does not just support the startups; it also supports the startup founders as well. Out of 10, at least nine startups tend to fail, but the ecosystem doesn't discourage the founders. They always have the chance to come up with a new idea when the previous one fails. Hence, the startup ecosystem gives equal opportunity to every person who wants to convert his idea into a business. The various elements of the startup ecosystem that function together can be depicted in the below figure:

Figure 3.8

Elements of Startup Ecosystem



➢ Start-up Landscape

Startups form an important part of the ecosystem and the startup landscape indicates the profile of startups in an ecosystem. The startup landscape covers the following information:

- Total number of start-ups
- Sector wise classification of startups
- District wise classification of startups
- Start-up hubs
- Founder profile: age, gender, education, etc.
- The number of new startups added every year
- Year-to-year startup growth rate
- Technology focus areas: cloud computing, artificial intelligence, etc.
- Business model: B2B,B2C and others

➢ Supporting Organisations

Supporting organisations include those that functions to guide and promote the functioning of startups. These include business accelerators, incubators, co-working spaces and technolodges.

✓ Accelerators

Accelerators are organisations that support startups and provide them with funding opportunities. They function with the aim of scaling up the growth of startups and work within a time frame of around three or four months. Accelerators accept startups through the application process; out of the total applications, only the best are chosen to fill the top spots. The startups taken by accelerators often have an idea and business model that need to be further developed. Accelerators provide mentorship facilities to startups and give them a chance to meet various investors. Sometimes accelerators also invest a specific amount of money in startups as an equity investment.

✓ **Business Incubators**

Incubators are organisations that provide facilities for early stage startups to work on and develop their businesses. They are normally funded by universities or economic development institutions. Incubators can mentor startups for up to one year or even more because they give importance to the longevity of startups rather than how fast they grow. Incubators accept startups with innovative ideas but no specific business model and will help these startups make their innovative ideas a reality through mentorship. They provide infrastructural facilities, networking support, mentoring support and funding opportunities for startups. Incubators help startups meet investors and pitch their products, but they rarely invest in these startups.

Infrastructural support provided by incubators and accelerators includes the following:

- 24 hours of access to the incubation centre
- Office space for rent
- 24-hour Wi-Fi facility
- Cloud computing facility
- Providing conference rooms and meeting halls
- Refreshment facilities
- Access to library facilities
- Access to laboratory and research facilities
- 24 hours of power supply

Mentoring and networking support by incubators and accelerators includes:

- Arranging workshops, conferences and other events.
- Arranging meetings with investors and venture capitalists.
- Providing access to industry mentors, advisors, faculty and alumni.
- Giving students the opportunity to attend entrepreneurial courses at prestigious business institutes.

- Giving students the chance to take part in events and conferences at other institutes.
- Helping in the formulation of business and financial plans.
- Providing marketing and technical assistance.
- Helps in connecting with suppliers and customers.

Classification of Business Incubators Based on Supporting Authority/ Organisation

1. **Central Government Supported:** Incubation centres that are funded and promoted by the central government are included in this category. These incubators are mostly housed in technology business incubators at educational institutions and research centres founded by the central government.

2. **State Government Supported:** Incubators supported and funded by the state government belong to this category. Incubation centres established by KSUM across the state, incubators functioning in government educational institutions and those directly funded by the state government of Kerala form part of this.

3. **University/Educational Institution Supported:** Incubators funded and managed by universities and other educational institutions themselves to support the business ideas of their students are included in this category. Such incubators are formed solely due to the initiative of universities and educational institutions.

4. **Private/Corporate Business Incubators:** These are business incubators operated by private individuals or corporate bodies. They provide all the necessary support for innovative business ideas that are profitable.

Business Incubation Models

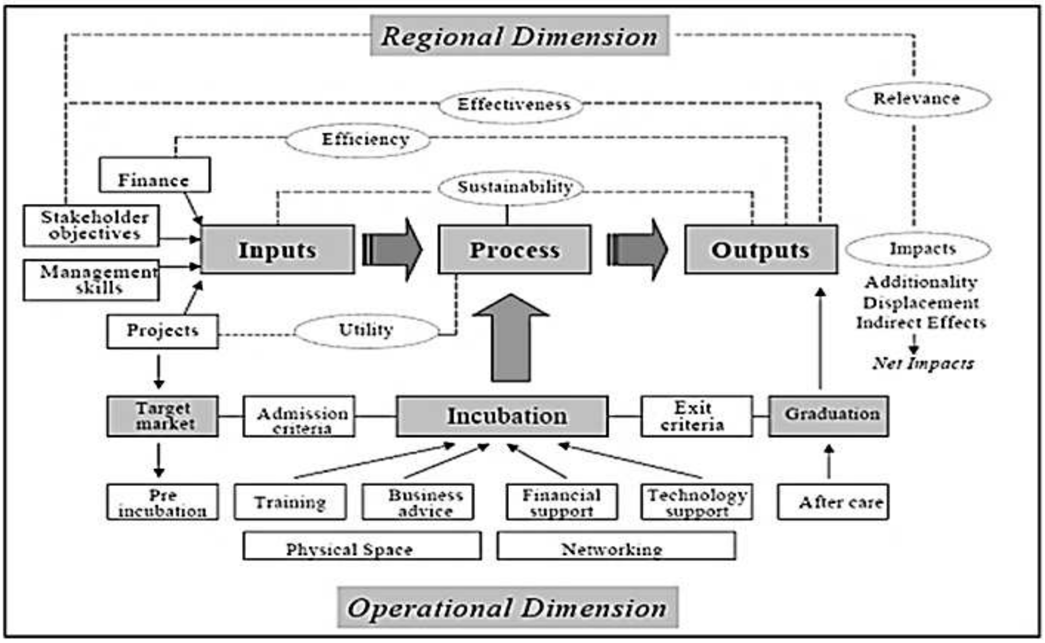
There are many business incubation models that describe the various functions and activities of incubators and can be used for analysing the performance of incubators. Two such models have been used in the study to identify the importance of activities performed by incubators. Those models are:

1. Costa-David, Malan & Lalkaka Incubation Model, 2002

This model was developed by Costa-David, Malan & Lalkaka in 2002 and was later used by the Centre for Strategy & Evaluation Services (CSES) to propose benchmarks for the performance and efficiency of incubators.

Figure 3.9

Costa-David, Malan & Lalkaka Generic Incubation Model, 2002



According to the model, incubation consists of three stages: pre-incubation, incubation and after-care. The main inputs for incubation, according to the model, are finance, stakeholder objectives, the management skills of employees and projects. Identification of target markets for projects and determination of admission criteria are included in the pre-incubation activity. Incubation includes training, business advice, financial support, technical support, physical space and networking. The after-care functions of an incubator are associated with the graduation of startups and providing them with a proper exit plan.

2. Bergek & Norman Incubation Model, 2008

According to the Bergek & Norman Incubation Model (2008), the performance of the incubator must be evaluated based on its objectives and the results it has achieved.

Figure 3.10

Bergek & Norman Incubation Model, 2008

Incubator Model			
Selection	Business Support	Mediation	Graduation

There are four activities included in the incubation process, as per the model. They are:

- **Selection:** deciding which startups should be selected for the incubation programme and those to be rejected.
- **Business support:** providing infrastructural and administrative support to incubated startups.
- **Mediation:** mediating the relationship of startups with the external world and helping startups build business networks.
- **Graduation:** developing a proper policy for the exit of startups after incubation.

✓ **Co-working spaces**

Co-working spaces indicate shared working spaces that can be used by people to do their work. The people working in co-working spaces have different business concerns. It is mainly used by people who like to do independent work. Co working spaces provide plug-and-play office facilities that can be used by anybody to do their work for rent. Apart from full-time power and internet facilities, refreshment facilities, meeting rooms, conference rooms, etc. are also provided by co-working spaces. Rent for the space will be on a per-seat basis and it will be more for separate cabins. They will be open 24 hours a day for their users. Startup teams can hire space and work here instead of renting an office.

✓ **Technolodges**

Technolodges are companies formed with the aim of providing technical support and infrastructure facilities to budding IT entrepreneurs, especially in rural areas. The concept of technolodges is to make use of unused government buildings in rural or suburban areas and turn them into a space that can be used by IT entrepreneurs to build their products and develop their own startups. This helps the IT entrepreneurs function in a low cost rural centre and will also provide employment opportunities to rural youth. Their functions are the same as those of a business incubator.

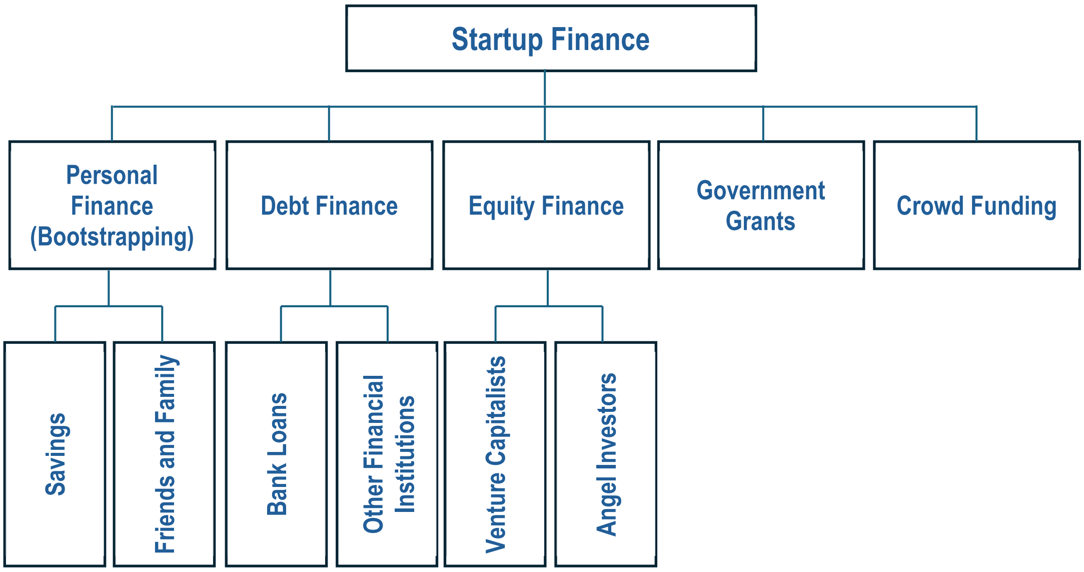
- **Capital**

Arranging funds for business has always been one of the toughest tasks faced by a startup founder. Normally, funding for a startup comes from personal investments (savings, friends and family), equity finance (venture capitalists and angel investors) and debt finance (bank loans, government grants/loans). Apart from these sources, crowdfunding platforms also provide financial support to startups. During the initial stage, every startup finds it difficult to arrange for seed capital and mostly depends on their own funds to finance their project. Many startups also engage in providing services outside for earning money in order to meet day-to-day expenses. Only once the project moves from ideation to prototype or Minimum Viable Product (MVP) can startups pitch in to venture capitalists and angel investors for financial support. Government grants through incubators at different stages of a startup also provide great support. It is a job of huge responsibility to convey the business idea to the investors and convince them to invest in a startup. Every piece of information available to the entrepreneur with respect to the project should also be available to the investor. Otherwise, information asymmetry will be there (Jones et al., 2022). Due to the lack of proper information, investors often refuse to fund a project. Communicating the right information about the different aspects of a particular project is very important to securing funds.

The major sources of funding can be classified as follows:

Figure 3.11

Sources of Startup Funding



Bootstrapping is the primary source of finance for any startup concern where funds are arranged from personal sources. While a startup is at its ideation and even prototype stage, a major source of finance will be bootstrapping. Startup founders arrange funds through their personal savings and by borrowing money from friends and relatives. Many startups provide some kind of service for other business concerns, like developing software for them, so that income received from their secondary activity can be used to build their startup. This kind of funding is also included in bootstrapping.

Angel Investors are individual investors who invest their personal money and assets in startups. They are mainly people who either used to be successful entrepreneurs and are now looking for various investment avenues or are currently running a business along with investment activities. They have vast experience in the industry and they wisely choose startup projects for investment. They can provide financial aid for fewer than three to five million dollars and they remain in business for a period of two to five years (Menon & Malik, 2016). They can assist startups by arranging seed capital. Along with money, they also provide mentoring support to startups and bring other resources to the business. Angel investors not only look into the particulars of business but also consider the passion of founders while making an investment decision. Business angels may focus on a particular sector for investment and they invest in startups through equity participation or loans.

Venture Capitalists are institutional investors who invest in high-risk and innovative startups. They fund startups at a stage where products are already developed and startups are looking for more funding. Venture capital usually follows after seed capital. Venture capitalists can invest above three to five million dollars in a business and stay for a relatively longer period of time in the business, say 10–12 years (Menon & Malik, 2016). Venture capitalists fund the business through equity participation and normally they exit by selling their shares. Venture capitalists will have control over the management of business and provide mentoring support to startups.

Banks and Other Financial Institutions provide business loans to startups. Once the business plan is ready, if the financial institutions are convinced by the business proposal, they may decide to fund the startups either in lump sum or in stages. There are different schemes under which loans are provided for startups, the features of the loan will depend on the scheme. Some financial institutions provide soft loans to startups, which carry a low interest rate and a long tenure of repayment.

Government Grants are provided to startups that are registered with the government nodal agency or authority that is responsible for looking into the growth and development of startups. Through the authorised channel, grants are allotted to startups in different stages. Grants are allotted only after a proper examination of the business proposals of startups. Government grants are mostly allotted through incubators and state financial institutions.

Crowdfunding platforms are the most modern way of funding business proposals. When a small amount of money is collected from a large group of people to finance a venture, an idea, or any other cause, it is called crowdfunding. Through the internet, many websites are providing crowdfunding platforms that bring investors and borrowers together. A business idea needs to be innovative and creative to get funded through crowdfunding platforms. The business proposal can be uploaded to the platform and it needs to be updated at each stage so that people who are interested in contributing will invest their money in the business.

- **Human Resources**

Talented human resources are the biggest asset for any startup. Normally, startups begin with one or two founders who have the same consensus of mind regarding the idea they need to develop into a business. It is a very important task for a founder to find an appropriate co-founder. Founders usually rely on their friends, relatives, or someone they know to become their co-founders. But this is the wrong method to find one. Choosing a co-founder should be an intellectual process where candidates who can support the founder in carrying forward the idea in the best possible manner need to be selected. If the founder is a technical guy, then the co-founder can be someone skilled in management or finance.

In the same way, forming the entire startup team is a very relevant process. A startup team in the initial stage may have four to eight members, which get enlarged as the startup grows. All the members are selected based on the role they need to fulfill. Getting talented employees is not always easy. Getting them adapted to the working culture, their remuneration, training, satisfaction, turnover and retention are all important tasks.

- **Universities and Educational institutions**

Universities and educational institutions play a key role in the development of a startup ecosystem. They mentor the young minds of our country and educate them regarding the importance of entrepreneurial ventures. There are a lot of young students who have brilliant business ideas and educational institutions can motivate those ideas by forming business incubators in their institutions. There will be conferences and seminars conducted by different organisations in universities, which will help the students understand how they can develop their own businesses. 50% of startup founders in Kerala are postgraduates and 42% are graduates (Kerala Startup Mission, 2019), so it is clear that young people who turn into entrepreneurs are mostly well educated. Also, research institutions can provide assistance to their students in developing innovative technologies. From educating young students to establishing business incubators there is a lot that can be done by universities and educational institutions to develop a cluster of quality entrepreneurs in the state.

- **Research Organisations**

Research organisations are funded by state and central governments with the aim of promoting research in science and technology. Such organisations can provide incubation facilities to startups that have innovative ideas in the field of technology on which the research organisation focuses. They provide access to raw materials and machinery for the startups during the incubation period and also provide sufficient infrastructure for experiments. During the incubation period, startups are also allowed to market their products in the name of the research organisation.

- **Startup Communities**

There are many communities that function exclusively to accelerate the growth and development of startups. Such communities are formed by a group of people who work towards a common objective. Startups, potential entrepreneurs, investors, technology experts, mentors, event organisers, NGOs and many others, directly or indirectly contributing to the startup ecosystem, can form and also become part of startup communities. Each community has its own objectives and performs the important function of knowledge sharing. Some of the objectives of startup communities are:

- Arranging events and workshops for startups in cooperation with the government and other related organisations.
- Evaluating startups based on their funding requirements and getting investments for them.
- Developing the technical skills and knowledge among women to develop more women programmers.
- Imparting software development and management knowledge among young people.

- Developing applications, programming languages and teaching programming.
- Providing an opportunity for students to meet with technology experts and business mentors.

These are only some of the objectives behind forming a startup community and there are many more purposes for which a startup community can be founded. Currently, they act as the backbone of the startup ecosystem by bringing together people from different domains of expertise and making them work together.

- **Mentors**

Mentors form a significant part of the startup ecosystem because entrepreneurs starting a startup may not have a business degree or background. There are many startups that fail due to management issues. 90% of startups fail in the first five years and one of the reasons is inexperienced startup founders (IBM, 2017). The idea will be brilliant, but both execution and management fail if the founders don't know how it should be done. Here comes the role of a mentor. A mentor will be someone who has a wide range of experience in the field of business. He may have his own startup business and also be someone who is already investing in profitable startup ideas. He will also have associations with the different elements of the startup ecosystem and will have his own strong network. Such a person can guide the entrepreneurs as to how they should carry forward their business by managing finance, marketing, human resources, first customer, customer retention and all other areas where guidance is needed. Mentors may also have access to resources and investors, which can be helpful for startups. But getting access to the right mentor is always a challenge for a startup.

- **Government Support**

Government support indicates the various steps that are taken by the central and state governments for the development and growth of startups. With respect to a startup ecosystem, government support is the most important element because the initiative for a startup ecosystem is to be taken by the government and it should ideally start with the central government. A government that understands the relevance of startups for the economy should take the following steps:

- Formulation of policies and plans exclusively for the growth of startups by central and state governments.
- Formation of a nodal agency for monitoring the developments in the startup ecosystem by state governments.
- Providing grants for innovative startup ideas through nodal agencies and public financial institutions.
- Formulation of various schemes focusing on providing concessions to startups
- Helping the startups market their products through various schemes and with the help of a nodal agency.
- Monitoring the functioning of incubators and other support organisations through nodal agencies.
- Building more education and research institutions throughout the country.

Apart from the above mentioned steps, in many other ways, both directly and indirectly, the government supports startups and the startup ecosystem. Unless the government steps forward and takes the initiative, there will never be a startup ecosystem in a country.

- **Market**

A market is traditionally the place where goods are bought and sold. For a startup, the market is the target customers they intend to serve, the competition they face and other marketing challenges. Startups are innovative firms that choose a target market they need to cater to by solving a problem they face. The first customer is always seen as an indicator that business is moving in the right direction. In the case of technology startups, the location of the customer doesn't matter; they can cater to the needs of international customers as well. Still, all of them try to serve local customers initially before widening their customer range on an international level.

Startups either come with unique solutions or they disrupt the already existing market. Either way, there will be competitors who will try to capitalise on the available opportunity. These competitors can be at the local, national, or even international level. It depends on the nature of the business and the nature of the output to determine which level of competition affects startups the most. Along with that, there are many other challenges, like marketing the product, retaining customers, etc., that startups face in their daily business.

These are the important elements that form part of the startup ecosystem. There are many other factors, like large corporations, technology, culture, etc., that can be included as part of the startup ecosystem, but this study has considered only those that are most relevant for all startups.

3.5 Actor-Resource-Activity Model

Actor-Resource-Activity model is a conceptual model, also known as relationship substance framework, developed by the Industrial Marketing and Purchase Group (IMP Group). However, this model was described elaborately by Hakan Hakansson and Ivan Snehota in their 1995 book 'Developing Relationships in Business Networks'. This is a model used for analysing B2B relationships and according to the model, every business relationship has three layers. They are:

- **Actor Layer:** Actors are individual firms in a business relationship. The actor layer describes the organisation structure of firms, the actor bond between two actors and the network of different actors formed through the business relationship (web of actors)

- **Resource Layer:** Resources are the tangible and intangible resources used in a business. The resource layer includes the resource collection of individual actors, resource ties between the actors with regard to resource sharing and the network of resources formed between the actors (resource constellation).

- **Activity Layer:** Activities can be anything done while performing business functions. The activity layer includes the activity structure of individual actors, activity links between actors while performing different activities and activity pattern developed when actors in a business network link their activities to one another.

Table 3.1

Three Layers of Business Relationships

Actor Layer	Organisation Structure	Actor Bonds	Web of Actors
Resource Layer	Resource Collection	Resource Ties	Resource Constellation
Activity Layer	Activity Structure	Activity Links	Activity Pattern

Source: Hakansson & Snehota, 1995

The three layers of ARA model (actor layer, resource layer and activity layer) describe the *substance of business relationships* between the actors in a business network. Actors perform various activities and to perform different activities, they need resources. Therefore, the three layers are interdependent. The interplay between the three layers leads to the development of a business network. Using the ARA model, business relationships can be analysed in three dimensions. Those are:

1. **Company Analysis:** Company analysis is the analysis of an individual actor (the company). Company analysis includes:

- *Activity Structure:* Various activities performed by an actor that may be connected to the activities performed by other actors in the business network.
- *Organisation Structure:* Hierarchy of decision-making and channels of communication existing within the company, which may be formal or informal. Flexibility, adaptability and suitability of the organisation structure to achieving the goals of the business concern also form part of organisation structure analysis.
- *Resource Collection:* Different tangible and intangible resources used by a business indicate their resource collection. Capital and physical infrastructure are the tangible resources commonly used in a business. Human resources, business

knowledge, technological resources and intellectual properties are the intangible resources.

2. **Relationship Analysis:** The analysis of dyadic relationships (relationships between two actors) between business concerns is the second dimension of the ARA model. Relationship analysis includes:

- *Activity Links:* Activities performed by business concerns can be connected to one another and when business activities are performed by two actors in coordination with one another, activity links are formed between them.

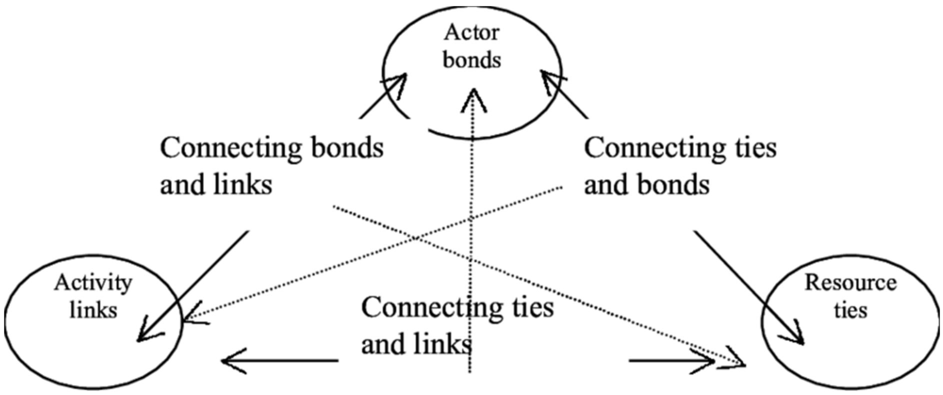
- *Actor Bonds:* structural, economic and social bonds developed between two actors in a business relationship are called actor bonds. Structural bonds are created through the value added partnership between actors, which is developed through the performance of business activities together and the sharing of resources. Economic bonds are developed because of the financial support provided by business concerns to each other. Social bonds are aroused by personal friendship, mutual trust, commitment and interaction between actors.

- *Resource Ties:* Resource ties indicate the strength of relationships between actors with regard to the sharing of different resources, such as physical infrastructural resources, financial resources, human resources, business knowledge, technological resources and other intangible resources.

Activity links, actor bonds and resource ties are interdependent. Actor bonds are developed through activity links and resource ties. They influence one another in a business relationship according to the ARA model. This is explained by the figure below:

Figure 3.12

Interplay between Actor Bonds, Activity Links and Resource Ties



3. **Network Analysis:** A business network is formed through the interactions and associations between three or more business concerns. Business network indicates a combination of various business concerns that have developed relationship with one another. Analysing business networks includes:

- *Activity Pattern:* Performing activities in coordination leads to the creation of activity links between business concerns and multiple activity links connecting multiple actors lead to the development of patterns in which various activities are performed by actors together.

- *Web of Actors:* A collection of all the actors included in a business network is known as a web of actors.

- *Resource Constellation:* The sharing of multiple resources by various actors in a business network leads to the formation of a resource constellation.

Table 3.2

Three Dimensions of Business Relationships

Company Analysis	Relationship Analysis	Network Analysis
Activity Structure	Activity Links	Activity Pattern
Organisation Structure	Actor Bonds	Web of Actors
Resource Collection	Resource Ties	Resource Constellation

Source: Hakansson & Snehota, 1995

The three dimensions of the ARA model (company analysis, relationship analysis and network analysis) describe the *functions of business relationships* between the actors in a business network.

Figure 3.13

Actor-Resource-Activity Model

	Function of a relationship		
Substance of a relationship	Company	Relationship	Network
Activities	Activity structure	Activity links	Activity pattern
Actors	Organisa-tional structure	Actor bonds	Web of actors
Resources	Resource collection	Resource ties	Resource constella-tion

From the activity layer, activity structure and activity links are included in the study. Similarly, from the actor layer, organisation structure and actor bonds are analysed. Finally, from the resource layer, resource collection and resource ties are studied in this research work. Among the three dimensions of the ARA model, only company analysis and relationship analysis are included in the study.

3.6 Chapter Summary

The different theories and models that support the context of research work have been discussed in detail in the chapter. The discussion about the theories is divided into four sections. The first section includes the definition of startups, features, stages of the life cycle, categories and major startup sectors. The second section explains the different elements of an entrepreneurial ecosystem based on the models proposed by different researchers. The third section summarises the concept of the startup ecosystem and various elements such as supporting organisations, capital, human resources, mentors, government, communities, universities/educational institutions and the market. The final section of the chapter explains the different aspects of Actor-Resource-Activity model that is used for analysing the business relationships of startups and incubators in the study.

Chapter 4

Research Methodology

4.1 Introduction

"Research Methodology is the strategy or architectural design by which the researcher maps out an approach to problem-finding or problem-solving."

(Buckley et al., 1976)

The theories and concepts associated with the research topic have been discussed in the previous chapter. The methodology and tools that are used to understand and analyse the research problem are discussed in this chapter. This chapter includes a detailed description of the procedure followed by the researcher in conducting the study. The topic of the study is based on the business relationships of startups associated with incubators and incubation centres in the startup ecosystem of Kerala.

4.2 Research Design

Research design is the "blue print" for the collection, measurement and analysis of data (R.Cooper, S.Schindler, & Sharma, 2014). It is the strategy formulated for conducting the research work. Both descriptive and exploratory research designs are used while executing the study. The study is descriptive because it describes the various categories of startups and incubators that are included in the research work. It is exploratory in nature, as the business relationships in the startup ecosystem of Kerala are explored using Actor-Resource-Activity (ARA) model and ARA model has not been used before to study the business relationships in a startup ecosystem.

4.3 Sources of Data

The data required for conducting the study has been taken from both secondary and primary sources.

Secondary Data

"Secondary data are the data that have already been collected by someone else before the current needs of a researcher. The present researcher only uses these data with related references and never collects it from the field" (Bajpai, 2017). The different sources from which secondary data is collected for the study are:

- Books related to the topic
- Periodicals
- Research publications
- Research Theses
- Conference proceedings
- Websites
- Kerala Technology Startup Policy 2014
- Reports
  - ✓ Reports of Startup Genome
  - ✓ Report of World Bank Group
  - ✓ Report of World Economic Forum
  - ✓ Reports of NASSCOM
  - ✓ Reports of ASSOCHAM India
  - ✓ Reports of Startup India
  - ✓ Executive report of IBM institute of Business Value
  - ✓ Report of Institute of Competitiveness, India
  - ✓ Reports of Kerala Startup Mission

Primary Data

Primary data is the first-hand data collected by the researcher specifically for the purpose of the study. Primary data for this particular research work is collected from 38 incubation centres across the state of Kerala and startups associated with these incubation centres, either as an incubatee or as a coworking startup. Pre-tested schedules were used to conduct personal as well as telephone interviews with respondents to collect primary data.

4.4 Variables of the Study

The variables used in the study describe the different categories, individual characteristics, business relationships and perspectives of startups and incubators in the startup ecosystem. Startups are categorised based on their registration in DPIIT, registration in KSUM, stages of the startup life cycle, nature of business, type of technology, nature of output, status in the incubators, legal status, sector of business, business model and separate office space. Incubators are categorised based on supporting authority/organisation, stage of the startup life cycle, nature of business (of incubatees) and nature of output (of incubatees). Variables used for describing the individual characteristics of startups and incubators are activity structure, organisation structure and resource collection. Variables describing the business relationships of startups and incubators are activity links, actor bonds and resource ties. Statements regarding the role of state government, investors/funding organisations, universities/educational institutions and mentors are variables used to understand the perspective of startups and incubators regarding the role of supporting actors in the ecosystem. Variables identified for the study are listed below, from table 4.1 to table 4.15.

Table 4.1

Different Categories of Startups

DPIIT Registration	Registered Not registered
KSUM Registration	Registered Not Registered
Stages of Startup Life Cycle	Ideation Validation Early traction Scale-up Maturity
Nature of Business	Technology Non-Technology Both Technology & Non-Technology

Type of Technology	IT Non-IT Both IT & non-IT None
Nature of Output	Product Oriented Service Oriented Both Product & Service Oriented
Status in Incubators	Incubatee startup Coworking startup
Legal Status	Sole Proprietor Partnership LLP Private Limited Company
Sector of Business	Food Health/Life science Agriculture Finance Education Communication Electronics/Robotics Advertisement Game Retail IT/Software Ecommerce Food
Business Model	B2C B2B B2G B2C, B2B
Separate Office Space	Yes No

Source: Compiled by the researcher

Table 4.2

Different Categories of Incubators

Supporting Authority/ Organisation	Central Government supported State Government supported University/Educational Institution supported Private/Corporate Business Incubator
Stage of Startup Life Cycle (Stage from which startups are taken for incubation)	Ideation Validation Early traction Scale-up Maturity
Nature of Business (Categories of startups incubated)	Technology Non-Technology Both Technology & Non-Technology Any category
Nature of Output (Categories of startups incubated)	Product Oriented Service Oriented Both Product & Service Oriented Any category

Source: (Holaday, B. M. G.,2019),Compiled by the researcher

Table 4.3

Activity Structure of Startups

Market Research & Business Formation Activities	Conducting a market survey Conducting a feasibility study Developing a business idea Arranging seed capital to start a business Formally registering a startup
Revenue Generation & Performance Evaluation Activities	Customer generation and care Sales and revenue generation Marketing of the product Evaluating the performance of startups

Planning & Team Building Activities	Preparing a business plan Hiring and training employees Devoting full time to business development Organising a startup team
Product Modeling & Networking Activities	Arranging mentoring support Arranging the technical assistance needed for business Attending workshops and seminars Research and Modeling of a prototype or sample
Funding & IP Registration Activities	Approaching financial institutions for credit Meeting investors and pitching for funds Applying for intellectual properties like patents, trademarks etc.
Physical Resource & Expertise Seeking Activities	Purchasing stock or raw materials & arranging machinery/equipment Arranging assistance of professionals like accountants, lawyers etc. Arranging office infrastructure facilities

Source: (Hakansson & Snehota, 1995) (Gartner et al., 2004), Compiled by the researcher

Table 4.4

Activity Structure of Incubators

Pre-Incubation Activities	Providing induction programmes Providing a coworking space Providing training for entrepreneurial skill development Conducting feasibility analyses for different ideas Conducting technical need analysis for different teams Providing labs and research facilities for experimenting Providing assistance in business plan development and team building

Incubation Activities	Screening and selection of startups for incubation Proving physical infrastructure facilities to startups Providing accommodation facilities to startup teams Assisting startups in prototype development Organising workshops, seminars and events Providing financial incentives and seed capital to startups Help startups recruit skilled and talented human resources. Arranging mentors to provide mentoring support to startups Providing technical support to startups Providing facilities for advanced research and development Assisting startups in applying for intellectual properties like patents, trademarks etc. Arranging assistance of professionals like accountants, lawyers etc. Providing an opportunity to meet investors and pitch for funding Assisting in product marketing and customer generation Conducting periodical reviews of startup performance
Post-Incubation Activities	Developing a proper exit plan for incubatees Providing business advice and support for business development Providing an extension to the graduated startups to continue using the incubation facilities if they need them. Allowing the startups to continue using the lab and other research facilities Providing support for technology commercialisation Providing assistance in portfolio management and IPOs Support for business expansion and internationalisation

Source: (Hakansson & Snehota, 1995), (Business Incubation Models, 2014), Compiled by the researcher

Table 4.5

Organisation Structure of Startups and Incubators

Organisation Structure of Startups	There is a formal organisation structure for the startup
	The individual positions of the members and the hierarchy of positions are well defined
	The communication within the startup is formal and structured
	The structure of the startup is simple and flexible
	The structure of the startup is adaptable to changing environments
	The structure of the startup is appropriate for achieving the planned goals
	The structure of the startup is appropriate for building business relationships
Organisation Structure of Incubators	There is a formal organisation structure for the incubator
	The individual positions of the members and the hierarchy of positions are well defined
	The communication within the incubator is formal and structured
	The structure of the incubator is simple and flexible
	The structure of the incubator is adaptable to changing environments
	The structure of the incubator is appropriate for achieving the planned goals
	The structure of the incubator is appropriate for building business relationships

Source: (Hakansson & Snehota, 1995), (Ahmady et al., 2016), Compiled by the researcher

Table 4.6

Resource Collection of Startups

Financial Resources (Sources of Funding)	Bootstrapping Earnings of Startups Grants through Incubators Grants from State Financial Institutions Loans from Commercial Banks and Other Financial Institutions Angel Investors Other Sources
Physical Infrastructure Resources	Office space Office equipments, furniture and fittings Conference rooms Computer systems Internet/WIFI Kitchen/Refreshment facilities Library Lab facility with equipments Plant & Machinery/Equipments Stock/Raw materials Electricity for office Security arrangements of office
Human Resources	Number of members in the startup team There is a team of members working in different positions for the startup Startup team members are qualified and skilled for their positions Skilled and qualified personnel are easily available for hiring
Business Knowledge	Business knowledge is acquired through coaching from incubation centre Business knowledge is acquired through training from incubation centre Business knowledge is acquired through various business activities

Technological Resources	Softwares/Applications License Agreements Patented Technology/Design
Other Intangible Resources	Logo Brand name

Source: (Hakansson & Snehota, 1995), (Alvarez-Salazar, 2020), (Van Weele et al., 2019), Compiled by the researcher

Table 4.7

Resource Collection of Incubators

Financial Resources (Sources of Funding)	Central Government State Government University/Educational Institution Fund from Corporate/Private Investors Loans from Banks and Other Financial Institutions Own Income Other Sources
Physical Infrastructure Resources	Office space Office equipments, furniture and fittings Conference rooms Computer systems Internet/WIFI Kitchen/Refreshment facilities Library Lab facility with equipments Plant & Machinery Raw materials Electricity Security arrangements
Human Resources	There are staff members in various positions working within the incubator The staff members are appointed through a formal appointment process There are sufficient numbers of workers in the incubator The staff members are skilled and qualified for their positions

Other Intangible Resources	Business Knowledge Business Network Business Reputation Intellectual Properties

Source: (Hakansson & Snehota, 1995), (Alvarez-Salazar, 2020), (Van Weele et al., 2019), Compiled by the researcher

Table 4.8

Activity Links of Startups with Other Startups and Incubators

Activity Links of Startups with Other startups	Marketing & Expertise assistance Idea Feasibility & Registration Product Modelling & Team Building Business Development & Evaluation Mentoring & Resource Collection
Activity Links of Startups with Incubators	Business Development & Team Building Marketing & Performance Evaluation Idea Generation & Feasibility Study Funding & Professional Assistance Product Modeling & Resource Collection

Source: (Hakansson & Snehota, 1995), (Persson et al., 2014), Compiled by the researcher

Table 4.9

Activity Links of Incubator with Other Incubators and Startups

Activity Links of Incubators with Other Incubators	Pre-Incubation Activities Incubation Activities Post-Incubation Activities
Activity Links of Incubators with Startups	Pre-Incubation Activities Incubation Activities Post-Incubation Activities

Source: (Hakansson & Snehota, 1995), (Persson et al., 2014), Compiled by the researcher

Table 4.10

Actor Bonds of Startups with Other Startups and Incubators

Structural Bond	Performing business activities with mutual support and coordination
	Sharing of facilities, equipments and other resources
	Formulating policies and programs that enhance business relationships
	Developing value added partnerships and collaborations
Economic Bond	Capital investment in startup
	Providing business credit/grant to startup
	Providing facilities/goods/services at lower rate and other financial incentives
	Joint investment in innovation projects
Social Bond	Personal attachment and friendship
	Mutual interaction and communication
	Mutual trust and belief
	Commitment

Source: (Hakansson & Snehota, 1995), (Holmlund & Törnroos, 1997), (Shammout et al., 2012), Compiled by the researcher)

Table 4.11

Actor Bonds of Incubators with Other Incubators and Startups

Structural Bond	Performing business activities with mutual support and coordination
	Sharing of facilities, information, equipments and other resources
	Formulating policies and programs that enhance business relationships
	Developing value added partnerships and connections
Economic Bond	Fund for managing incubation expenses
	Equity investment in startups
	Providing grants and loans to startups
	Providing facilities/goods/services at lower rate and other financial incentives
	Joint investment in innovation projects

Social Bond	Personal attachment and friendship Mutual interaction and communication Mutual trust and belief Commitment

Source: (Hakansson & Snehota, 1995), (Holmlund & Törnroos, 1997), (Shammout et al., 2012), Compiled by the researcher

Table 4.12

Resource Ties of Startups with Other Startups and Incubators

Resource Ties of with Other Startups	Financial Resources Physical Infrastructure Resources Human Resources Business Knowledge Technological Resources
Resource Ties of with Incubators	Financial Resources Human Resources Business Knowledge Technological Resources Other Intangible Resources

Source: (Hakansson & Snehota, 1995), (Persson et al., 2014), Compiled by the researcher

Table 4.13

Resource Ties of Incubators with Other Incubators and Startups

Resource Ties with Other Incubators	Financial Resources Physical Infrastructure resources Human Resources Business Knowledge Business Networks Business Reputation Intellectual Properties

Resource Ties with Startups	Financial Resources Physical Infrastructure resources Human Resources Business Knowledge Business Networks Business Reputation Intellectual Properties

Source: (Hakansson & Snehota, 1995), (Persson et al., 2014), Compiled by the researcher

Table 4.14

Role of Supporting Actors - Startups

State Government	Adequate policies are formulated and implemented by the state government for the growth and development of startups in Kerala Startup policies adopted by the government are favourable for the functioning of startups in the state It is less time-consuming and involves only limited procedures for availing various benefits for startups through the government The startup activities in the state are effectively coordinated through the nodal agency, KSUM
Investors/ Funding Organisations	There are angel investors who are interested in investing in your sector of business The state financial institutions are ready to provide loans for startups and the procedures to be followed are simple The loan amount is sanctioned and provided to the startups within an appropriate time period by the funding organisations There is no difficulty in arranging funds through investors and funding organisations in the state
Universities/ Educational Institutions	Basic education regarding entrepreneurship and startups is provided to students at educational institutions Students are trained and encouraged to develop their own business ideas Organising startup camps/workshops in coordination with other actors in the ecosystem Provides research and incubation facilities for students with the help of the government or institution itself

Mentors	It is easy and affordable for startups to get the help of mentors to support the management of their businesses
	Mentors are ready to share their knowledge, time and resources with startups
	Mentors help solve the technical, financial, marketing and other problems faced by startups
	Mentors help in the revenue generation and performance evaluation of startups

Source: (Graybeal & Sindik, 2016), (Rao & Kumar, 2016), (Ramadani, 2009), (Lockett et al., 2002), (Acharya & Dixit, 2019),Compiled by the researcher

Table 4.15

Role of Supporting Actors - Incubators

State Government	The government has introduced policies that support the functioning of incubators in the state
	The government provides infrastructural support to incubators
	The government provides financial assistance to incubators for their development and supports the startups
	The government effectively coordinates the functioning of various incubators in the state through KSUM
Investors/ Funding Organisations	State financial institutions help provide loans to incubated startups
	Angel networks and venture capital firms are ready to coordinate with incubators and provide funds to startups
	Investors/funding organisations coordinate with incubators in arranging seminars/ workshops/pitching sessions for the startups
	Investors/funding organisations provide timely funding to startups and evaluate their performance
Universities/ Educational Institutions	Basic education regarding entrepreneurship and startups is provided to students at educational institutions
	Students are trained and encouraged to develop their own business ideas
	Organising startup camps/workshops in coordination with other actors in the ecosystem
	Provides incubation and research facilities for students to support their startup ideas with the help of the government or institution itself

Mentors	Mentors are available to coordinate with incubators and help startups manage their businesses Mentors are ready to share their knowledge, time and resources with incubated startups Mentors support incubators in arranging seminars/workshops/pitching sessions for startups Mentors help incubators evaluate and improve the performance of startups

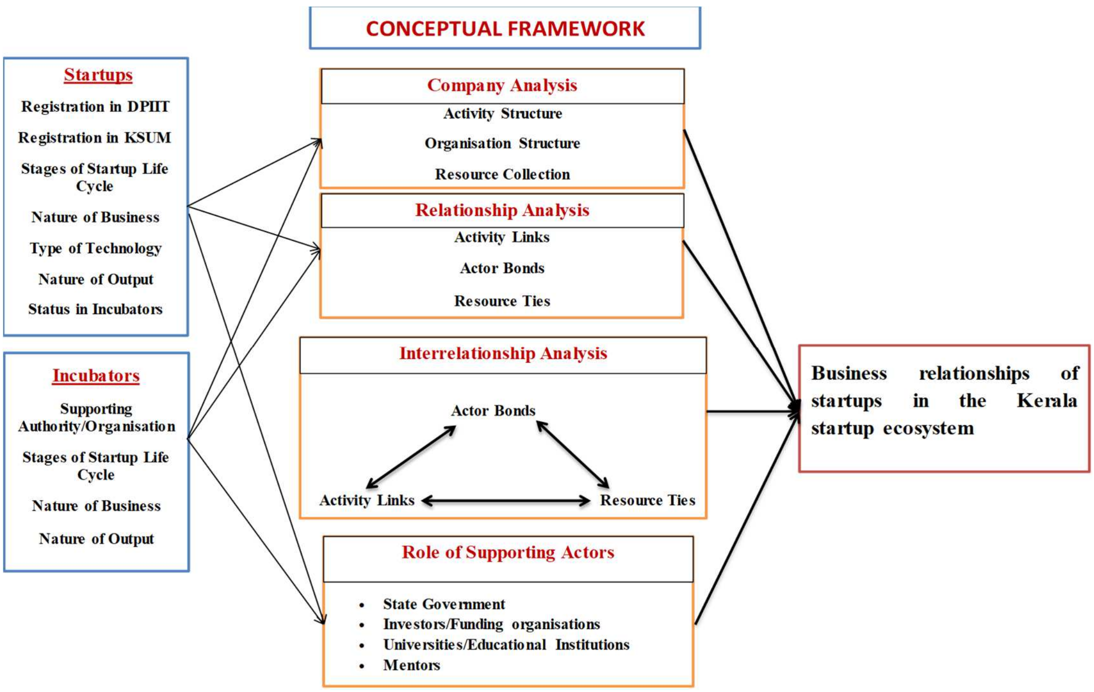
Source: (Graybeal & Sindik, 2016), (Rao & Kumar, 2016), (Ramadani, 2009), (Lockett et al., 2002), (Acharya & Dixit, 2019),Compiled by the researcher

4.5 Conceptual Framework of the Study

The conceptual framework developed using the different variables identified for the study is given below.

Figure 4.1

Conceptual Framework of the Study



An illustration of the different research variables and their relationships is provided by a conceptual framework. Startups and incubators are the actors studied in this research work. The different variables describing the various categories of startups and incubators are provided in the framework. A company analysis that studies the activity structure, organisation structure and resource collection of the actors, as well as a relationship analysis based on the activity links, actor bonds and resource ties of the actors, is depicted in the framework. The interrelationship between activity links, actor bonds and resource ties of startups with other actors is explored in detail as well. Apart from startups and incubators, there are many other actors that function within the startup ecosystem. The perspective of startups and incubators about the role played by these actors in the ecosystem is also included in the framework. Finally, all these analyses will help us understand the business relationships of different types of startups and incubators in the ecosystem.

4.6 Sample Design

Sample design is the process of defining the target population, determining the sampling frame, deciding the appropriate sampling technique, determining the sample size and executing the sampling process (Bajpai, 2017).

4.6.1 Target Population

The research study includes two populations. They are:

- **Incubators**

Incubators in Kerala, which consist of at least one active startup under incubation, were considered for the study. 38 incubation centres (as on 31.05.2022) were identified for the purpose of the study. Data was collected from all these 38 incubators and it is considered a population study. The list of incubators from different districts from which data is collected is given in the below table.

Table 4.16

Population of Incubation Centres in Kerala

Districts	Name of Incubation Centre
Kasargod	Kerala Startup Mission (KSUM)
	Central Plantation Crops Research Institute (CPCRI)
Kannur	Business Incubation Centre, Kannur University
	Malabar Innovation & Entrepreneurship Zone (Mizone)
	Kannur Technolodge
Calicut	IIMK Live
	Kerala Startup Mission (KSUM)
	Kerala State Industrial Development Corporation (KSIDC)
	Technology Business Incubator, NIT
	Indian Institute of Spices Research (IISR)
Malappuram	MES College of Engineering, Kuttippuram
Palakkad	Kerala Startup Mission (KSUM)
	Govt. Engineering College, Sreekrishnapuram
	Nehru Group of Institutions Technology Business Incubator (NGI TBi)
Trissur	Govt. Engineering College, Trissur
	Sahrdaya Technology Business Incubator (STBI)
	KAU Agri Business Incubator
Ernakulam	Kerala Startup Mission (KSUM)
	BioNest – Rajeev Gandhi Centre of Biotechnology
	CITTIC – CUSAT TBI
	RUSA Innovation Startup Ecosystem (RISE), CUSAT
	Technolodge, Piravam
	Technolodge, Kalamassery
	Adi Shankara Institute of Engineering & Technology – TBI
	Federal Institute of Science And Technology – TBI
	Rajagiri School of Engineering & Technology
	LECCON, Rajagiri College of Management & Applied Sciences
	inQ Innovation
	Central Institute of Fisheries Technology (CIFT)
	Albertian Institute of Science and Technology

Districts	Name of Incubation Centre
Kottayam	Technolodge, Kottayam
	Startups Valley, Amal Jyothi College of Engineering
Thiruvananthapuram	Kerala Startup Mission (KSUM)
	Kerala University Business Innovation and Incubation Centre (KUBIIC)
	B-HUB
	College of Engineering Trivandrum – TBI (CET-TBI)
	Central Tuber Crops Research Institute (CTCRI)
	Government Engineering College, Bartonhill - TBI

Source: Kerala Startup Mission, Compiled by the researcher

- **Startups**

The second population that is included in the research work are startups. Startups that are associated with the 38 incubation centres in the study, either as incubatees or as coworking startups, are considered for research. As on May 31, 2022, there are 1138 startups associated with the incubators in the study. Since the complete list of startups is available, the population is finite. Hence, the study of startups is a sample study. The number of startups in each incubator selected for the study is given below.

Table 4.17

List of Incubators and Number of Startups

Names of Incubation Centres	No. of Startups
Kerala Startup Mission, Kasargod	7
Central Plantation Crops Research Institute	6
Business Incubation Centre, Kannur University	15
Malabar Innovation & Entrepreneurship Zone	70
Kannur Technolodge	5
IIMK Live	91
Kerala Startup Mission, Calicut	59
Kerala State Industrial Development Corporation	16
Technology Business Incubator, NIT	18
Indian Institute of Spices Research	11

Names of Incubation Centres	No. of Startups
MES College of Engineering, Kuttippuram	9
Kerala Startup Mission, Palakkad	9
Govt. Engineering College, Sreekrishnapuram	9
Nehru Group of Institutions Technology Business Incubator	11
Govt. Engineering College, Trissur	10
Sahrdaya Technology Business Incubator	6
KAU Agri Business Incubator	200
Kerala Startup Mission, Kochi	91
BioNest – Rajeev Gandhi Centre of Biotechnology	30
CITTIC – CUSAT TBI	105
RUSA Innovation Startup Ecosystem (RISE), CUSAT	35
Technolodge, Piravam	15
Technolodge, Kalamassery	28
Adi Shankara Institute of Engineering & Technology – TBI	10
Federal Institute of Science And Technology – TBI	2
Rajagiri School of Engineering & Technology	5
LECCON, Rajagiri College of Management & Applied Sciences	7
inQ Innovation	1
Central Institute of Fisheries Technology	12
Albertian Institute of Science and Technology	8
Technolodge, Kottayam	25
Startups Valley, Amal Jyothi College of Engineering	37
Kerala Startup Mission, Thiruvananthapuram	70
Kerala University Business Innovation and Incubation Centre	17
B-HUB	70
College of Engineering Trivandrum – TBI	6
Central Tuber Crops Research Institute	2
Government Engineering College, Bartonhill – TBI	10
Total	**1138**

Source: Field Survey

4.6.2 Sample Size Determination

Since the study on startups is a sample study, it is necessary to decide on the sample size for data collection. The sample size is determined using the method proposed by Krejcie & Morgan (1970) for finding sample size for a finite population, as the population of startups is finite in nature. The following formula is applied:

$$s = \frac{X^2 NP(1-P)}{d^2(N-1)+X^2P(1-P)}$$

s	=	*required sample size*
X	=	*the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)*
N	=	*the size of population (N=1138)*
P	=	*the population proportion (assumed to be .05)*
d	=	*the degree of accuracy expressed as proportion (.05)*

Therefore, sample size is:

$$s = \frac{3.841 \times 1138 \times .5(1-5)}{(.05)^2 \times (1138-1) + 3.841 \times .5(1-.5)}$$

$$= \frac{1092.7645}{3.80275}$$

$$= 287.36$$

The sample size calculated is 287.36, it is rounded off to 288 for the purpose of research work.

4.6.3 Sampling Technique

Since the population has a sample frame, samples are selected using the stratified random sampling method. Stratified random sampling is a sampling methodology in which the population is stratified according to a criterion and samples are selected from each stratum using either simple random sampling or a systematic random sampling method (Bryman & Bell, 2011). One stratum consists of startups associated with incubators located in the northern region of the state, specifically in the districts of Malappuram, Calicut, Kannur and Kasargod. Another stratum is made up of startups connected to incubation centres located in the state's central districts, namely Ernakulam, Kottayam, Trissur and Palakkad. The third stratum consists of incubators belonging to the southern district of the state, Thiruvananthapuram. Because the talent, social environment, infrastructure and allied facilities accessible to startups incubated in each region are similar, Kerala's startup ecosystem can be classified into three regions: the north, central and southern. This is why stratification is done in this manner. From each stratum, startups are selected on a proportionate basis using a simple random sampling method. The stratification of the population can be further explained in the following table:

Table 4.18

Sample Selection

Stratum No.	Region and districts in which Incubators function	No. of startups associated with incubators in each stratum	Proportionate no. of startups for sampling
1	Northern Region - Malappuram, Calicut, Kannur and Kasargod	307	78
2	Central Region - Ernakulam, Kottayam, Trissur and Palakkad	656	166
3	Southern Region – Thiruvananthapuram	175	44
	Total	**1138**	**288**

Source: Field Survey

4.7 Method and Period of Data Collection

The interview method is used for collecting data from incubators and startups. Both personal and telephone interview methods are employed. Data for the study was collected between May 2022 and February 2023.

4.8 Instruments Used for Data Collection

Pre-tested interview schedules are used for data collection. Two separate interview schedules are used to collect data from incubators and startups.

4.8.1 Designing Interview Schedules

Interview schedules for gathering information from incubators and startups were created based on the literature review and the researcher's observations. Twenty startup company founders and two managers of incubation centres were invited to fill the schedules during the first phase of the pilot study in order to pre-test the interview schedule. While completing the interview schedule's questions, their suggested alterations were taken into account. Data collection is conducted using two distinct schedules.

4.8.2 Structure of Interview Schedules

Interview schedules for startups and incubators include the following sections:

1) Details of different categories of startups and incubators
2) Activity Structure
3) Activity links
4) Organisation Structure
5) Actor Bonds
6) Resource Collection
7) Resource Ties
8) Perception regarding the role of supporting actors

The first section of the schedule consists of questions relating to the different categories of startups and incubation centres functioning in Kerala. The second section includes questions relating to the activities performed by startups and incubators, which will help in describing their activity structure. Activity links of startups with other startups and incubators, as well as those of incubators with other incubators and startups are measured in the third section.

Statements that describe the organisation structure of startups and incubators are included in the fourth section. The structural, economic and social bond shared between the actors is measured in the fifth section and questions about various resources belonging to startups and incubators are included in the sixth section. The strength of the resource ties between the actors for resource sharing is measured through the questions in the seventh section. Finally, questions that can help understand the perspective of startups and incubators in relation to the role of supporting actors are included.

4.8.3 Scaling Techniques

The questions included in the first section, which describe the various categories of startups and incubators, are measured using nominal, ordinal and ratio scales. Questions relating to the activity structure, organisation structure and perspective regarding the role of supporting actors are measured using a Likert scale ranging from strongly disagree (1) to strongly agree (5). The presence of physical infrastructural resources and intangible resources is measured using categorical variables and questions relating to other resources are measured using a Likert scale ranging from strongly disagree (1) to strongly agree (5). Activity links are measured using a five-point scale ranging from very high (5) to very low (1). Whereas actor bonds and resource ties are measured using a five-point scale ranging from very strong (5) to very weak (1). The operational definition of scales used in measuring activity links, actor bonds and resource ties is as follows:

Table 4.19

Operational Definition of Scales Used to Measure Activity Links, Actor Bonds and Resource Ties

Variables	Scale	Meaning
Activity Links	Very High	There is direct, continuous and regular coordination between the actors while performing various activities. Two actors perform the activities together.
	High	The direct but irregular and discontinuous coordination between actors for performing various activities. The coordination may be on a demand basis as and when needed.
	Moderate	There is no direct coordination between actors, but they indirectly coordinate with one another, where one actor directs the other to a third party who can help them or will connect them with an expert who can help them or mediate the procedures that are involved in performing the activity. Provided on a demand basis.
	Low	Indirect and irregular coordination in the performance of activities. Only basic information or help needed to support the performance of the activity is provided.
	Very Low	There is neither direct nor indirect coordination between actors while performing activities.
Actor Bonds	Very Strong	There is a direct, close and continuing relationship between the actors, whether structural, economic or social.
	Strong	There is a direct and close relationship, but only demand or situation-based support between actors.
	Moderately Strong	There is no direct and close relationship, but one actor indirectly helps others when needed and maintains the relationship from time to time.
	Weak	There is no direct or indirect relationship between the actors. Very rarely do the actors communicate with or help each other.
	Very Weak	No interaction, relationship or any type of bond between actors.

Variables	Scale	Meaning
Resource Ties	Very Strong	There is direct, continuous and regular resource sharing between the actors.
	Strong	There is direct, but situational or demand-based, resource sharing between parties.
	Moderately Strong	There is no direct resource sharing, but one actor will help the other actor by connecting or mediating with the source, which will provide the resource that the other actor needs.
	Weak	There will be no direct or indirect resource sharing between the actors; only the basic information regarding the resource will be shared.
	Very Weak	There is no resource sharing between the actors.

Source: Formulated by the researcher

4.8.4 Pilot Study

A pilot study for the research work was conducted among a small group of respondents. Data was collected from 5 incubation centres in Calicut district and 60 startups associated with them. The pilot study was conducted between December 2021 and March 2022. It got delayed due to the third wave of the COVID-19 pandemic. During the initial phase of the pilot study, the interview schedule was pre-tested and after the completion of the pilot study, appropriate changes were made to the interview schedules. Cronbach's alpha was calculated to check the reliability of the data collected through the pilot survey and it was found that constructs such as activity structure of startups (.434), organisation structure of incubators (.513), actor bonds of incubators with startups (.467) and resource ties of startups with incubators (.532) have an alpha value below 0.7. Items included in these constructs were revised as well as deleted to improve their reliability. After necessary revisions were made, the interview schedule was used for data collection.

4.9 Validity

"Validity is the degree to which the measurement scale accurately captures and reflects the actual differences among the objects that the researcher is attempting to measure" (Dangi & Dewen, 2016). Therefore, validity is a measure used to ensure that the instrument accurately measures what it is supposed to measure. In the research work, face validity, content validity and construct validity of various constructs are ensured.

4.9.1 Face Validity

Face validity of the interview schedules was ensured through an informal review of the instruments by startup founders and incubation centre managers.

4.9.2 Content Validity

The content validity of the interview schedules were guaranteed by a complete review of the schedules by subject and industry experts. The necessary changes suggested by the experts have been incorporated into the schedules.

4.9.3 Construct validity

"Construct validity is the extent to which a scale measures an intended hypothesis. Construct validity requires a sound understanding of the theory relating to constructs" (Dangi & Dewen, 2016). The degree to which scores on a test can be accounted for by the explanation of the theory associated with the construct is called construct validity (Kothari & Garg, 2019). The construct validity of an instrument is measured through the convergent and discriminant validity of the constructs. "The degree to which scores on one scale correlate with scores on the other scales designed to assess the same construct" (R.Cooper, S.Schindler, & Sharma, 2014) is known as convergent validity. The constructs measured in the study using PLS-SEM models include items with high factor loadings and Composite Reliability above 0.7. The Average Variance Extracted (AVE) of constructs is 0.5 and more, which guarantees their convergent validity. Discriminant validity is the "degree to which scores on a scale do not correlate with the scores from scales designed to measure different constructs" (R.Cooper, S.Schindler, & Sharma, 2014). The Fornell-Larcker Criterion is used to ensure the discriminant validity of constructs in PLS-SEM models. According to the Fornell-Larcker Criterion, if the square root of the AVE of a construct is greater than the correlation of the construct with every other construct in the model, then it is said to have discriminant validity. The constructs in the PLS-SEM models satisfy the condition of the Fornell-Larcker Criterion, thereby ensuring their discriminant validity.

4.10 Reliability Analysis

The ability of an instrument to produce the same result when it is repeatedly used is called reliability. Reliability indicates the “consistency” or “repeatability” of the instrument used for measuring different variables. Reliability can be measured by calculating Cronbach’s alpha coefficient. “Cronbach’s alpha is a commonly used test for internal reliability. It essentially calculates the average of all possible split-half reliability coefficients. A computed alpha coefficient will vary between 1 and 0” (Bryman & Bell, 2011). A Cornbach’s alpha coefficient greater than 0.7 is an indicator of “good” reliability (George & Mallery, 2003). Cornbach’s alpha coefficient has been calculated for the different constructs in both the interview schedules and coefficient values are given in the table below.

Table 4.20

Reliability Statistics

Variables	Cronbach’s Alpha	N of Items
Activity Structure of Startups		
Market Research & Business Formation Activities	.825	5
Revenue Generation & Performance Evaluation Activities	.938	4
Planning & Team Building Activities	.804	4
Product Modeling & Networking Activities	.781	4
Funding & IP Registration Activities	.735	3
Physical Resource & Expertise Seeking Activities	.719	3
Activity Structure of Incubators		
Pre-Incubation Activities	.937	7
Incubation Activities	.842	15
Post-Incubation Activities	.915	7

Variables	Cronbach's Alpha	N of Items
Organisation Structure		
Organisation Structure of Startups	.939	7
Organisation Structure of Incubators	.859	7
Resource Collection of Startups		
Financial Resources (Sources of Funding)	.711	7
Human Resources	.809	4
Business Knowledge	.787	4
Resource Collection of Incubators		
Financial Resources (Sources of Funding)	.722	7
Human Resources	.924	4
Activity Links of Startups with Other startups		
Marketing & Expertise assistance	.797	5
Idea Feasibility & Registration	.865	4
Product Modeling & Team Building	.780	3
Business Development & Evaluation	.726	3
Mentoring & Resource Collection	.748	3
Activity Links of Startups with Incubators		
Business Development & Team Building	.911	5
Marketing & Performance Evaluation	.898	4
Idea Generation & Feasibility Study	.883	4
Funding & Professional Assistance	.839	3
Product Modeling & Resource Collection	.733	3
Activity Links of Incubators with Other Incubators		
Pre-incubation Activities	.861	7
Incubation Activities	.909	15
Post-incubation Activities	.908	7
Activity Links of Incubators with Startups		
Pre-incubation Activities	.945	7
Incubation Activities	.879	15
Post-incubation Activities	.898	7

Variables	Cronbach's Alpha	N of Items
Actor Bonds of Startups with Other Startups		
Structural Bond	.919	4
Economic Bond	.796	4
Social Bond	.960	4
Actor Bonds of Startups with Incubators		
Structural Bond	.894	4
Economic Bond	.782	4
Social Bond	.958	4
Actor Bonds of Incubators with Other Incubators		
Structural Bond	.956	4
Economic Bond	.812	5
Social Bond	.995	4
Actor Bonds of Incubators with Startups		
Structural Bond	.749	4
Economic Bond	.703	5
Social Bond	.990	4
Resource Ties of Startups		
Resource Ties of Startups with Other Startups	.740	5
Resource Ties of Startups with Incubators	.793	5
Resource Ties of Incubators		
Resource Ties of Incubators with Other Incubators	.897	7
Resource Ties of Incubators with Startups	.770	7
Role of Supporting Actors – Startups		
State Government	.915	4
Investors/Funding Organisations	.733	4
Universities/Educational Institutions	.917	4
Mentors	.933	4
Role of Supporting Actors – Incubators		
State Government	.703	4
Investors/Funding Organisations	.753	4
Universities/Educational Institutions	.843	4
Mentors	.747	4

Source: Field Survey

From the aforesaid table, it can be understood that the Cornbach's alpha coefficient of scaled constructs in both interview schedules is above 0.7, thereby ensuring the internal consistency between the items in the constructs. Hence, the reliability of the instruments is guaranteed.

4.11 Normality Test of the Data

When the statistical distribution of sampling data is normal, it is said to have normality. Understanding the normality of the sample data is necessary in order to determine what type of statistical test can be used. Since only the study about startups is a sample study where statistical tests are applied, normality is calculated only for them. Both the Kolmogorov-Smirnov and Shapiro-Wilk tests are employed to determine the normality of the sample data. Test results are shown in the below table:

Table 4.21

Normality Test of the Data

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Activity Structure						
Market Research & Business Formation Activities	.154	288	.000	.936	288	.000
Revenue Generation & Performance Evaluation Activities	.199	288	.000	.878	288	.000
Planning & Team Building Activities	.187	288	.000	.876	288	.000
Product Modeling & Networking Activities	.201	288	.000	.918	288	.000
Funding & IP Registration Activities	.130	288	.000	.963	288	.000
Physical Resource & Expertise Seeking Activities	.140	288	.000	.969	288	.000
Organisation Structure	.116	288	.000	.950	288	.000
Financial Resources (Sources of Funding)						
Bootstrapping	.463	288	.000	.503	288	.000
Earnings of Startups	.416	288	.000	.544	288	.000

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Grants through Incubators	.273	288	.000	.752	288	.000
Grants from State Financial Institutions	.295	288	.000	.671	288	.000
Loans from Commercial Banks and Other Financial Institutions	.267	288	.000	.794	288	.000
Angel Investors	.276	288	.000	.760	288	.000
Other Sources	.295	288	.000	.752	288	.000
Human Resources						
There is a team of members in different positions working for the startup	.287	288	.000	.808	288	.000
Startup team members are qualified and skilled for their positions	.349	288	.000	.760	288	.000
Skilled and qualified personnel are easily available for hiring in Kerala	.222	288	.000	.883	288	.000
Business Knowledge						
Business knowledge is acquired through coaching from incubation centre	.173	288	.000	.906	288	.000
Business knowledge is acquired through training from incubation centre	.225	288	.000	.894	288	.000
Business knowledge is acquired through various business activities	.345	288	.000	.714	288	.000
Activity Links with Other Startups						
Marketing & Expertise Assistance	.073	288	.001	.988	288	.021
Idea Feasibility & Registration	.174	288	.000	.939	288	.000
Product Modelling & Team Building	.137	288	.000	.960	288	.000
Business Development & Evaluation	.177	288	.000	.945	288	.000
Mentoring & Resource Collection	.175	288	.000	.941	288	.000

Variables	**Kolmogorov-Smirnov**			**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Activity Links with Incubators						
Business Development & Team Building	.288	288	.000	.858	288	.000
Marketing & Performance Evaluation	.221	288	.000	.920	288	.000
Idea Generation & Feasibility Study	.131	288	.000	.964	288	.000
Funding & Professional Assistance	.189	288	.000	.942	288	.000
Product Modeling & Resource Collection	.176	288	.000	.946	288	.000
Actor Bonds with Other Startups						
Structural Bond	.088	288	.000	.971	288	.000
Economic Bond	.149	288	.000	.909	288	.000
Social Bond	.133	288	.000	.933	288	.000
Actor Bonds with Incubators						
Structural Bond	.085	288	.000	.977	288	.000
Economic Bond	.121	288	.000	.948	288	.000
Social Bond	.103	288	.000	.970	288	.000
Resource Ties with Other Startups	.078	288	.000	.980	288	.001
Resource Ties with Incubators	.081	288	.000	.974	288	.000
Role of Supporting Actors						
State Government	.108	288	.000	.968	288	.000
Investors/Funding Organisations	.118	288	.000	.866	288	.000
Universities/Educational Institutions	.123	288	.000	.942	288	.000
Mentors	.114	288	.000	.961	288	.000

Source: Field Survey

Table 4.21 indicates the results of normality tests for different variables in the sample data that need to be subjected to statistical tests. The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests show that the sample data is not normal since the P values for both tests are less than .05 for all the variables. Hence, the hypothesis that "sample data is normal" has been rejected. As the sample data is not normal, parametric tests cannot be employed in the study.

4.12 Tools Used for Data Analysis

It has been found through normality tests that the sample data is not normal. Hence, non-parametric tests are used for analysis. Data analysis is done with the help of softwares such as IBM-SPSS 21.0, Smart PLS 4 and MS Excel (2010). The association between different categories of startups is analysed using the Chi-square test and Fisher's Exact test. Analysis of activity structure, organisation structure and resource collection of startups is done using descriptive statistics, Exploratory Factor Analysis (EFA), Kruskal-Wallis H test, Mann-Whitney U test and bar charts. Variables measuring business relationships, such as activity links, actor bonds and resource ties, are analysed using descriptive statistics, EFA, Kruskal-Wallis H test, Mann-Whitney U test, Spearman's Rank Correlation and multiple regression analysis. The perspective of startups about the role of supporting actors in the startup ecosystem is studied using descriptive statistics, EFA, Kruskal-Wallis H test and the Mann-Whitney U test. Descriptive statistics, Chi-square test, Fisher's Exact test, EFA, Kruskal-Wallis H test, Mann-Whitney U test and Spearman's Rank Correlation are performed using IBM-SPSS 21.0. Multiple regression analysis is done through Partial Least Squares Structural Equation Modeling (PLS-SEM). Smart PLS 4 is the software used for creating PLS-SEM models. Bar charts are prepared using MS Excel. Since the study about incubators is a population study, only descriptive statistics methods are used for data analysis. The different tools used for data analysis are described below:

Mean is a measure of central tendency; it is a single value that represents the entire group. The mean is used for analysing the responses of incubators in the study. It is also used while analysing the number of members in different categories of startups.

Median is the value that divides a group into two equal parts (middle value); it is a measure of central tendency. Median values are used while analysing the responses of various categories of startups to different variables.

Standard deviation is a measure of dispersion. "It is the square root of the arithmetic mean of the squared deviations of all values from the mean." (Aggarwal, 2005).

Standard deviation is used for analysing the responses of incubators to different variables and also for analysing the number of members in different startup categories.

Bar charts used in the study are stacked column charts. They are used while analysing the physical, technological and other intangible resources of startups.

Chi-square (χ^2) Test is used to test whether there is significant difference between observed values and expected values. It can be applied to contingency tables. "It allows us to establish how confident we can be that there is a relationship between the two variables in a population" (Bryman & Bell, 2011). Chi-square test of independence of attributes is used to examine the association between different categories of startups.

Fisher's Exact Test is applied when observed values in a contingency table go below 5. While testing the association between different startup categories, in cases where even a single cell value is below 5, Fisher's Exact test is used.

Exploratory Factor Analysis (EFA) is used to summarise the information contained in a large number of variables into a small number of factors. It is a statistical technique used for data reduction and summarisation (Bajpai, 2017). EFA is used for grouping data related to activity structure, organisation structure, activity links, actor bonds, resource ties and perspective of startups about the role of supporting actors.

Kruskal-Wallis H Test is the non-parametric substitute for one-way ANOVA (Bryman & Bell, 2011). When the dependent variable is not normally distributed, the Kruskal-Wallis H test can be used to compare three or more independent groups. The Kruskal-Wallis H test is used to determine if there is a substantial difference in the responses from various categories of startups to different variables. A pair wise comparison is also performed to learn about the startup categories whose responses significantly differ from one another. P values after adjusting for the chances of type I error (Adjusted P values) is used to determine if there is a significant difference between the responses of two categories of startups.

Mann-Whitney U Test is the non-parametric alternative to the Independent Sample T test. It can be used to compare two independent groups when the dependent variable is not normally distributed. The Mann-Whitney U test is used to analyse if there are significant differences in the responses of various startup categories.

Spearman's Rank Correlation is applied to determine the degree of association between two variables (Bajpai, 2017). For measuring the correlation between variables that are not normally distributed, Spearman's rank correlation can be used (Schober et al., 2018). Spearman's rank correlation is used to analyse the correlation between activity links, actor bonds and resource ties of startups.

Multiple Regression Analysis is used when we study the effect of two or more independent variables on a dependent variable. To understand the dependency of activity links, actor bonds and resource ties of startups on each other, multiple regression analysis is used. Partial Least Squares Structural Equation Modeling (PLS-SEM) is used to perform regression analysis. PLS-SEM models are developed using Smart PLS 4 software.

Confirmatory Factor Analysis (CFA) assesses the measurement properties of constructs and examines the relations among latent variables in a measurement model (Bajpai, 2017). CFA validates the measurement model and leads to structural equation modeling. Measurement models in the study consist of only lower order constructs. The criteria used for assessing measurement models are given in the below table.

Table 4.22

Assessment of Measurement Models

	Particulars	Criteria
1	Reliability	Factor Loadings > .05 Cronbach's Alpha > .07
2	Internal Consistency	Composite Reliability (rho_a) > .07
3	Convergent Validity	Average Variance Extracted (AVE) > .05
4	Discriminant Validity	Fornell-Larcker Criterion
5	Multicollinearity	VIF values less than 5

Source: (Cronbach & Meehl, 1955), (Hulland, 1999), (Bagozzi & Yi, 1988), (Hair et al., 2010) and (James et al., 2014)

While developing measurement models for the interrelationship between activity links, actor bonds and resource ties of startups with other startups, five activities, such as preparing a business plan, arranging seed capital to start a business, approaching financial institutions for credit, meeting investors and pitching for funds and attending workshops and seminars and one item from resource ties, i.e., resource ties for other intangible assets, have been deleted due to cross-loading and validity concerns. Similarly, while developing the measurement models for the interrelationship between activity links, actor bonds and resource ties of startups with incubators, three activities, such as arranging mentoring support, arranging office infrastructure facilities and attending workshops and seminars and one item from resource ties, i.e., resource ties for physical infrastructure resources, were also eliminated due to validity concerns.

Structural Equation Modeling is a multivariate data analysis technique for examining complex relationships among constructs and indicators (Hair et al., 2021). After confirming the measurement models through CFA, structural models are developed for the multiple regression analysis. The structural models in the study are PLS-SEM models with only lower-order constructs. "PLS-SEM is a causal Modeling approach aimed at maximizing the explained variance of the dependent latent constructs" (Hair et al., 2011). Structural models analyse the effect of independent variables on dependent variables and show if there is a significant relationship between the latent variables. Criteria for assessing the relationship between latent variables through structural models are given in the table below.

Table 4.23

Assessment of Structural Models

	Particulars	Criteria
1	Path loading significance	P value < 0.05 T statistics > 1.96

Source: (Hair et al., 2017)

4.13 Period of the Study

The study was conducted from July 2018 to April 2024.

2018 – 2020 – Review of Literature and Research gap identification
2020 – 2021 – Theoretical framework of the study
2021 – 2022 – Questionnaire development and Pilot study (July 2021 to April 2022)

2022 – 2023 – Data collection (May 2022 to February 2023)

2023 – 2024 – Data analysis and report preparation (March 2023 to April 2024)

4.14 Chapter Summary

Methods and tools used in the study are discussed in this chapter. Research design, sources of data, variables of the study, conceptual framework, sample design, method and period of data collection, instrument used for data collection, design and structure of interview schedules, pilot study, validity and reliability of data, normality of data, softwares and tools used for data analysis have been explained in detail. This chapter thus gives a detailed insight into the methodology adopted during the research work.

Chapter 5

Components of Individual Actors - Startups

5.1 Introduction

In the previous chapter, the methodology used for the study was described and it was found that among the actors studied in the research work, startups are the most important. The integral part of a startup ecosystem is the startups themselves. This chapter is a detailed analysis of startups in the Kerala startup ecosystem. According to the Actor-Resource-Activity (ARA) model of studying business relationships, components used to analyse an individual actor are activity structure, organisation structure and resource collection (Hakansson & Snehota, 1995). Therefore, the focus of this chapter is to analyse startups based on their category, activity structure, organisation structure and resource collection. Startups functioning in the Kerala startup ecosystem have varied features that can affect the way they function and their exposure to different opportunities available for startups. The first section of this chapter focuses on describing the various categories of startups based on their features.

The second section of this chapter examines the activity structure, organisation structure and resource collection of various categories of startups. Activity structure indicates the activities that are performed by the startups. Twenty-three activities that are commonly performed by startups are identified and these activities are categorised into six groups using exploratory factor analysis for further analysis. For the performance of various activities and establishing authority and responsibility, there should be a proper organisation structure for startups. Seven statements that describe the organisation structure of startups are formed and they are used to understand the characteristics of the organisation structure of different categories of startups. Resource collection indicates the group of tangible and intangible resources that are required by startups for performing various activities. Resources include tangible resources as well as intangible resources. For the purpose of studying the resource collection of startups, two tangible resources are identified: finance and physical infrastructural resources. The intangible resources of startups examined in the study are: human resources, business knowledge, technological resources and other intangible resources (brand name and logo).

5.2 Different Categories of Startups and Cross-Tabulations

There are various categories of startups that function within the startup ecosystem. Through the monitoring of the startup ecosystem in Kerala, it has been found that the startups functioning in the ecosystem can be classified based on their registration status in DPIIT and KSUM, stages of startup life cycle, nature of business, type of technology, nature of output, status in the incubators, legal status, sector of business, business model and separate office space. The information regarding various categories of startups is explained using frequency and percentage analysis in this section. From the pilot study, the most relevant categories of startups whose business relationships need to be analysed were identified and a cross-tabulation of these categories was done to understand if there is any association between them. The basic information regarding the different categories of startups under study is described in the table below.

Table 5.1

Various Categories of Startups

Classification of Startups	Different Categories and Total	Frequency	Percentage
DPIIT Registration	Yes	189	65.6
	No	99	34.4
	Total	**288**	**100**
KSUM Registration	Yes	143	49.7
	No	145	50.3
	Total	**288**	**100**

Classification of Startups	Different Categories and Total	Frequency	Percentage
Stages of Startup Life Cycle	Ideation	11	3.8
	Validation	41	14.2
	Early traction	141	49.0
	Scale-up	85	29.5
	Maturity	10	3.5
	Total	**288**	**100**
Nature of Business	Technology	243	84.4
	Non-Technology	32	11.1
	Both Technology & Non-Technology	13	4.5
	Total	**288**	**100**
Type of Technology	IT	142	49.3
	Non-IT	76	26.4
	Both IT & non-IT	38	13.2
	None	32	11.1
	Total	**288**	**100**
Nature of Output	Product Oriented	148	51.4
	Service Oriented	38	13.2
	Both Product & Service Oriented	102	35.4
	Total	**288**	**100**
Status in Incubators	Incubatee	234	81.3
	Coworking	54	18.8
	Total	**288**	**100**
Legal Status	Sole Proprietor	16	5.6
	Partnership	24	8.3
	LLP	29	10.1
	Private Limited Company	219	76.0
	Total	**288**	**100**

Classification of Startups	Different Categories and Total	Frequency	Percentage
Sector of Business	Food	11	3.8
	Health/Life science	46	16.0
	Agriculture	24	8.3
	Finance	13	4.5
	Education	24	8.3
	Communication	10	3.5
	Electronics/Robotics	35	12.2
	Advertisement	11	3.8
	Game	5	1.7
	Retail	14	4.9
	IT/Software	44	15.3
	Ecommerce	8	2.8
	Food	11	3.8
	Total	**288**	**100**
Business Model	B2C	115	39.9
	B2B	114	39.6
	B2G	4	1.4
	B2C,B2B	55	19.1
	Total	**288**	**100**
Separate Office Space	Yes	60	20.8
	No	228	79.2
	Total	**288**	**100**

Source: Field Survey

A detailed outlook of startups under the study can be obtained from the above table. Looking into the registration status of startups, it can be found that 65.6% of startups have registered with the Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, and 49.7% of startups have taken registration under KSUM. Startups at different stages of their growth are included in the study. 49% of startups are at the early traction stage, 29.5% of startups are at the scale-up stage and 14.2% of startups are at the validation stage. The majority of startups are technology based (84.4%). 49.3% of startups use IT-based technology in their businesses, whereas 26.4% of startups use non-IT-based technology. 13.2% of startups have both IT & non-IT based technology in their business. It can be found that 51.4% of startups are product-oriented, which means they deal only with products in their business and 13.2% of startups have only services as their output.

81.3% of startups are incubatees at the incubation centre and 18.8% of startups use the incubation centre as a coworking space and are not part of the incubation programme. 76% of startups are registered as private limited companies and 10.1% as limited liability partnerships. There are different sectors where startups can focus their businesses and among the startups in the study, 16% are in the health/life sciences sector and 15.3% in the IT/software sector. 12.25% of startups are in electronics/ robotics and 8.3% are in education as well as in the agriculture sector. Ecommerce and games have the lowest percentage of startups engaged in them (2.8% and 1.7%, respectively).

The business model of the startups is based on who the products and services of the startups are targeted at. 39.9% and 39.6% of startups in the study are engaged in B2C and B2B business models respectively. 19.1% of startups have both B2C & B2B business model, but startups with B2G business model make up only 1.4 percentage. Sometimes the startups that are associated with incubators (as incubatees or as startups using coworking spaces) will also have their own separate office space that they use for working. 20.8% of startups have a separate office space other than the space provided by incubation centres to them. But 79.2% of startups only have the offices provided by the incubation centres.

5.2.1 Cross-Tabulation and Association between Selected Startup Categories

Among the various categories of startups in the ecosystem, there are certain categories whose relationships with others need to be analysed in detail. This is done through the cross-tabulation of selected categories and testing their association with each other using Pearson's Chi-square and Fisher's Exact tests. Categories of startups based on DPIIT registration, KSUM registration, stages of the startup life cycle, nature of business, type of technology, nature of output, status in the incubators and sector of business are selected for cross-tabulation. Association testing is conducted among all the various selected categories of startups, except those based on sectors of business.

Association testing will help to know if there is any dependence between the different categories of startups.

- **Selected Categories of Startups and Registration in Department for Promotion of Industry and Internal Trade**

The Department for Promotion of Industry and Internal Trade (DPIIT) is a national-level agency for startup growth and development. DPIIT registration will give startups the opportunity to avail themselves of the benefits of schemes and policies formulated and implemented by DPIIT. Cross-tabulation of different categories of startups with DPIIT will help us understand the number of startups that have registered and not registered in DPIIT from different categories. Pearson's Chi-square and Fisher's Exact tests are used to determine if there is any association between various categories of startups. The results of cross-tabulation and association testing are given below.

Table 5.2

Selected Categories of Startups and DPIIT Registration

Categories of Startups		DPIIT Registration			Test Statistics	Df	Sig.
		Yes	**No**	**Total**			
KSUM Registration	Yes	143 (75.7%)	0 (0%)	143 (49.7%)	Nil*** (Fisher's Exact Test)	-	<0.01**
	No	46 (24.3%)	99 (100%)	145 (50.3%)			
	Total	**189 (100%)**	**99 (100%)**	**288 (100%)**			
Stages of Startup Life Cycle	Ideation	4 (2.1%)	7 (7.1%)	11 (3.8%)	12.267 (Fisher's Exact Test)	-	.013*
	Validation	20 (10.6%)	21 (21.2%)	41 (14.2%)			
	Early Traction	96 (50.8%)	45 (45.5%)	141 (49%)			
	Scale-up	63 (33.3%)	22 (22.2%)	85 (29.5%)			
	Maturity	6 (3.2%)	4 (4%)	10 (3.5%)			
	Total	**189 (100%)**	**99 (100%)**	**288 (100%)**			

Categories of Startups		DPIIT Registration			Test Statistics	Df	Sig.
		Yes	No	Total			
Nature of Business	Technology	170 (89.9%)	73 (73.7%)	243 (84.4%)	21.819 (Fisher's Exact Test)	-	.003**
	Non-Technology	9 (4.8%)	23 (23.2%)	32 (11.1%)			
	Both technology & non-technology	10 (5.3%)	3 (3%)	13 (4.5%)			
	Total	**189 (100%)**	**99 (100%)**	**288 (100%)**			
Type of Technology	IT	100 (52.9%)	42 (42.4%)	142 (49.3%)	25.729 (Pearson's Chi-square Test)	3	<0.01**
	Non-IT	49 (25.9%)	27 (27.3%)	76 (26.4%)			
	Both IT & non-IT	31 (5.3%)	7 (3%)	38 (4.5%)			
	None	9 (16.4%)	23 (7.1%)	32 (13.2%)			
	Total	**189 (100%)**	**99 (100%)**	**288 (100%)**			
Nature of Output	Product oriented	102 (54%)	46 (46.5%)	148 (51.4%)	40.501 (Pearson's Chi-square Test)	2	<0.01**
	Service oriented	8 (4.2%)	30 (30.3%)	38 (13.2%)			
	Both product & service oriented	79 (41.8%)	23 (23.2%)	102 (35.4%)			
	Total	**189 (100%)**	**99 (100%)**	**288 (100%)**			
Status in Incubators	Incubatee	169 (89.4%)	65 (65.7%)	234 (81.3%)	24.078 (Pearson's Chi-square Test)	1	<0.01**
	Coworking	20 (10.6%)	34 (34.3%)	54 (18.8%)			
	Total	**189 (100%)**	**99 (100%)**	**288 (100%)**			

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance
***Fisher's Exact Test in SPSS does not give test statistics for 2x2 contingency table
Figures in Parentheses indicate Column Percentages

The registration status of the several startup categories in DPIIT is explained in the above table. Out of the 288 startups, 144 have registered with both KSUM and DPIIT. Furthermore, it should be mentioned that while every startup registered in KSUM is also registered in DPIIT, 24.3% of DPIIT registered startups are not registered in KSUM. Compared to KSUM, there are 189 more startups registered in DPIIT. The 99 startups included in the report are not registered with either KSUM or DPIIT. As the P value of Pearson's Chi-Square test is less than .05 (P = <0.01), there is a strong association between startups registering for DPIIT and KSUM.

Startups experience many stages in their life cycle and based on those stages, they might or might not have registered with DPIIT. Most of the DPIIT registered startups (50.8% and 33.3%) are in the scale-up and early traction stages, respectively. 10.6% of DPIIT-registered startups are in the validation stage. There is a notable association between the stage of the startup life cycle and the registration of startups with the Department for Promotion of Industry and Internal Trade, as evidenced by the Fisher's Exact test P value of less than .05 (P = 0.13).

On the basis of the nature of business, startups can be technology based, non-technology based and both technology & non-technology based. Based on the nature of business, most of the startups registered in DPIIT are Technology based (89.9%). Only 4.8% of startups registered in DPIIT are non-technology based; it can be seen that out of 23 non-technology startups, only 9 have registered in DPIIT. Since the P value of Fisher's Exact test is less than .05 (P = .003), there is a significant association between the nature of business conducted by startups and their registration with the Department for Promotion of Industry and Internal Trade.

Startups may use different types of technologies in their businesses. One of the major types of technology used in Kerala by startups is IT based technology. Among the startups registered in DPIIT, 52.9% are IT technology based startups. 25.9% of non-IT technology based startups and 5.3% of startups based on both IT & non-IT technology are registered in DPIIT. 16.4% of registrations in DPIIT are from startups that are not based on any type of technology. Since the P value of the Pearson's Chi-Square test is less than .05 (P = <0.01), there is a significant association between the type of technology used by startups and their registration with the Department for Promotion of Industry and Internal Trade.

The final output of a startup may be a product, service or both. Assistance and support received by product oriented startups may be different from service oriented startups. The above table indicates that startups registered in DPIIT are 54% product oriented and 41.8% both product & service oriented. Only 4.2% of startups registered in DPIIT are service oriented. Since the P value of Pearson's Chi-Square is less than .05 (P = <0.01), there is a significant association between the nature of the output of startups and their registration in the Department for Promotion of Industry and Internal Trade.

Startups connected to incubators can be co-working startups that use the incubator's space for work, or they can be incubatees under the incubator's programme. It is evident from the above table that 10.6% of businesses registered with DPIIT are coworking startups, while 89.4% of startups are incubatees. On the other hand, 34.3% of unregistered startups in DPIIT are coworking startups, while 65.7% of startups are incubatees. There is a notable connection between the incubator status of startups and their DPIIT registration since Pearson's Chi-square P value is less than .05 (P = <0.01).

- **Selected Categories of Startups and Registration in Kerala Startup Mission**

Kerala Startup Mission (KSUM) is the state-level nodal agency for regulating the functioning of the startup ecosystem in Kerala. Startups can register with KSUM, which will give them exposure to different policies and schemes that are formulated at the state level for startup growth. Registration at KSUM is optional but important for availing benefits from the state government. The result of cross-tabulation and association testing of selected categories of startups and their registration status in KSUM using Pearson's Chi-square and Fisher's Exact tests is given in the table below.

Table 5.3

Selected Categories of Startups and KSUM Registration

Categories of Startups		KSUM Registration Yes	No	Total	Test Statistics	df	Sig.
Stages of Startup Life Cycle	Ideation	1 (0.7%)	10 (6.9%)	11 (3.8%)	15.819 (Fisher's Exact Test)	-	.003**
	Validation	13 (9.1%)	28 (19.3%)	41 (14.2%)			
	Early Traction	74 (51.7%)	67 (46.2%)	141 (49%)			
	Scale-up	49 (34.3%)	36 (24.8%)	85 (29.5%)			
	Maturity	6 (4.2%)	4 (2.8%)	10 (3.5%)			
	Total	**143 (100%)**	**145 (100%)**	**288 (100%)**			
Nature of Business	Technology	137 (95.8%)	106 (73.1%)	243 (84.4%)	44.490 (Fisher's Exact Test)	-	<0.01**
	Non-Technology	0 (0%)	32 (22.1%)	32 (11.1%)			
	Both technology & non-technology	6 (4.2%)	7 (4.8%)	13 (4.5%)			
	Total	**143 (100%)**	**145 (100%)**	**288 (100%)**			
Type of Technology	IT	78 (54.5%)	64 (44.1%)	142 (49.3%)	50.505 (Fisher's Exact Test)	-	<0.01**
	Non-IT	37 (25.9%)	39 (26.9%)	76 (26.4%)			
	Both IT & non-IT	28 (19.6%)	10 (6.9%)	38 (13.2%)			
	None	0 (0%)	32 (22.1%)	32 (11.1%)			
	Total	**143 (100%)**	**145 (100%)**	**288 (100%)**			

Categories of Startups		KSUM Registration			Test Statistics	df	Sig.
		Yes	No	Total			
Nature of Output	Product oriented	77 (53.8%)	71 (49%)	148 (51.4%)	57.690 (Fisher's Exact Test)	-	<0.01**
	Service oriented	0 (0%)	38 (26.2%)	38 (13.2%)			
	Both product & service oriented	66 (46.2%)	36 (24.8%)	102 (35.4%)			
	Total	**143 (100%)**	**145 (100%)**	**288 (100%)**			
Status in Incubators	Incubatee	135 (94.4%)	99 (68.3%)	234 (81.3%)	32.327 (Pearson's Chi-square Test)	1	<0.01**
	Coworking	8 (5.6%)	46 (31.7%)	54 (18.8%)			
	Total	**143 (100%)**	**145 (100%)**	**288 (100%)**			

Source: Field Survey
**Significant at 1% level of significance
Figures in Parentheses indicate Column Percentages

At any point in their development, startups are eligible to register with KSUM. Registration with KSUM opens up a world of opportunities for startups at all phases of their life cycle, since it is the nodal agency for startup growth and development in Kerala. The majority of KSUM-registered startups (51.7% and 34.3%, respectively) are in the early traction and scale-up stages. Of all startups registered in KSUM, only 0.7% is in the ideation stage. The stages of the startup life cycle and startup registrations in Kerala Startup Mission are significantly correlated, as evidenced by the P value of the Fisher's Exact test being less than .05 (P = .003).

Cross tabulation between the nature of business and KSUM registration will help us identify the number of startups under the study that are registered and not registered in KSUM, depending on whether they use any technology for their business or not. It is clear from the above table that startups without a technological focus are not registered with KSUM and of those that are; the majority (95.8%) are focused on technology. It should be mentioned that 73.1% of the startups that are not registered with KSUM are also in the technology sector. Given that the Fisher's Exact test P value is less than .05 (P = 0.01), there is a strong association between the nature of business of startups and their Kerala Startup Mission registration.

Startups can use any type of technology in their business. It can be noted from the cross-tabulation that 54.5% of startups registered in KSUM are IT technology based and 25.9% are non-IT technology based. 44.1% of startups that are not registered in KSUM are IT technology based. Startups that don't use any type of technology i.e. non-technology startups, are not registered in KSUM. Since the P value of the Fisher's Exact test is less than .05 (P = <0.01), there is a notable association between the type of technology used by startups and their registration in the Kerala Startup Mission.

A startup may produce a product, a service, or both. 53.8% of startups registered with KSUM are focused on products and 46.2% are focused on both products and services. Of the startups that aren't registered in KSUM, 49% are focused on products. However, not a single service-focused startup has registered with KSUM. The nature of a startups product and its registration with the Kerala Startup Mission are significantly associated, as indicated by the P value of the Fisher's Exact test being less than .05 (P = <0.01).

Startups within the incubation centre can be incubatees or coworking startups. The aforesaid table shows that 94.4% of startups registered in KSUM are incubatees and 5.6% are coworking startups. It can be noticed that among incubatee startups, the majority are registered in KSUM, but among coworking startups, the majority are not registered in KSUM. Since the P value of Pearson's chi-square is less than .05 (P = <0.01) there is a significant association between the status of startups in incubators and their registration under the Kerala Startup Mission.

- **Selected Categories of Startups and Nature of Business**

Technology based, non-technology based and both types of startups can be found in various stages of the startup life cycle; they can be IT based, non-IT based or both; they can also be product or service oriented, or both; they can be incubated or coworking startups. We may evaluate the association between these factors by cross-tabulating the stages of the startup life cycle, the type of technology, the nature of output and the status in the incubators with the nature of business. The following table presents the findings from the cross-tabulation and association testing of selected categories of startups with the nature of business using Fisher's Exact test:

Table 5.4

Selected Categories of Startups and Nature of Business

Categories of Startups		Nature of Business				Test Statistics	df	Sig.
		Technology	**Non-Technology**	**Both**	**Total**			
Stages of Startup Life Cycle	Ideation	8 (3.3%)	3 (9.4%)	0 (0%)	11 (3.8%)	6.240 (Fisher's Exact Test)	-	.538
	Validation	33 (13.6%)	7 (21.9%)	1 (7.7%)	41 (14.2%)			
	Early Traction	119 (49%)	15 (46.9%)	7 (53.8%)	141 (49.0%)			
	Scale-up	74 (30.5%)	6 (18.8%)	5 (38.5%)	85 (29.5%)			
	Maturity	9 (3.7%)	1 (3.1%)	0 (0%)	10 (3.5%)			
	Total	**243 (100%)**	**32 (100%)**	**13 (100%)**	**288 (100%)**			
Type of Technology	IT	138 (56.8%)	0 (0%)	4 (30.8%)	142 (49.3%)	182.001 (Fisher's Exact Test)	-	<0.01**
	Non-IT	73 (30%)	0 (0%)	3 (23.1%)	76 (26.4%)			
	Both IT & non-IT	32 (13.2%)	0 (0%)	6 (46.2%)	38 (13.2%)			
	None	0 (0%)	32 (100%)	0 (0%)	1 (11.1%)			
	Total	**243 (100%)**	**32 (100%)**	**13 (100%)**	**288 (100%)**			
Nature of Output	Product oriented	127 (52.2%)	19 (59.4%)	2 (15.4%)	148 (51.4%)	39.801 (Fisher's Exact Test)	-	<0.01**
	Service oriented	24 (9.8%)	12 (40.6%)	2 (15.4%)	38 (13.2%)			
	Both product & service oriented	92 (38%)	0 (0%)	9 (69.2%)	102 (35.4%)			
	Total	**243 (100%)**	**32 (100%)**	**13 (100%)**	**288 (100%)**			

Categories of Startups		Nature of Business				Test Statistics	df	Sig.
		Technology	Non-Technology	Both	Total			
Status in Incubators	Incubatee	205 (84.4%)	19 (59.4%)	10 (76.9%)	234 (81.3%)	10.498 (Fisher's Exact Test)	-	.004**
	Coworking	38 (15.6%)	13 (40.6%)	3 (23.1%)	54 (18.8%)			
	Total	**243 (100%)**	**32 (100%)**	**13 (100%)**	**288 (100%)**			

Source: Field Survey
**Significant at 1% level of significance
Figures in Parentheses indicate Column Percentages

After cross-tabulation, it can be noticed that 49% of technology startups and 46.9% of non-technology startups are at the early traction stage. 53.8% of startups, which are both technology & non-technology based, are also in the early traction stage. 30.5% of technology based startups, 18.8% of non-technology based startups and 38.5% of both technology & non-technology based startups are at the scale-up stage. Startups at ideation and maturity/IPO stages are competitively low for all three groups of startups. But the P value of Fisher's Exact test is more than .05 (P = .538). Therefore, there is no strong association between stages of the startup life cycle and the nature of business conducted by startups.

The technology used by startups can be IT based or non-IT based or both. 56.8% of technology startups are IT based and 30% are non-IT based. 32 startups are non-technology based which means they don't use any type of technology. 46.2% of both technology & non-technology startups are both IT & non-IT based. Since the P value of the Fisher's Exact test is less than .05 (P = <0.01), there is a notable association between the nature of business conducted by startups and the type of technology used.

Startups that are product oriented may be technology-based, where technological products like electronic equipment are developed, or they may be non-technology-based, where they are engaged in the trading of products without any technology involved. It can be found that 52% and 38% of technology startups are product oriented and both product & service oriented respectively. 59.4% of non-technology startups are product oriented and 40.6% are service oriented. Since the P value of the Fisher's Exact test is less than .05 (P = <0.01), there is a significant association between the nature of business conducted by startups and the nature of output produced by them.

Based on the cross tabulation between nature of business and status in the incubators it can be seen that 84.4% of technology based startups are incubatees and only 15.6% are coworking startups. 59.4% of non-technology startups are incubatees and 40.6% are coworking startups. Startups that are both technology & non-technology based have 76.9% as incubatees and 23.1% as coworking startups. The P value of the Fisher's Exact test is less than .05 (P = .004). There is a notable association between the status of startups in incubators and their nature of business.

- **Selected Categories of Startups and Nature of Output**

Startups that are product oriented or service oriented or those that focus on both, will be at different stages of the startup life cycle. While using technology, it can be IT based or non-IT based or both. An IT based product can be an application and IT based service can be like web designing. Similarly, non-IT based products can be biotechnology related or robotics/electronics related. Service of equipments and instruments are examples of non-IT based services. Also, some startups do not use any type of technology in their business. Startups that are product oriented, service oriented or both found in incubators are either incubatees or coworking startups. A cross tabulation of stages of startups, type of technology and status in the incubators with the nature of the output of startups will help us understand the association between the variables. Details of the cross tabulation and association testing using Pearson's Chi-square and Fisher's Exact Test are given below.

Table 5.5

Selected Categories of Startups and Nature of Output

Categories of Startups		Nature of Output				Test Statistics	df	Sig.
		Product Oriented	Service Oriented	Both	Total			
Stages of Startup Life Cycle	Ideation	6 (4.1%)	4 (10.5%)	1 (1%)	11 (3.8%)	21.322 (Fisher's Exact Test)	-	.004**
	Validation	31 (20.9%)	4 (10.5%)	6 (5.9%)	41 (14.2%)			
	Early Traction	62 (41.9%)	18 (47.4%)	61 (59.8%)	141 (49%)			
	Scale-up	45 (30.4%)	10 (26.3%)	30 (29.4%)	85 (29.5%)			
	Maturity	4 (2.7%)	2 (5.3%)	4 (3.9%)	10 (3.5%0			
	Total	**148 (100%)**	**38 (100%)**	**102 (100%)**	**288 (100%)**			
Type of Technology	IT	53 (35.8%)	23 (60.5%)	66 (64.7%)	142 (49.3%)	71.694 (Fisher's Exact Test)	-	<0.01**
	Non-IT	57 (38.5%)	2 (5.3%)	17 (16.7%)	76 (26.4%)			
	Both IT & non-IT	19 (12.8%)	0 (0%)	19 (18.6%)	38 (13.2%)			
	None	19 (12.8%)	13 (34.2%)	0 (0%)	32 (11.1%)			
	Total	**148 (100%)**	**38 (100%)**	**102 (100%)**	**288 (100%)**			
Status in Incubators	Incubatee	133 (89.9%)	17 (44.7%)	84 (82.4%)	234 (81.3%)	10.498 (Pearson's Chi-square Test)	2	<0.01**
	Coworking	15 (10.1%)	21 (55.3%)	18 (17.6%)	54 (18.8%)			
	Total	**148 (100%)**	**38 (100%)**	**102 (100%)**	**288 (100%)**			

Source: Field Survey
**Significant at 1% level of significance
Figures in Parentheses indicate Column Percentages

The cross-tabulation of startups at various stages of their life cycle with their nature of output indicates that 41.9% of product oriented startups, 47.4% of service oriented startups and 59.8% of both product & service oriented startups are at the early traction stage. After the early traction stage, most of the product oriented startups (30.4%), service oriented startups (26.3%) and both product & service oriented startups (29.4%) are in the scale-up stage. Since the P value of the Fisher's Exact test is less than .05, there is an association between the stage of the startup life cycle and the nature of business conducted by startups.

Based on the type of technology and nature of the output of the startups, it can be found that 38.5% and 35.8% of product oriented startups use non-IT and IT technology, respectively. 60.5% of service oriented startups and 64.7% of both product & service oriented startups use IT technology. None of the service oriented startups use both IT and non-technology. The P value of the Fisher's exact test is less than .05 ($P = <0.01$). Therefore, there is an association between the nature of the output produced by startups and the type of technology used by them.

While analysing the nature of output and status in the incubators for startups, it can be understood that 89.9% of product oriented startups are incubatees and only 10.1% are coworking in incubators. Whereas 55.3% of service oriented startups are coworking startups and 44.7% are incubatees, 82.4% of startups that are both product & service oriented are also incubatees. Since the P value of Pearson's Chi-Square Test is less than .05 ($P = <0.01$), there is a significant association between the status of startups in incubators and the nature of the output produced by them.

- **Status of Startups in Incubator and Type of Technology**

Startups at an incubation centre that employ various technologies or that don't use any technology at all can be classified as coworking startups or incubatees. Based on their technology and incubator status, a cross-tabulation of different startup categories is conducted. Testing is also done to see if the two variables are associated. The following table provides information on association testing and cross tabulation using Fisher's Exact test:

Table 5.6

Status in Incubators and Type of Technology

Status in Incubators	Type of Technology				
	IT	Non-IT	Both IT & non-IT	None	Total
Incubatee	111 (78.2%)	72 (94.7%)	32 (84.2%)	19 (59.4%)	234 (81.3%)
Coworking	31 (21.8%)	4 (5.3%)	6 (15.8%)	13 (40.6%)	54 (18.8%)
Total	**142 (100%)**	**76 (100%)**	**38 (100%)**	**32 (100%)**	**288 (100%)**
Fisher's Exact Z Value =20.623, P value = <0.01**					

Source: Field Survey
**Significant at 1% level of significance
Figures in Parentheses indicate Column Percentages

It can be understood from the above cross-tabulation that 78.2% of IT technology based startups, 94.7% of non-IT technology based startups and 32% of both IT & non-IT technology based startups are incubatees. 59.4% of startups that do not use any type of technology are also incubated. Only 21.8% of IT technology based startups, 5.3% of non-IT technology based startups and 15.8% of both IT & non-IT technology based startups are coworking in incubators. Since the P value of the Fisher's exact test is less than .05 (P = <0.01), there is a notable association between the status of startups in incubators and the type of technology used by them.

- **Sector of Business and Nature of Business**

We can determine how many startups under the study that belong to different sectors are technology based, non-technology based or both technology & non-technology based by looking at the cross-tabulation of the business sector and the nature of business of startups.

Table 5.7

Sector of Business and Nature of Business

Sectors of Business	Nature of Business			
	Technology	Non-Technology	Both Technology & Non-Technology	Total
Food	7 (2.9%)	2 (6.5%)	2 15.4%	11 3.8%
Health/Life science	44 (18%)	1 (3.2%)	1 (7.7%)	46 (16%)
Agriculture	18 (7.4%)	3 (9.7%)	3 (23.1%)	24 (8.3%)
Finance	12 (4.9%)	1 (3.2%)	0 (0%)	13 (4.5%)
Education	19 (7.8%)	5 (16.1%)	0 (0%)	24 (8.3%)
Communication	10 (4.1%)	0 (0%)	0 (0%)	10 (3.5%)
Electronics/Robotics	34 (13.9%)	1 (3.2%)	0 (0%)	35 (12.2%)
Advertisement	11 (4.5%)	0 (0%)	0 (0%)	11 (3.8%)
Game	5 (2%)	0 (0%)	0 (0%)	5 (1.7%)
Retail	3 (1.2%)	10 (32.3%)	1 (7.7%)	14 (4.9%)
Software	44 (18%)	0 (0%)	0 (0%)	44 (15.3%)
Ecommerce	7 (2.9%)	0 (0%)	1 (7.7%)	8 (2.8%)
Others	30 (12.3%)	8 (25.8%)	5 (38.5%)	43 (14.9%)
Total	**244** **(100%)**	**31** **(100%)**	**13** **(100%)**	**288** **(100%)**

Source: Field Survey
Figures in Parentheses indicate Column Percentages

From the cross-tabulation, it can be understood that among the technology based startups, 18% belong to the health/life sciences and software sectors, respectively. 32.3% and 25.8% of non-technology startups are from retail and other business sectors. 38.5% and 15.4% of both technology & non-technology startups belong to other business sectors and the food sector, respectively. Apart from retail, most of the startups in every other sector are technology based.

- **Sector of Business and Type of Technology**

We can identify the various startup sectors that employ IT, non- IT, Both IT & non-IT and no technologies at all by cross-tabulating the sectors of business and different types of technologies.

Table 5.8

Sector of Business and Type of Technology

Sectors of Business	Type of Technology				
	IT	Non-IT	Both IT & non-IT	None	Total
Food	4 (2.8%)	5 (6.6%)	0 (0%)	2 (6.3%)	11 (3.8%)
Health/Life science	11 (7.7%)	29 (38.2%)	5 (13.2%)	1 (3.1%)	46 (16%)
Agriculture	5 (3.5%)	11 (14.5%)	5 (13.2%)	3 (9.4%)	24 (8.3%)
Finance	11 (7.7%)	1 (1.3%)	0 (0%)	1 (3.1%)	13 (4.5%)
Education	17 (12%)	1 (1.3%)	1 (2.6%)	5 (15.6%)	24 (8.3%)
Communication	10 (7%)	0 (0%)	0 (0%)	0 (0%)	10 (3.5%)
Electronics/Robotics	2 (1.4%)	18 (23.7%)	14 (36.8%)	1 (3.1%)	35 (12.2%)
Advertisement	10 (7%)	0 (0%)	1 (2.6%)	0 (0%)	11 (3.8%)

Sectors of Business	Type of Technology				
	IT	Non-IT	Both IT & non-IT	None	Total
Game	4 (2.8%)	1 (1.3%)	0 (0%)	0 (0%)	5 (1.7%)
Retail	3 (2.1%)	1 (1.3%)	0 (0%)	10 (31.3%)	14 (4.9%)
Software	43 (30.3%)	0 (0%)	0 (0%)	1 (3.1%)	44 (15.3%)
Ecommerce	5 (3.5%)	0 (0%)	3 (7.9%)	0 (0%)	8 (2.8%)
Others	17 (12%)	9 (11.8%)	9 (23.7%)	8 (25%)	43 (14.9%)
Total	**142 (100%)**	**76 (100%)**	**38 (100%)**	**32 (100%)**	**288 (100.0%)**

Source: Field Survey
Figures in Parentheses indicate Column Percentages

A cross-tabulation across startup sectors and technology types reveals that 30.3% of technology based companies are in the software sector. 12% of technology based startups come from the education sector and other business sectors, respectively. The health/life sciences sector accounts for 38.2% of non-IT technology based startups, while the electronics/robotics sector accounts for 23.7%. According to the cross-tabulation, 14.5% of non-IT startups come from the agriculture sector. 36.8% and 23.7% of startups which are Both IT & non-IT technology based belongs to electronics/robotics and other business sectors. Sectors like communication, advertisement, IT/software and e-commerce have only IT technology based startups in the study. 31.3% and 15.6% of startups that do not have any technology as a part of their business belong to the retail and education sectors.

- **Sector of Business and Nature of Output**

The output of startups is products, services or both. The output of startups can be based on their sector of business. We can better understand the type of output created by startups that fall into various sector by examining the cross-tabulation of the business sectors and the nature of output.

Table 5.9

Sector of Business and Nature of Output

Sectors of Business	Nature of Output			
	Product Oriented	**Service Oriented**	**Both product & service oriented**	**Total**
Food	6 (4.1%)	1 (2.6%)	4 (3.9%)	11 (3.8%)
Health/Life science	26 (17.6%)	2 (5.3%)	18 (17.6%)	46 (16%)
Agriculture	16 (10.8%)	1 (2.6%)	7 (6.9%)	24 (8.3%)
Finance	7 (4.7%)	1 (2.6%)	5 (4.9%)	13 (4.5%)
Education	10 (6.8%)	5 (13.2%)	9 (8.8%)	24 (8.3%)
Communication	3 (2%)	1 (2.6%)	6 (5.9%)	10 (3.5%)
Electronics/Robotics	24 (16.2%)	0 (0%)	11 (10.8%)	35 (12.2%)
Advertisement	3 (2%)	3 (7.9%)	5 (4.9%)	11 (3.8%)
Game	4 (2.7%)	0 (0%)	1 (1%)	5 (1.7%)
Retail	9 (6.1%)	2 (5.3%)	3 (2.9%)	14 (4.9%)
Software	13 (8.8%)	15 (39.5%)	16 (15.7%)	44 (15.3%)
Ecommerce	2 (1.4%)	0 (0%)	6 (5.9%)	8 (2.8%)
Others	25 (16.9%)	7 (18.4%)	11 (10.8%)	43 (14.9%)
Total	**148 (100%)**	**38 (100%)**	**102 (100%)**	**288 (100%)**

Source: Field Survey
Figures in Parentheses indicate Column Percentages

After considering the sector of businesses represented by startups and the nature of their output, it can be found that 17.6% and 16.2% of product oriented startups are from the health/life science sector and the electronic/robotics sector, respectively. 39.5% of service oriented startups are from the software sector and 17.6% of both product & service oriented startups belong to the health/life sciences sector. We can see that the majority of startups in most of the different business sectors are product oriented.

5.3 Activity Structure, Organisation Structure and Resource Collection of Startups

The previous section of the chapter discussed the different categories of startups in the ecosystem of Kerala and their associations with each other. This section focuses on startups as individual actors and the components that describe an actor according to the Actor-Resources-Activity (ARA) model (Hakansson & Snehota, 1995). As per the ARA model, activity structure, organisation structure and resource collection are associated with individual actors. Activity structure means the technical, commercial, administrative and other activities performed by the business. Organisation structure indicates the nature of power hierarchy, channel of communication, as well as assigning authority and responsibility that will support the performance of activities and achieve the objectives of business. Resource collection refers to the various tangible and intangible resources that have value and are useful to the business. Businesses need resources for performing various activities and these resources are arranged by startups through different means. Resources arranged by startups together form their resource collection.

Figure 5.1

Functions of Individual Actors

Activity structure, organisation structure and resource collection describe an individual actor; that's why they are called functions of an individual actor (Hakansson & Snehota, 1995). Startups perform different activities, from ideation to IPO, during the course of their business. They have an organisation structure, which can be formal or informal, structured or unstructured, depending on the culture maintained in the startups. The performance of activities leads to the need for various resources. Therefore, startups have to arrange for resources to perform different activities.

5.3.1 Activity Structure

The activity structure includes the different sets of activities performed by the startups. These activities need to be grouped and studied with respect to various categories of startups, since there can be notable differences between the activity structures of different startup categories. The analysis of activity structure includes exploratory factor analysis of activity structure for grouping the activities as well as the Kruskal-Wallis H test and Mann-Whitney U test for testing whether there is a significant difference in the activity structure of various categories of startups.

❖ **Exploratory Factor Analysis - Activity Structure**

Twenty-three activities performed by startups have been identified through communication with startups and incubators for developing the activity structure of startups. Exploratory factor analysis is done for the dimension reduction and grouping of these activities. The Kaiser-Meyer-Olkin test is conducted to measure the suitability of data for factor analysis and Bartlett's test is used to test the null hypothesis that data in the correlation matrix are uncorrelated.

Table 5.10

KMO and Bartlett's Test – Activity Structure

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.812
Bartlett's Test of Sphericity	Approx. Chi-Square	1381.986
	DF	253
	Sig.	<0.01

Source: Field Survey

The result of KMO and Bartlett's test is given in the above table and it shows that the value of Kaiser-Meyer-Olkin measure of sampling adequacy is .812. KMO value between .80 and .89 is considered meritorious. Therefore, the sampling data is adequate for factor analysis. The P value of Bartlett's Test of Sphericity ($P = <0.01$) indicates statistical significance in the correlation between sample data. The results of statistical assumption tests indicate that sample data is suitable for factor analysis; therefore, principal component analysis is conducted.

Table 5.11

Total Variance Explained – Activity Structure

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.721	33.571	33.571	7.721	33.571	33.571
2	2.131	9.265	42.837	2.131	9.265	42.837
3	1.887	8.203	51.040	1.887	8.203	51.040
4	1.559	6.777	57.817	1.559	6.777	57.817
5	1.300	5.653	63.470	1.300	5.653	63.470
6	1.037	4.508	67.977	1.037	4.508	67.977
Extraction Method: Principal Component Analysis						

Source: Field Survey

Principal component analysis yielded six components with Eigenvalues greater than 1, which collectively account for 67.977% of the extracted variance. This is deemed as a good result for factorisation. Consequently, six factors are found for the summarisation and categorisation of the activities carried out by startups based on the findings of the exploratory factor analysis. The table below lists the factors and factor loadings:

Table 5.12

Factors and Factor Loadings – Activity Structure

Factors	Activities	Factor Loadings
Factor-1 (Market Research & Business Formation Activities)	Conducting a market survey	.789
	Conducting a feasibility study	.771
	Developing a business idea	.750
	Arranging seed capital to start a business	.722
	Formally registering a startup	.659
Factor-2 (Revenue Generation & Performance Evaluation Activities)	Customer generation and care	.880
	Sales and revenue generation	.874
	Marketing of the product	.849
	Evaluating the performance of startups	.817
Factor-3 (Planning & Team Building Activities)	Preparing a business plan	.747
	Hiring and training employees	.731
	Devoting full time to business development	.723
	Organising a startup team	.722
Factor-4 (Product Modeling & Networking Activities)	Arranging mentoring support	.758
	Arranging the technical assistance needed for business	.736
	Attending workshops and seminars	.666
	Research and modeling of a prototype or sample	.522
Factor-5 (Funding & IP Registration Activities)	Approaching financial institutions for credit	.727
	Meeting investors and pitching for funds	.703
	Applying for intellectual properties like patents, trademarks etc.	.692
Factor-6 (Physical Resource & Expertise Seeking Activities)	Purchasing stock or raw materials & arranging machinery/equipment	.723
	Arranging assistance of professionals like accountants, lawyers etc.	.499
	Arranging office infrastructure facilities	.439

Source: Field Survey

❖ Analysis of Activity Structure

Based on the performance of various activities, the factor analysis has divided the startup activity structure into six groups. These groupings include planning & team-building activities, market research & business formation activities, revenue generation & performance evaluation activities, product modeling & networking activities, funding & intellectual property registration activities and physical resource & expertise seeking activities. Using a five-point Likert scale, startups were asked if they agreed with the execution of 23 activities that had been identified through the pilot study. It is not required that every activity be performed by a particular category of startup. There may be notable differences in the activities carried out by startups depending on their nature of business, nature of product, or other elements. The hypothesis for testing the performance of different groups of activities in the activity structure by various categories of startups is as follows:

H_0: There is no significant difference in the activity structure of various categories of startups.

The hypothesis is tested based on DPIIT registration, KSUM registration stages of the startup life cycle, nature of business, type of technology, nature of output and status in the incubators of startups. To determine whether there is any valid difference in the activity structure of various startup categories, different groups of activities must be tested. The following tests and their outcomes are as follows:

- **Factor 1 - Market Research & Business Formation Activities**

Market research and business formation activities include five activities such as conducting a market survey, conducting a feasibility study, developing a business idea, arranging seed capital to start a business and formally registering a startup. These are activities performed by startups at the initial stage of business formation. Every startup goes through at least three of the activities mentioned in this group. Every startup is formed from an idea and in order to check if the idea is practical, a feasibility study is conducted. To understand the target market and competition, a market survey is done. The capital needed to establish the business is arranged by every startup, mostly through bootstrapping. Finally, to establish the startup as an organisation, it has to be registered either as a partnership, an LLP, or a private limited company. To find out if the distribution of market research and business formation activities differs among the various startup categories, the Kruskal-Wallis test and Mann-Whitney U test is carried out. The result of the test is given below.

Table 5.13

Market Research & Business Formation Activities – Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.60	84.73	20.429	<0.01**
	Validation	41	4.00	103.43		
	Early Traction	141	4.20	150.26		
	Scale-up	85	4.40	159.41		
	Maturity	10	4.50	170.75		
Nature of Business	Technology	244	4.20	148.55	9.596	.008**
	Non-Technology	31	4.00	102.76		
	Both technology & non-technology	13	4.60	168.12		
Type of Technology	IT	142	4.20	144.76	10.700	.013*
	Non-IT	76	4.40	155.45		
	Both IT & non-IT	38	4.40	157.30		
	None	32	4.00	102.14		
Nature of Output	Product oriented	148	4.20	148.70	7.582	.023*
	Service oriented	38	4.00	110.30		
	Both product & service oriented	102	4.20	151.15		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

According to the above table, research & business formation activities are performed by most categories of startups. Based on stages of startup (P = <0.01), nature of business (P = .008), type of technology (P = .013) and nature of output (P = .023) there is a significant difference in the performance of market research & business formation activities among the various categories of startups, according to the Kruskal-Wallis H test. This is because the P values of these groups are less than .05. Pairwise comparison is conducted for groups with P value less than .05 and pairs with notable differences in each group are displayed in the table below.

Table 5.14

Pairwise Comparison - Market Research & Business Formation Activities

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Scale-up	-74.679	.047
	Validation and Early traction	-46.832	.014
	Validation and Scale-up	-55.979	.004
Nature of Business	Non-technology and Technology	45.787	.011
	Non-technology and Both technology & non-technology	- 65.357	.049
Type of Technology	None and IT	-42.620	.050
	None and Non-IT	-53.307	.013
	None and Both IT & non-IT	-55.162	.032
Nature of Output	Service oriented and Product oriented	38.397	.031
	Service oriented and Both product & service oriented	-40.844	.027

Source: Field Survey

From the pairwise comparison, it can be found that with regard to market research & business formation activities, there is a significant difference in the activity structure of startups at the early and later stages of their life cycle. Similarly, the activity structure of non-technology startups and service oriented startups is also significantly different from other categories of startups in their respective groups regarding the performance of market research & business formation activities.

Based on the DPIIT registration, KSUM registration and status in the incubators, the Mann-Whitney U test is used to analyse whether the distribution of activities in market research & business formation differs among the different categories of startups.

Table 5.15

Market Research & Business Formation Activities – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.20	150.92	8141.500	.068
	No	99	4.20	132.24		
KSUM Registration	Yes	143	4.20	154.71	8908.000	.057
	No	145	4.20	139.43		
Status in Incubators	Incubatee	234	4.20	147.91	5520.000	.144
	Coworking	54	4.20	129.72		

Source: Field Survey

In the performance of market research & business formation activities, there is no significant difference between the different categories of startups based on their DPIIT registration (P = .068), KSUM registration (P = .057) and status in incubators (P = .144), according to the Mann-Whitney U test, because the P values are greater than .05. Therefore, the inference is that the activity structure of startups with regard to the performance of market research & business formation activities, based on the registration status in DPIIT and KSUM as well as the status of startups in the incubators, is similar.

- **Factor 2 - Revenue Generation & Performance Evaluation Activities**

Revenue generation & performance evaluation activities include activities such as customer generation and care, sales and revenue generation, marketing of products and evaluating the performance of startups. Once the product is ready, it needs to be taken to the target customer. Marketing the product leads to customer as well as revenue generation. Based on how the startups have performed in terms of generating customers and revenue, their performance has to be evaluated. The performance of these activities may be different among various categories of startups. The Kruskal-Wallis H test and Mann-Whitney U test is used to assess whether there are differences in the distribution of activities linked to revenue generating and performance evaluation across the various startup categories.

Table 5.16

Revenue Generation & Performance Evaluation Activities - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	47.32	51.658	<0.01**
	Validation	41	2.00	90.12		
	Early Traction	141	4.00	144.28		
	Scale-up	85	4.75	181.02		
	Maturity	10	4.62	167.05		
Nature of Business	Technology	244	4.00	140.55	3.871	.144
	Non-Technology	31	4.25	163.61		
	Both technology & non-technology	13	4.50	173.08		
Type of Technology	IT	142	4.00	136.91	6.419	.093
	Non-IT	76	4.00	139.02		
	Both IT & non-IT	38	4.62	167.89		
	None	32	4.25	163.41		
Nature of Output	Product oriented	148	4.00	138.99	3.687	.158
	Service oriented	38	4.00	133.20		
	Both product & service oriented	102	4.25	156.70		

Source: Field Survey
**Significant at 1% level of significance

Activities included in revenue generation & performance evaluation are performed by most categories of startups except those at the ideation and validation stages. Given that the P value is less than .05., the Kruskal-Wallis H test indicates that there is a significant difference in the performance of revenue generation & performance evaluation activities among the different categories of startups based on stages of startups (P = <0.01). Because their P values are greater than .05, there is no discernible difference in the performance of revenue generation & performance evaluation activities among the various categories of startups based on the nature of business (P = .144), type of technology (P = .093) and nature of output (P = .158). Therefore, only based on the stages of the life cycle is there a significant difference in the activity structure of startups with regard to revenue generation & performance evaluation activities and a pairwise comparison of startups at various stages of their life cycle is carried out. The table below displays the pairs with valid differences.

Table 5.17

Pairwise Comparison - Revenue Generation & Performance Evaluation Activities

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Early traction	-96.958	.001
	Ideation and Scale-up	-133.705	<0.01
	Ideation and Maturity	-119.732	.008
	Validation and Early Traction	-54.155	.002
	Validation and Scale-up	-90.902	<0.01
	Early traction and Maturity	-36.747	.010

Source: Field Survey

Pairwise comparison indicates that there is a significant difference in the performance of revenue generation & performance evaluation activities between startups at the early and later stages.

The table below displays the Mann-Whitney U test results:

Table 5.18

Revenue Generation & Performance Evaluation Activities – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.00	149.89	8337.500	.121
	No	99	4.00	134.22		
KSUM Registration	Yes	143	4.00	155.43	8804.000	.104
	No	145	4.00	133.72		
Status in Incubators	Incubatee	234	4.00	149.00	5264.000	.051
	Coworking	54	4.00	124.98		

Source: Field Survey

It is noteworthy that replies across different startup categories have a median value of 4 or above, indicating that revenue generation & performance evaluation activities are performed by the above mentioned startup categories. Mann-Whitney U test indicates that there is no significant difference in the activity structure of various startup categories based on their DPIIT registration (P = .121), KSUM registration (P = .104) and incubator status (P = .051) with regard to their performance of revenue generation & performance evaluation activities.

- **Factor 3 - Planning & Team Building Activities**

Activities such as preparing a business plan, hiring and training employees, devoting full time to business development and organising a startup team are the activities involved in planning and team building activities. Building a startup business involves preparing a plan and devoting time to developing the plan into a reality. To build a business, first you need to build a team that is talented and will work towards the achievement of common goals. A team is needed for all the startups, but there may be differences in the performance of various categories of startups. The Kruskal-Wallis H test and Mann-Whitney U test are used to analyse if the distribution of planning & team building activities differs between the different startup categories.

Table 5.19

Planning & Team Building Activities – Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.75	58.86	32.454	<0.01**
	Validation	41	4.00	106.05		
	Early Traction	141	4.25	143.28		
	Scale-up	85	4.25	172.61		
	Maturity	10	4.50	174.60		
Nature of Business	Technology	244	4.25	148.18	3.998	.135
	Non-Technology	31	4.00	131.10		
	Both technology & non-technology	13	4.00	107.35		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Type of Technology	IT	142	4.25	144.29	2.192	.534
	Non-IT	76	4.25	143.99		
	Both IT & non-IT	38	4.25	158.74		
	None	32	4.00	129.73		
Nature of Output	Product oriented	148	4.25	150.70	4.626	.099
	Service oriented	38	4.00	118.70		
	Both product & service oriented	102	4.25	145.11		

Source: Field Survey
**Significant at 1% level of significance

Planning and team building activities are performed by most of the startup categories, but since the P values are less than .05, the Kruskal-Wallis H test shows that there is a significant difference in the performance of planning & team building activities among the different categories of startups based on stages of the startup life cycle (P = 0.01). Since their P values are greater than .05, there is no discernible difference in the performance planning & team building activities between the various startup categories based on the nature of business (P = .135), type of technology (P = .534) and nature of output (P = .099). Hence, there is a significant difference in the activity structure of startups based on their stages of life cycle regarding the performance of planning & team building activities. A pairwise comparison is conducted for startups at different stages of their life cycle. The pairs with significant differences are displayed in the table below.

Table 5.20

Pairwise Comparison - Planning & Team Building Activities

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Early traction	-84.417	.010
	Ideation and Scale-up	-113.748	<0.01
	Ideation and Maturity	-115.736	.012
	Validation and Scale-up	-66.563	<0.01

Source: Field Survey

It can be understood from the above table that there is a significant difference in the activity structure of startups in the early and later stages based on their performance of planning & team building activities.

The table below shows the Mann-Whitney U test results:

Table 5.21

Planning & Team Building Activities – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.25	151.89	7958.000	.034*
	No	99	4.00	130.38		
KSUM Registration	Yes	143	4.25	158.78	8325.500	.003**
	No	145	4.00	130.42		
Status in Incubators	Incubatee	234	4.25	148.19	5454.500	.111
	Coworking	54	4.00	128.51		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

It can be observed that for every category, the median value for responses is 4 or above. When it comes to the execution of planning & team building activities, the Mann-Whitney U test shows that there are notable differences in the activity structure of the startup categories based on DPIIT registration (P = .034) and KSUM registration (P = .003). Since the P value is greater than .05, there is no discernible difference between the various startup categories according to their status in incubators (P = .111) in terms of the performance of planning & team building activities.

- **Factor 4 - Product Modeling & Networking Activities**

Research and modeling of prototype/sample, arranging mentoring support, arranging technical assistance needed for business and attending workshops and seminars are the activities included in product modeling & networking activities. Prototypes or samples prepared by startups before commercialisation of a product. Modeling a prototype will require the assistance of technical experts. Experts in the areas of business and administration can act as mentors for startups. Especially startups that are weak in managerial aspects will definitely need the assistance of mentors. Attending workshops and seminars is one way to develop business knowledge and also meet with business experts who can be potential mentors. To determine whether the distribution of product modeling & networking activities varies between startup categories, Kruskal-Wallis H and Mann-Whitney U tests are applied.

Table 5.22

Product Modeling & Networking Activities - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	4.25	155.14	13.142	.011*
	Validation	41	4.00	112.50		
	Early Traction	141	4.00	139.06		
	Scale-up	85	4.25	166.07		
	Maturity	10	4.25	157.35		
Nature of Business	Technology	244	4.25	155.87	32.644	<0.01**
	Non-Technology	31	3.50	70.05		
	Both technology & non-technology	13	4.00	108.65		
Type of Technology	IT	142	4.25	145.48	34.424	<0.01**
	Non-IT	76	4.25	159.20		
	Both IT & non-IT	38	4.25	174.75		
	None	32	3.50	69.34		
Nature of Output	Product oriented	148	4.25	150.36	38.764	<0.01**
	Service oriented	38	3.50	68.95		
	Both product & service oriented	102	4.25	164.14		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

Product modeling & networking activities are performed by most categories of startups. Kruskal-Wallis H test results show that, when it comes to the performance of product modeling & networking activities, there are significant differences among the different categories of startups based on stages of the startup life cycle (P = .011), nature of business (P = <0.01) type of technology (P = <0.01)and nature of output (P = <0.01). Therefore, it can be understood that there is a significant difference in the activity structure of startup categories with regard to their performance of product modeling & networking activities. For each group of startups with a P value less than .05, a pairwise comparison is conducted. The pairs with notable differences in each group are displayed in the table below.

Table 5.23

Pairwise Comparison – Product Modeling & Networking Activities

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Validation and Scale-up	-53.571	.006
Nature of Business	Technology and Non-technology	85.820	<0.01
Type of Technology	None and IT	-76.132	<0.01
	None and Non-IT	-89.854	<0.01
	None and Both IT & non-IT and	-105.406	<0.01
Nature of Output	Service oriented and Product oriented	81.417	<0.01
	Service oriented and Both product & service oriented	-95.190	<0.01

Source: Field Survey

The pairwise comparison indicates that the activity structure of startups that do not use any type of technology and service oriented startups is significantly different from other startup categories in their group.

The Mann-Whitney U test results are given in the table below.

Table 5.24

Product Modeling & Networking Activities – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.25	157.82	6838.500	<0.01**
	No	99	4.00	119.08		
KSUM Registration	Yes	143	4.25	163.36	7671.000	<0.01**
	No	145	4.00	125.90		
Status in Incubators	Incubatee	234	4.25	154.37	4007.500	<0.01**
	Coworking	54	3.87	101.71		

Source: Field Survey
**Significant at 1% level of significance

From the above table it can be understood that product modeling & networking activities are performed by most of the above mentioned startup categories. But as the P values of these groups are less than .05, the Mann-Whitney U test indicates that there are significant differences in the activity structure of different categories of startups based on their DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P = <0.01) with regard to the performance of product modeling & networking activities.

- **Factor 5 - Funding & IP Registration Activities**

Approaching financial institutions for credit, meeting investors and pitching for funds and applying for intellectual properties like patents, trademarks, etc. are the activities included in fund & IP registration activities. Funding is essential for any startup from the initial stage itself. Meeting investors and pitching for funds is a common method used by startups to raise funding. Securing credit through financial institutions is tedious and procedurally difficult, but still, that is also a way to arrange finance for startups. Patents and trademarks are the common intellectual properties that startups get registered with. The Kruskal-Wallis H and Mann-Whitney U test are used to assess whether startup categories differ in how funding & IP registration activities are performed.

Table 5.25

Funding & IP Registration Activities - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	52.41	54.072	<0.01**
	Validation	41	2.00	88.98		
	Early Traction	141	3.33	143.51		
	Scale-up	85	4.00	186.26		
	Maturity	10	3.33	132.45		
Nature of Business	Technology	244	3.33	150.20	8.413	.015*
	Non-Technology	31	2.67	105.61		
	Both technology & non-technology	13	3.00	130.15		
Type of Technology	IT	142	3.00	116.35	57.746	<0.01**
	Non-IT	76	4.00	189.59		
	Both IT & non-IT	38	4.00	191.12		
	None	32	2.67	106.97		
Nature of Output	Product oriented	148	3.33	154.03	19.332	<0.01**
	Service oriented	38	2.67	89.67		
	Both product & service oriented	102	3.33	151.10		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

The results show that, with the exception of startups in the ideation stage, validation stage, non-technology startups and service oriented startups, funding & IP registration activities are performed by the other categories of startups. With regard to the performance of funding & IP registration activities, it is clear from the Kruskal-Wallis H test that there are significant differences among the startup categories in terms of stages of the startup life cycle (P = <0.01), nature of business (P = .015), type of technology (P = <0.01) and nature of output (P = <0.01). So it can be inferred that the activity structure of different categories of startups is significantly different with regard to their performance in terms of funding & IP registration activities. A pairwise comparison is conducted for each group of startups with a P value less than .05. The pairs that show a valid difference for each group are displayed in the table below.

Table 5.26

Pairwise Comparison - Funding & IP Registration Activities

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Early traction	-91.098	.004
	Ideation and Scale-up	-133.856	<0.01
	Validation and Early traction	-54.531	.002
	Validation and Scale-up	-97.289	<0.01
	Early traction and Scale-up	-42.758	.002
Nature of Business	Technology and Non-technology	44.592	.014
Type of Technology	IT and Non-IT	-73.233	<0.01
	IT and Both IT & non-IT	-74.766	<0.01
	None and IT	-82.617	<0.01
	None and Both IT & non-IT	-84.150	<0.01
Nature of Output	Service oriented and Product oriented	65.359	<0.01
	Service oriented and Both product & service oriented	-61.427	<0.01

Source: Field Survey

With regard to the performance of funding & IP registration activities, there is a significant difference in the activity structure of startups in the early and later stages. The activity structure of non-technology startups is also significantly different from that of technology and both technology & non-technology startups. Service oriented startups also have notably different activity structure from product oriented and both product & service oriented startups.

The table below shows the Mann-Whitney U test results:

Table 5.27

Funding & IP Registration Activities – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.33	157.32	6933.000	<0.01**
	No	99	3.00	120.03		
KSUM Registration	Yes	143	3.33	162.95	7729.500	<0.01**
	No	145	3.00	126.31		
Status in Incubators	Incubatee	234	3.33	153.62	4184.000	<0.01**
	Coworking	54	3.00	104.98		

Source: Field Survey
**Significant at 1% level of significance

The results of Mann-Whitney U test show that there are significant differences in the performance of funding & IP registration activities between the startup categories based on DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P = <0.01), as indicated by the P values of these groups being less than .05. It is thus understood that the activity structure of a startup registered in DPIIT, KSUM and that of an incubatee startup is significantly different from startups that are not registered in DPIIT, KSUM and coworking startups, respectively, with regard to their performance of funding & IP registration activities.

- **Factor 6 - Physical Resource & Expertise Seeking Activities**

Activities involved in physical resource & expertise seeking activities include arranging office infrastructure facilities, purchasing raw materials and arranging machinery or equipment and arranging the assistance of professionals like accountants, lawyers etc. Office infrastructure facilities are the basic physical resources needed for startups. In the case of an incubatee startup, this is provided by the incubators. Raw materials and equipment that are needed for the manufacturing of products may be arranged by the startups themselves. Professionals like accountants and lawyers are needed by startups in the course of their business for taxation, legal advice, etc. Therefore, the services of such experts are also needed by startups. Kruskal-Wallis H and Mann-Whitney U tests are performed to determine whether the distribution of activities in the physical resource & expertise seeking differs throughout various startup categories.

Table 5.28

Physical Resource & Expertise Seeking Activities - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.33	124.45		
	Validation	41	3.33	108.67		
	Early Traction	141	3.67	144.60	13.148	.011[*]
	Scale-up	85	3.67	163.93		
	Maturity	10	3.67	146.90		
Nature of Business	Technology	244	3.33	143.40		
	Non-Technology	31	3.67	153.63	.427	.808
	Both technology & non-technology	13	3.67	143.42		
Type of Technology	IT	142	3.33	94.68		
	Non-IT	76	4.00	206.12		
	Both IT & non-IT	38	4.00	203.66	114.194	<0.01[**]
	None	32	3.67	149.00		
Nature of Output	Product oriented	148	4.00	166.57		
	Service oriented	38	3.00	83.80	32.591	<0.01[**]
	Both product & service oriented	102	3.33	135.09		

Source: Field Survey
[*]Significant at 5% level of significance, [**]Significant at 1% level of significance

The results of the Kruskal-Wallis H Test show that there is a significant difference in the activity structure of various categories of startups in terms of the stages of their life cycle (P = .011), type of technology used (P = <0.01) and nature of the output (P

= <0.01) with regard to the performance of physical resource & expertise seeking activities. However, there is no significant difference in the activity structure of the different categories of startups based on the nature of their business (P = .808) since the P value is greater than .05. For each group of startups with a P value less than .05, a pairwise comparison is performed. The pairs with notable differences in each group are presented in the table below.

Table 5.29

Pairwise Comparison - Physical Resource & Expertise Seeking Activities

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Validation and Scale-up	-55.259	.004
Type of Technology	IT and Non-IT	-111.442	<0.01
	IT and Both IT & non-IT	-108.982	<0.01
	IT and None	54.324	.005
	None and Non-IT	-57.118	.006
	None and Both IT & non-IT	-54.658	.034
Nature of Output	Service oriented and Product oriented	82.765	<0.01
	Both product & service oriented and Product oriented	31.474	.009
	Service oriented and Both product & service oriented	-51.291	.003

Source: Field Survey

It has been found that there is a significant difference in the activity structure of startups that do not use any type of technology compared to other types of startups that use technology in terms of the performance of physical resource & expertise seeking activities. Likewise, the activity structure of service oriented startups is also notably different from product oriented and both product & service oriented startups.

The Mann-Whitney U test results are shown below.

Table 5.30

Physical Resource & Expertise Seeking Activities – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.67	148.25	8646.500	.286
	No	99	3.33	137.34		
KSUM Registration	Yes	143	3.67	153.63	9061.500	.062
	No	145	3.33	135.49		
Status in Incubators	Incubatee	234	3.67	152.45	4458.500	<0.01**
	Coworking	54	3.00	110.06		

Source: Field Survey
**Significant at 1% level of significance

Mann-Whitney U test shows that there is a significant difference between the startup categories based on status in incubators (P = <0.01) in terms of performing physical resources and expertise activities because the P value is less than .05. Nevertheless, based on the KSUM registration (P = .062) and DPIIT (P = .286) for the performance of physical resource & expertise searching activities, there is no appreciable difference between the various startup groups. Therefore, with regard to the performance of physical resource & expertise searching activities, there is a significant difference in the activity structure of incubatee startups and coworking startups.

The summary of hypothesis testing for the activity structure of startups is given in the below table.

Table 5.31

Hypothesis Testing - Activity Structure

Hypothesis	Activity Structure	Groups for which H_0 is rejected
There is no significant difference in the activity structure of various categories of startups.	Market Research & Business Formation Activities	Stages of startup life cycle, nature of business, type of technology, nature of output,
	Revenue Generation & Performance Evaluation Activities	Stages of startup life cycle and KSUM registration
	Planning & Team Building Activities	Stages of startup life cycle, DPIIT registration and KSUM registration
	Product Modeling & Networking Activities	Stages of startup life cycle, nature of business, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators
	Funding & IP Registration Activities	Stages of startup life cycle, nature of business, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators
	Physical Resource & Expertise Seeking Activities	Stages of startup life cycle, type of technology, nature of output and status in incubators

Source: Field Survey

5.3.2 Organisation Structure

Organisational structure is a method by which organisational activities are divided, organised and coordinated (Ahmady et al., 2016). The organisations create structures to coordinate the activities of work factors and control the members' actions (Rezayian, 2005). This section addresses the organisation structure of startups and explores whether there are any significant difference in the organisation structure of different categories of startups. Exploratory factor analysis is used to determine whether a single factor can accurately describe the organisation structure of startups. The Mann-Whitney U test and the Kruskal-Wallis H test are used to assess whether there are notable differences between the organisation structures of different startup categories.

❖ Exploratory Factor Analysis - Organisation Structure

In order to examine the organisation structure of startups, seven statements about organisation have been identified. An exploratory factor analysis is carried out to determine whether these seven statements can be integrated into a factor for assessing the organisation structure of startups.

The Bartlett's test is used to determine whether the sample data has enough correlation to support factor analysis and the Kaiser-Meyer-Olkin test is used to determine whether the sampling is adequate for factor analysis.

Table 5.32

KMO and Bartlett's Test – Organisation Structure

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.840
Bartlett's Test of Sphericity	Approx. Chi-Square	735.736
	DF	21
	Sig.	<0.01

Source: Field Survey

The aforesaid table presents the results of the KMO and Bartlett's tests, indicating that the Kaiser-Meyer-Olkin measure of sampling adequacy has a value of .840. A KMO value of .80-.89 is regarded as meritorious. For factor analysis, the sampling data is therefore sufficient. The correlation between the sample data exhibits statistical significance when the P value of Bartlett's test of Sphericity (P = <0.01) is observed. Principal component analysis has been carried out since sample data is suitable for factor analysis, according to the results of statistical assumption tests.

Table 5.33

Total Variance Explained – Organisation Structure

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.958	70.832	70.832	4.958	70.832	70.832
2	.897	12.810	83.643			
3	.464	6.623	90.266			
4	.307	4.381	94.647			
5	.190	2.721	97.368			
6	.115	1.648	99.016			
7	.069	.984	100.000			

Extraction Method: Principal Component Analysis

Source: Field Survey

Principal component analysis results show that one component, with an Eigenvalue larger than 1 account for 70.832% of the extracted variance. As a result, one component is chosen as the outcome of the exploratory factor analysis to be used in the analysis of startups organisation structure. The table below lists the factors and factor loadings:

Table 5.34

Factor and Factor Loadings – Organisation Structure of Startups

Factor	Statements	Factor Loadings
Organisation Structure of Startups	There is a formal organisation structure for the startup	.864
	The individual positions of the members and the hierarchy of positions are well defined	.868
	The communication within the startup is formal and structured	.741
	The structure of the startup is simple and flexible	.827
	The structure of the startup is adaptable to changing environments	.834
	The structure of the startup is appropriate for achieving the planned goals	.861
	The structure of the startup is appropriate for building business relationships	.889

Source: Field Survey

❖ Analysis of Organisation Structure

The organisation structure of startups may differ from one another depending on their stage in the startup life cycle, the nature of their business, the type of technology used by them, etc. Some startups follow a strict and formal hierarchical structure with a well-defined path of communication, but some startups have a more friendly and informal atmosphere without a well-structured hierarchy in positions and relationships. The organisation structure of startups is measured using a five-point Likert scale, where respondents were asked to state their agreement with seven statements regarding the organisation structure of their startups. The seven statements relate to the formality, hierarchy, communication, flexibility, adaptability and ability (to achieve goals and maintain business relationships) of the organisation structure. To know if there is a significant difference in the organisation structure of different categories of startups, hypothesis testing is done and the hypothesis is as follows:

H_0: There is no significant difference in the organisation structure of various categories of startups.

Kruskal-Wallis H test is used to determine whether the distribution of organisation structure differs for each category of startup based on stages of the startup life cycle, nature of business, type of technology and nature of output.

Table 5.35

Organisation Structure - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startups Life Cycle	Ideation	11	2.57	50.59	60.427	<0.01**
	Validation	41	3.00	81.34		
	Early Traction	141	4.00	143.00		
	Scale-up	85	4.28	183.81		
	Maturity	10	4.35	193.85		
Nature of Business	Technology	244	4.00	146.59	1.232	.540
	Non-Technology	31	3.71	129.10		
	Both technology & non-technology	13	3.85	142.08		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Type of Technology	IT	142	4.00	146.64	7.032	.071
	Non-IT	76	3.71	132.84		
	Both IT & non-IT	38	4.21	172.63		
	None	32	3.71	129.28		
Nature of Output	Product oriented	148	4.00	141.42	5.233	.073
	Service oriented	38	3.71	122.54		
	Both product & service oriented	102	4.00	157.16		

Source: Field Survey
**Significant at 1% level of significance

Except for startups at the ideation stage and validation stage, responses from every other category of startups are favourable about organisation structure of startups. Kruskal-Wallis Test results show that there is a significant difference in the organisation structure of various categories of startups on the basis of stages of the life cycle (P = <0.01). Therefore, the organisation structure of startups at different stages is different from one another. There is no significant difference in the organisation structure of various categories of startups based on their nature of business (P = .540), type of technology (P = .071) and nature of output (P = .075). A pairwise analysis of startups at different phases of their life cycle is carried out. The table that follows shows the pairs that show notable differences.

Table 5.36

Pairwise Comparison – Organisation Structure

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Early Traction	-92.406	.004
	Ideation and Scale-up	-133.215	<0.01
	Ideation and Maturity	-143.259	.001
	Validation and Early Traction	-61.655	<0.01
	Validation and Scale-up	-102.464	<0.01
	Validation and Maturity	-112.509	.001
	Early Traction and Scale-up	-40.809	.003

Source: Field Survey

It is evident from the above table that there are notable differences in the organisation structure of startups at various phases, particularly between early stage and later stage startups.

Mann-Whitney U test is used to determine if the distribution of organisation structure varies for each type of startup based on the status in incubators, DPIIT registration and KSUM registration.

Table 5.37

Organisation Structure – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.00	158.65	6681.500	<0.01**
	No	99	3.57	117.49		
KSUM Registration	Yes	143	4.00	164.31	7535.000	<0.01**
	No	145	3.71	124.97		
Status in Incubators	Incubatee	234	4.00	148.01	5497.500	.136
	Coworking	54	3.85	129.31		

Source: Field Survey
**Significant at 1% level of significance

The Mann-Whitney U test results indicate that there is a notable difference in the organisation structure of the startup categories based on their KSUM registration (P = <0.01) and DPIIT registration (P = <0.01). This indicates that organisation structure of startups registered and not registered in DPIIT and KSUM is different from one another. Regarding the organisation structure, however, there is no discernible difference between the various categories of startups according to their status in incubators (P = .136). Hence, the organisation structure of incubatee startups and coworking startups is not significantly different.

The hypothesis that there is no significant difference in the organisation structure of various categories of startups is rejected in case of different types of startups based on their stages of startup life cycle, DPIIT registration and KSUM registration.

5.3.3 Resource Collection

Resource collection indicates the collection of tangible and intangible resources for a startup. For the purpose of this study, two tangible resources have been identified: finance and physical infrastructure. Human resources, business knowledge, technological resources and other intangible resources like logos and brand names are the intangible resources selected for the study. The analysis of resource collection includes Kruskal-Wallis H test and Mann-Whitney U test to know if there is a notable difference in the resource collection of various startup categories with regard to financial resources, human resources and business knowledge. The hypothesis used for testing is:

H_0: There is no significant difference among various categories of startups with regard to the sources of funding, human resources employed and business knowledge of the startup team.

Physical infrastructure, technological resources and intangible resources are analysed using frequency and percentage analysis. A detailed analysis of various tangible and intangible resources used in business is given in the following section.

❖ **Financial Resources (Sources of Funding)**

Finance is the lifeblood of any business venture. Startups require funds at every stage of their life cycle for the establishment, expansion and growth of their businesses. For the purpose of the study, seven different sources through which funds can be collected by startups have been identified. The agreement of respondents with regard to raising funds through these seven sources is measured using a five-point Likert scale. The seven sources of finance selected for the study are bootstrapping, earnings of startups, grants through incubators, grants from state financial institutions, loans from commercial banks and other financial institutions, angel Investors and other sources. In order to know if there is a significant difference in the sources of funding among various categories of startups in different groups, hypothesis testing needs to be done. Various groups need to be tested for each source of funding to determine whether the hypothesis is rejected or not. Tests and corresponding results are as follows:

- **Bootstrapping & Earnings of Startups**

Bootstrapping means arranging funds through family and friends. Bootstrapping is the primary source of funding for startups and until the business starts generating revenue, it remains the most important source of funding for a startup. Another important source of startup finance is the earnings made by startups. Once revenue is realised, startups begin to earn their own income, which can be used for their businesses. Earnings should be at least enough to meet the expenses of the business; only then can a startup hope to survive. Kruskal-Wallis H test is performed to determine whether there are any significant differences between the various startup categories concerning bootstrapping and earnings of startups as funding sources based on stages of the startup life cycle, nature of business, type of technology and nature of output.

Table 5.38

Bootstrapping & Earnings of Startups - Kruskal-Wallis H Test

Categories of Startups		N	Bootstrapping				Earnings of Startups			
			Median	Mean Rank	χ^2	Sig.	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	5.00	121.77	4.826	.306	2.00	73.41	68.247	<0.01**
	Validation	41	5.00	139.85			2.00	74.32		
	Early Traction	141	5.00	146.45			5.00	152.41		
	Scale-up	85	5.00	149.68			5.00	166.68		
	Maturity	10	5.00	117.05			5.00	183.50		
Nature of Business	Technology	244	5.00	153.91	10.220	.006**	5.00	144.97	.574	.750
	Non-Technology	31	5.00	166.10			5.00	146.31		
	Both technology & non-technology	13	4.00	104.04			5.00	131.31		
Type of Technology	IT	142	5.00	162.06	7.224	.065	5.00	142.10	1.728	.631
	Non-IT	76	5.00	136.39			5.00	143.03		
	Both IT & non-IT	38	5.00	153.34			5.00	157.33		
	None	32	5.00	142.32			5.00	142.10		

Categories of Startups		N	Bootstrapping				Earnings of Startups			
			Median	Mean Rank	χ^2	Sig.	Median	Mean Rank	χ^2	Sig.
Nature of Output	Product oriented	148	5.00	148.03	1.090	.580	5.00	140.96	1.147	.563
	Service oriented	38	5.00	141.59			5.00	143.82		
	Both product & service oriented	102	5.00	140.47			5.00	149.89		

Source: Field Survey
**Significant at 1% level of significance

The above table shows the findings of the Kruskal-Wallis test and the test results indicate that there is a significant difference among startups based on the nature of business (P = .006) when it comes to using bootstrapping as a source of funding. However, there is no notable difference between the different startup categories based on their stages of the startup life cycle (P = .306), type of technology (P = .065) and nature of output (P = .580) with regard to bootstrapping as a source of funding. This means that for most of the startup categories, bootstrapping is a source of funding. About earnings from startups, test results show that there is a significant difference (P = <0.01) between the different categories of startups depending on the stages of their startup life cycle when it comes to their earnings as a source of funding. It means that startup earnings are not a source of funding for startups at all stages. However, there is no discernible difference between the different startup categories based on their nature of output (P = .580), type of technology (P = .065) and nature of business (P = .066) with regard to the earnings of startups as a source of funding. A pairwise comparison is conducted for different startup categories that have significant differences in their responses. The comparison is shown in the below table.

Table 5.39

Pairwise Comparison – Bootstrapping & Earnings of Startups

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Bootstrapping			
Nature of Business	Non-technology and Both technology & non-technology	62.058	.005
Earnings of Startups			
Stages of Startup Life Cycle	Ideation and Early traction	-78.999	.001
	Ideation and Scale-up	-93.267	<0.01
	Ideation and Maturity	-110.091	.001
	Validation and Early Traction	-71.518	<0.01
	Validation and Scale-up	-85.786	<0.01
	Validation and Maturity	-102.610	<0.01

Source: Field Survey

The result of pairwise comparison shows that, based on the nature of business, startups belonging to non-technology and both technology & non-technology categories have a significant difference in their response with regard to bootstrapping as a source of funding. This can be because bootstrapping is a more important source of funding for non-technology startups than both technology & non-technology startups. Earnings of startups are a source of funding for startups at their later stages, but not for startups at the ideation and validation stages.

Mann-Whitney U test is used to examine whether there are any relevant variations between various startup categories according to their DPIIT registration, KSUM registration and status in incubators about bootstrapping and the earnings of startups as a source of funding.

Table 5.40

Bootstrapping & Earnings of Startups – Mann-Whitney U Test

Categories of Startups		N	Bootstrapping				Earnings of Startups			
			Median	Mean Rank	Mann-Whitney χ^2	Sig.	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	5.00	146.58	8962.500	.410	5.00	148.24	8649.000	.177
	No	99	5.00	140.53			5.00	137.36		
KSUM Registration	Yes	143	5.00	147.17	9986.000	.448	5.00	150.61	9493.500	.112
	No	145	5.00	141.87			5.00	138.47		
Status in Incubators	Incubatee	234	5.00	148.01	6497.000	.131	5.00	147.55	5603.500	.096
	Coworking	54	5.00	140.30			5.00	131.27		

Source: Field Survey

The aforesaid table shows that responses from different startup categories have a median value of 5. Due to the P values exceeding .05, based on DPIIT registration (P = .410), KSUM registration (P = .448) and status in incubators (P = .131), there is no appreciable difference between the various startup categories with regard to bootstrapping as a source of their capital. The results of Mann-Whitney U test indicate that there is no significant difference with respect to the earnings of startups as a source of funding between the various categories of startups based on their DPIIT registration (P = .117), KSUM registration (P = .112) and status in business incubator (P = .096) because the P values are greater than .05. Therefore, both bootstrapping and startup earnings are sources of funding for the different categories of startups tested.

- **Grants through Incubators & State Financial Institutions**

Grants received through incubators are a big support for startups for their research, growth and development. Grants are provided to startups either based on the innovativeness of the idea or based on the progress made in startup growth. Grants from incubators are not easy to get and not every startup under incubation receives them. Startups can also get grants from state financial institutions through a formal application. State financial institutions like KSIDC provide grants in the form of soft loans to startups. But the procedures to obtain such grants can be tedious, making it difficult for startups. Still, as a source of finance, this type of grant is very beneficial to startups. With the help of the Kruskal-Wallis H test, it can be understood if there is a valid difference among various categories of startups based on stages of the startup life cycle, nature of business, type of technology and nature of output about grants received through incubators and state financial institutions.

Table 5.41

Grants through Incubators & State Financial Institutions - Kruskal-Wallis H Test

Categories of Startups		N	Grants through Incubators				Grants from State Financial Institutions			
			Median	Mean Rank	χ^2	Sig.	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	1.00	131.77	14.240	.007**	1.00	113.36	12.485	.014*
	Validation	41	1.00	107.21			1.00	112.63		
	Early Traction	141	2.00	144.87			1.00	147.71		
	Scale-up	85	2.00	162.59			2.00	156.22		
	Maturity	10	1.50	152.45			2.00	164.50		
Nature of Business	Technology	244	2.00	147.17	11.216	.004**	1.00	145.64	8.038	.018*
	Non-Technology	31	1.00	106.32			1.00	118.02		
	Both technology & non-technology	13	4.00	185.46			2.00	186.23		
Type of Technology	IT	142	2.00	146.15	10.292	.016*	1.00	136.04	11.469	.009**
	Non-IT	76	2.00	145.33			2.00	164.50		
	Both IT & non-IT	38	2.00	167.42			2.00	156.13		
	None	32	1.00	107.98			1.00	120.73		

Categories of Startups		N	Grants through Incubators				Grants from State Financial Institutions			
			Median	Mean Rank	χ^2	Sig.	Median	Mean Rank	χ^2	Sig.
Nature of Output	Product oriented	148	2.00	154.16	19.070	<0.01**	1.00	147.48	11.342	.003**
	Service oriented	38	1.00	93.11			1.00	107.33		
	Both product & service oriented	102	2.00	149.63			2.00	154.02		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

The responses of startups from various categories, except both technology & non-technology startups is unfavourable towards receiving grants from incubators. This indicates that grants from incubators is a major source of funding only for both technology & non-technology startups. The results of the Kruskal-Wallis test show that there are notable differences between the various categories of startups based on stages of the startup life cycle (P = .007), nature of business (P = .004), type of technology (P = .016) and nature of output (P = <0.01) with regard to receiving grants through incubators. The median value of the replies provided by startups across all categories is 2 or less about receiving grants through state financial institutions. Test results show that there is a significant difference with respect to grants received from state financial institutions as a source of funding among the different categories of startups based on stages of the startup life cycle (P = .014), nature of business (P = .018), type of technology (P = .009) and nature of output (P = .003). A pairwise comparison is carried out for groups with P value less than .05. The table below displays the pairs in each group that have valid differences:

Table 5.42

Pairwise Comparison - Grants through Incubators & State Financial Institutions

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Grants through Incubators			
Stages of Startup Life Cycle	Validation and Scale-up	-55.381	.002
Nature of Business	Non-technology and Technology	40.845	.019
	Non-technology and Both technology & non-technology	- 79.139	.007
Type of Technology	None and Both IT & non-IT	-59.437	.009
Nature of Output	Service oriented and Product oriented	61.054	.000
Grants from State Financial Institutions			
Stages of Startup Life Cycle	Validation and Scale-up	- 43.589	.021
Nature of Business	Non-technology and Both technology & non-technology	- 68.215	.017
Type of Technology	IT and Non-IT	- 28.461	.043
	None and Non-IT	- 43.766	.032
Nature of Output	Service oriented and Product oriented	40.151	.009
	Service oriented and Both product & service oriented	- 46.696	.003

Source: Field Survey

From the pairwise comparison, it can be seen that with regard to grants from incubators and state financial corporations, the responses of startups at the validation stage and scale-up stage, non-technology and both technology & non-technology startups, IT and non-IT startups as well as service oriented and product oriented startups are significantly different from one another.

While comparing grants through incubators and state financial institutions as a source of funding, the Mann-Whitney U Test is used to determine whether there are any significant differences between various startup categories based on their DPIIT registration, KSUM registration and status in incubators.

Table 5.43

Grants through Incubators & State Financial Institutions – Mann-Whitney U Test

Categories of Startups		N	Grants through Incubators				Grants from State Financial Institutions			
			Median	Mean Rank	Mann-Whitney χ^2	Sig.	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	164.42	5591.000	<0.01**	0	159.03	6609.500	<0.01**
	No	99	1.00	106.47			1.00	116.76		
KSUM Registration	Yes	143	4.00	173.34	6244.000	<0.01**	2.00	167.20	7121.000	<0.01**
	No	145	1.00	116.06			1.00	122.11		
Status in Incubators	Incubatee	234	2.00	156.15	3592.000	<0.01**	2.00	150.78	4849.500	.003**
	Coworking	54	1.00	94.02			1.00	117.31		

Source: Field Survey
**Significant at 1% level of significance

The responses of several startup categories, with the exception of those registered in KSUM is unfavourable about grants through incubators. This means that grants through incubators are received by startups registered in KSUM. Based on DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in business incubator (P = <0.01) results of the Mann-Whitney U test reveal a significant difference between the various startup categories with respect to grants received through incubators. When it comes to grants from state financial institutions as a source of funding, the test results reveal that there are significant differences between the various categories of startups based on their DPIIT registration (P = .000), KSUM registration (P = <0.01) and status in the business incubator (P = .003) because the P values of these groups are less than .05.

- **Loans from Commercial Banks and Other Financial Institutions**

Startups can apply for short, medium or long term loans from commercial banks and other financial institutions. Loans from commercial banks and other financial institutions are subject to certain policies and procedures that must be followed. Although the procedures can be challenging, it is a good source of funding for new businesses. To determine whether there are any notable differences between the various startup categories when it comes to loans from commercial banks and other financial institutions as a source of funding based on stages of the startup life cycle, nature of business, type of technology and nature of output, the Kruskal-Wallis H test is used and the results are as follows:

Table 5.44

Loans from Commercial Banks and Other Financial Institutions - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	1.00	105.95	21.205	<0.01**
	Validation	41	1.00	112.55		
	Early Traction	141	2.00	140.63		
	Scale-up	85	2.00	163.78		
	Maturity	10	3.50	208.50		
Nature of Business	Technology	244	2.00	142.27	3.439	.179
	Non-Technology	31	3.00	168.24		
	Both technology & non-technology	13	2.00	129.65		
Type of Technology	IT	142	2.00	126.23	17.594	.001**
	Non-IT	76	2.50	168.91		
	Both IT & non-IT	38	2.00	144.21		
	None	32	2.00	167.94		
Nature of Output	Product oriented	148	2.00	151.37	6.488	.039*
	Service oriented	38	1.00	114.79		
	Both product & service oriented	102	2.00	145.60		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

With regard to loans from commercial banks and other financial institutions as a source of funding, the results of the Kruskal-Wallis H Test indicate that there are significant differences among the various categories of startups based on stages of the startup life cycle (P = <0.01), type of technology (P = .001) and nature of output (P = .039). However, P value of .179 indicates that there is no significant variation between the various types of startups according to their nature of business when it comes to loans from commercial banks and other financial institutions as a source of funding. It can be inferred that irrespective of whether the business is technology based or not, loans from commercial banks and other financial institutions are not a source of funding for startups. A pairwise comparison is performed for groups with P value below .05. The pairs with significant differences in each group are presented below.

Table 5.45

Pairwise Comparison - Loans from Commercial Banks and Other Financial Institutions

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life cycle	Ideation and Maturity	-102.545	.030
	Validation and Scale-up	-51.234	.007
	Validation and Maturity	-95.951	.006
Type of Technology	IT and Non-IT	-42.676	.001
Nature of Output	Service oriented and Product oriented	36.582	.033

Source: Field Survey

With regard to the responses about loans from commercial banks and other financial institutions, there is notable difference between startups at early and later stages, IT and non-IT startups, as well as service oriented and product oriented startups.

When comparing startup categories based on their DPIIT registration, KSUM registration and status in incubators to know if there is any notable difference with respect to loans from commercial banks and other financial institutions as a source of finance, the Mann-Whitney U test is used.

Table 5.46

Loans from Commercial Banks and Other Financial Institutions – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	147.24	8837.500	.417
	No	99	1.00	139.27		
KSUM Registration	Yes	143	2.00	145.48	10227.500	.835
	No	145	2.00	143.53		
Status in Incubators	Incubatee	234	2.00	147.67	5576.000	.157
	Coworking	54	1.50	130.76		

Source: Field Survey

As per the aforesaid table, responses from several startup categories have median values that are 2 or less. According to Mann-Whitney U test, with regard to the loans from commercial banks and other financial institutions as a source of funds, there is no significant difference in the response from various categories of startups based on their DPIIT registration (P = .417), KSUM registration (P = .835) and status in the business incubator (P = .157). This is because the P values of these groups are more than .05. Hence, loans from commercial banks and other financial institutions are not considered as a source of funding for the different categories of startups tested.

- **Angel Investors & Other Sources**

"Angels' are individuals who stand on the sidelines coaching the entrepreneurial team, offering advice, support and finance to help the new firm to reach critical mass, profitability and sustainability" (Menon & Malik, 2016). Angel investors are risk-takers and they enjoy investing in risky new ventures. Their resources and expertise is a valuable asset to startups. Startups can pitch their ideas and if investors are convinced, they will be ready to invest funds in startups. Apart from the different sources of funds already discussed, there are many other sources through which funds can be arranged by startups. Some of such sources are venture capital funding, crowd funding platforms, earnings from other businesses of the owner, etc. Not every startup has access to funds through other sources. To determine if there is a significant difference among various categories of startups based on stages of the startup life cycle, nature of business, type of technology and nature of output with respect to angel investors and other sources of funds, the Kruskal-Wallis H test is used.

Table 5.47

Angel Investors & Other Sources - Kruskal-Wallis H Test

Categories of Startups		N	Angel Investors				Other Sources			
			Median	Mean Rank	χ^2	Sig.	Median	Mean Rank	χ^2	Sig.
Stages of startup Life Cycle	Ideation	11	1.00	112.86	32.117	<0.01**	1.00	102.45	15.525	.004**
	Validation	41	1.00	101.16			1.00	109.15		
	Early Traction	141	2.00	139.05			2.00	148.83		
	Scale-up	85	2.00	170.83			2.00	155.55		
	Maturity	10	3.00	210.10			2.00	180.75		
Nature of Business	Technology	244	2.00	145.61	2.934	.231	2.00	147.02	2.611	.271
	Non-Technology	31	1.00	126.08			2.00	142.87		
	Both technology & non-technology	13	2.00	167.58			2.00	148.77		
Type of Technology	IT	142	1.00	134.77	11.251	.010*	2.00	146.07	4.261	.126
	Non-IT	76	2.00	153.76			2.00	164.91		
	Both IT & non-IT	38	2.00	176.53			2.00	152.51		
	None	32	1.00	127.66			2.00	143.91		
Nature of Output	Product oriented	148	2.00	144.37	7.631	.022*	2.00	141.53	3.881	.144
	Service oriented	38	1.00	114.89			1.00	127.32		
	Both product & service oriented	102	2.00	155.72			2.00	155.21		

Source: Field Survey
**Significant at 1% level of significance

When considering angel investors as a source of funding, the Kruskal-Wallis H Test reveals that there are significant differences between the various categories of startups based on stages of the startup life cycle (P = <0.01), type of technology (P = .010) and nature of output (P = .022). However, there is no discernible difference between the various startup categories according to their type of business (P = .231) when it comes to funding through angel investors. So, it can be understood that irrespective of the usage of technology, startups are not getting funding from angel investors. The responses from startups across a range of categories about funding through other sources show a median value of 2 or less. The test results indicate that there are valid differences between the startup categories depending on the stages of the startup life cycle (P = .004) when it comes to other sources of funding because the P value is less than .05. However, there is no notable difference between the various startup categories based on the nature of their business (P = .231), technology (P = .126) and output (P = .144) with respect to other sources of funding. Therefore, it can be understood that there are no other sources of funding for startups. With regard to groups with P values less than .05, a pairwise comparison is performed and the pairs with relevant difference are presented in the table given below.

Table 5.48

Pairwise Comparison - Angel Investors & Other Sources

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
	Angel Investors		
Stages of Startup Life Cycle	Ideation and Maturity	-97.236	.042
	Validation and Scale-up	-69.671	<0.01
	Validation and Maturity	-108,941	.001
	Early Traction and Scale-up	-31.783	.029
Type of Technology	IT and Both IT & non-IT	-41.759	.020
Nature of Output	Service oriented and Both product & service oriented	-40.821	.017
	Other Sources		
Stages of Startup Life Cycle	Validation and Early traction	-39.860	.046
	Validation and Scale-up	-46.407	.020

Source: Field Survey

In order to determine whether there are any significant variations between various startup categories depending on their DPIIT registration, KSUM registration and status in incubators with respect to arranging funds through angel investors and other sources, the Mann-Whitney U Test is utilised.

Table 5.49

Angel Investors & Other Sources – Mann-Whitney U Test

Categories of Startups		N	Angel Investors				Other Sources			
			Median	Mean Rank	Mann-Whitney χ^2	Sig.	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	159.16	6585.500	<0.01**	2.00	155.15	7342.500	.002**
	No	99	1.00	116.52			1.00	124.17		
KSUM Registration	Yes	143	2.00	168.16	6984.500	<0.01**	2.00	159.62	8205.000	.001**
	No	145	1.00	121.17			1.00	129.59		
Status in Incubators	Incubatee	234	2.00	151.27	4733.000	.002**	2.00	149.82	5073.000	.017*
	Co-working	54	1.00	115.15			1.00	121.44		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

As the P values are less than .05, testing reveals that there are significant differences between the various startup categories based on their KSUM registration (P = <0.01), DPIIT registration (P = <0.01) and status in business incubator (P = .002) with respect to angel investors as a source of funding. This can be because startups registered in DPIIT, registered in KSUM and incubated startups have better access to incubators than others, but the median value (2 and below) of responses indicates that angel investors are not a major source of funding for these startups and Mann-Whitney U test also reveals that there are significant differences between the various startup categories based on their DPIIT registration (P = .002), KSUM registration (P =

.001)and status in the business incubator (P = .017) with respect to funding through other sources as well.

The summary of hypothesis testing for financial resources is given in the below table.

Table 5.50

Hypothesis Testing - Financial Resources

Hypothesis	Sources of Funding	Groups for which H_0 is rejected
There is no significant difference among various categories of startups with regard to the sources of funding.	Bootstrapping	Nature of business
	Earnings of startup	Stages of startup life cycle
	Grants through Incubators	Stages of startup life cycle, nature of business, type of technology, nature of output, DPIIT registration, KSUM registration and Status in Incubators
	Grants from State Financial Institutions	Stages of startup life cycle, nature of business, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators
	Loans from Commercial Banks and Other Financial Institutions	Stages of startup life cycle, type of technology and nature of output
	Angel Investors	Stages of startup life cycle, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators
	Other Sources	Stages of startup life cycle, DPIIT registration, KSUM registration and status in incubators

Source: Field Survey

❖ Physical Infrastructure Resources

Physical infrastructure resources are those non-financial tangible resources that offer the physical facilities required to operate a firm. They are necessary for a startup to operate at a physical location. Twelve crucial physical resources that are fundamentally needed by various kinds of startups have been discovered through pilot study. These resources are typically supplied by the incubator to a startup affiliated with it. However, there may also be resources that entrepreneurs arrange by themselves as well as resources that startups do not require. Below is a summary and analysis of the resources for the physical infrastructure of startups:

Table 5.51

Physical Infrastructure Resources

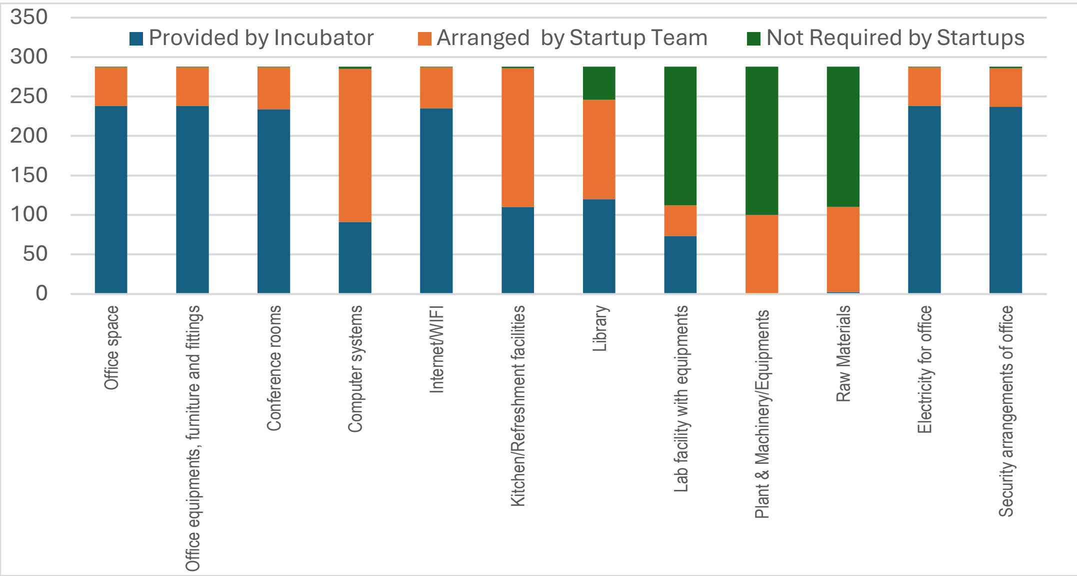
Physical Infrastructure Resources	Provided by Incubator	Arranged by Startup Team	Not Required by Startups	Total
Office space	238 (82.6%)	49 (17%)	1 (0.3%)	288 (100%)
Office equipments, furniture and fittings	238 (82.6%)	49 (17%)	1 (0.3%)	288 (100%)
Conference rooms	234 (81.3%)	53 (18.4%)	1 (0.3%)	288 (100%)
Computer systems	91 (31.6%)	194 (67.4%)	3 (1%)	288 (100%)
Internet/Wi-Fi	235 (81.6%)	52 (18.1%)	1 (0.3%)	288 (100%)
Kitchen/Refreshment facilities	110 (38.2%)	176 (61.1%)	2 (0.7%)	288 (100%)
Library	120 (41.7%)	126 (43.8%)	42 (14.6%)	288 (100%)
Lab facility with equipments	73 (25.3%)	39 (13.5%)	176 (61.1%)	288 (100%)
Plant & Machinery/Equipments	0 (0%)	100 (34.7%)	188 (65.3%)	288 (100%)
Raw materials/stock	2 (0.7%)	108 (37.5%)	178 (61.8%)	288 (100%)
Electricity for office	238 (82.6%)	49 (17%)	1 (0.3%)	288 (100%)
Security arrangements of office	237 (82.3%)	49 (17%)	2 (0.7%)	288 (100%)

Source: Field Survey
Figures in Parentheses indicate Column Percentages

From the analysis of physical infrastructure resources, it can be found that 82.6% of startups under the study have mentioned that office space, office equipments, furniture and fittings are provided to them by incubators. 81.3% of startups say that conference rooms for discussions are also provided by incubators. According to 81.6% of startups, internet/Wi-Fi facilities are received through incubators. But 67.4% and 61.1% of startups have stated that computer systems and kitchen/refreshment facilities are arranged by the startups themselves. 41.7% of startups have stated that incubators provide library facilities, whereas 43.8% of startups have stated that library facilities are arranged by startups themselves. 61.1% of startups under the study don't need lab facilities and 25.3% of startups get fab facilities through incubators. 65.3% and 61.8% of startups in the study don't need plant & machinery, raw materials, or stock of any kind. But it is to be noted that 34.7% of startups that need plant & machinery arrange it themselves and 37.5% of startups that need raw materials or stock also arrange it themselves. The majority of the startups have mentioned that electricity for office work (82.6%) and security arrangements for offices (82.3%) are provided by incubators. The visual representation below provides information on the physical infrastructure resources and indicates whether startups, incubators, or neither is responsible for their organisation.

Chart 5.1

Physical Infrastructure Resources



❖ Human Resources

Human resources provide an indication of the level of talent required for startups to operate profitably. "Employees appear to be the most influential factor on the future of all organisations" (Todericiu et al., 2014). Human talent is a valuable intangible asset that must be hired from outside the state or nation if it is not available locally. An organisation should have enough talent with the necessary abilities and expertise to both advance the business and address its challenges. Human talent cannot be replaced. Data regarding number of team members across several startup categories has been collected and analysed. The results are displayed in the table below.

Table 5.52

Number of Members in Startup Team

Categories of Startups		N	Mean	SD	Maximum	Minimum
DPIIT Registration	Yes	189	14.74	9.78976	43.00	2.00
	No	99	12.17	9.31100	42.00	1.00
KSUM Registration	Yes	143	15.57	9.85135	43.00	3.00
	No	145	12.17	9.25364	42.00	1.00
Stages of Startup Life Cycle	Ideation	11	5.72	6.69464	25.00	1.00
	Validation	41	7.53	6.18909	25.00	1.00
	Early Traction	141	11.55	7.10877	42.00	1.00
	Scale-up	85	20.56	10.35495	43.00	4.00
	Maturity	10	24.30	9.74166	40.00	12.00
Nature of Business	Technology	244	14.00	9.48965	43.00	1.00
	Non-Technology	31	12.77	10.71357	42.00	1.00
	Both technology & non-technology	13	13.76	11.46119	40.00	2.00
Type of Technology	IT	142	12.83	8.69061	42.00	2.00
	Non-IT	76	12.93	8.87594	40.00	1.00
	Both IT & non-IT	38	20.39	11.70479	43.00	2.00
	None	32	12.84	10.54670	42.00	1.00
Nature of Output	Product oriented	148	14.52	10.51172	43.00	1.00
	Service oriented	38	11.52	9.47468	42.00	1.00
	Both product & service oriented	102	13.77	8.38894	42.00	2.00
Status in Incubators	Incubatee	234	14.02	9.39475	43.00	1.00
	Coworking	54	13.16	10.94368	42.00	1.00

Source: Field Survey

The information in the above table includes the mean, standard deviation, maximum and lowest number of team members for each of the study's main startup categories. It can be noted that the average number of members in the startup team for startups registered in DPIIT and KSUM is 15. The average number of members for startups at the ideation stage is 6, validation stage 8, early traction stage 11, scale-up stage 20 and maturity stage 24. Technology startups and both technology & non-technology startups have an average of 14 members. Non-technology startups have an average of 13 members. IT as well as non-IT startups have 13 members, whereas startups with both IT & non-IT technology have an average of 20 members in their team. Product oriented startups have 15, service oriented startups have 11 and both product & service oriented startups have on average 14 members in their teams. Incubatee and coworking startups both have an average of 14 members in their teams. We can see a wide difference in the average number of members in the case of startups at different stages.

Three statements were developed about the startup team, competency of team members and availability of talent in Kerala. A five-point Likert scale was created and the degree to which startups agreed with each statement was assessed. Hypothesis testing is done to determine whether there are any notable differences in how the different startup categories have responded to these statements. For every statement, various startup groups must be examined in order to ascertain whether or not the hypothesis is rejected. Here are the tests and related outcomes:

- **Startup Team and Qualified Members**

Startups may or may not have a group of employees in various roles. Owners assign team members to different positions according to a set structure, or they multitask without assigning other team members. The knowledge and abilities of the team members determine how competent the startup is. In order to occupy positions of responsibility, it is critical for the startup team to have competent and skilled people. Such ability could be hard to come by and tough to develop. In order to know if there is a significant difference among various categories of startups in terms of having a team of people working at different jobs inside the business and the presence of competent and skilled colleagues, the Kruskal-Wallis H test and the Mann-Whitney U test are conducted. The results of the tests are as follows:

Table 5.53

Startup Team and Qualified Members - Kruskal-Wallis H Test

Categories of Startups		N	Startup Team				Skilled and Qualified Members			
			Median	Mean Rank	χ^2	Sig.	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.00	82.23	37.351	<0.01**	3.00	71.05	23.910	<0.01**
	Validation	41	3.00	95.62			4.00	118.82		
	Early Traction	141	4.00	145.79			4.00	144.39		
	Scale-up	85	4.00	167.65			4.00	163.34		
	Maturity	10	5.00	198.50			4.00	171.95		
Nature of Business	Technology	244	4.00	145.64	.756	.685	4.00	147.61	4.263	.119
	Non-Technology	31	4.00	133.52			4.00	119.27		
	Both technology & non-technology	13	4.00	149.38			4.00	146.35		
Type of Technology	IT	142	4.00	146.30	3.202	.361	4.00	144.19	4.995	.172
	Non-IT	76	4.00	135.93			4.00	145.05		
	Both IT & non-IT	38	4.00	161.24			4.00	162.18		
	None	32	4.00	137.02			4.00	123.58		
Nature of Output	Product oriented	148	4.00	139.56	3.594	.166	4.00	142.67	.700	.705
	Service oriented	38	4.00	133.74			4.00	139.36		
	Both product & service oriented	102	4.00	155.67			4.00	149.07		

Source: Field Survey
**Significant at 1% level of significance

The aforesaid table shows that, with the exception of startups in the ideation and validation stage (median = 3), responses from startups across a range of categories have a median value of 4 or higher. This indicates that most of the startups agree to the statement that they have a startup team with members qualified to work at different positions. Because the P value is less than .05, the Kruskal-Wallis H test indicates that there are significant differences between startup categories depending on stages of the startup life cycle (P = <0.01) with regard to both having a startup team and having qualified members in the team. There is no discernible difference between the various startup categories based on the nature of their business (P = .685 & .199), type of technology (P = .361 & .172) and nature of output (P = .166 & .705) in relation to having a startup team and having qualified team members. For startups at various phases of their life cycles, a pairwise comparison is conducted; the ones with a notable difference are listed in the table below.

Table 5.54

Pairwise Comparison - Startup Team and Qualified members

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
	Startup team		
Stages of Startup Life Cycle	Ideation and Scale-up	-85.420	.004
	Ideation and Maturity	-116.273	.005
	Validation and Early Traction	-50.165	.002
	Validation and Scale-up	-72.025	<0.01
	Validation and Maturity	-102.878	.001
	Skilled and Qualified members		
Stages of Startup Life Cycle	Ideation and Early Traction	-73.348	.011
	Ideation and Scale-up	-92.296	.001
	Ideation and Maturity	-100.905	.013

Source: Field Survey

It can be understood from the pairwise comparison that startups at later stages have a proper startup team with qualified members, but startups at early stages do not have a proper startup team; therefore, there is a significant difference in the responses of startups at early and later stages.

The Mann-Whitney U test results are as follows:

Table 5.55

Startup Team and Qualified Members – Mann-Whitney U Test

Categories of Startups		N	Startup Team				Skilled and Qualified Members			
			Median	Mean Rank	Mann-Whitney χ^2	Sig.	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.00	154.19	7524.000	.369	4.00	150.81	8163.500	.050
	No	99	4.00	148.00			4.00	142.46		
KSUM Registration	Yes	143	4.00	157.41	8522.000	.475	4.00	152.95	9159.000	.058
	No	145	4.00	150.77			4.00	143.17		
Status in Incubators	Incubatee	234	4.00	145.08	6182.500	.788	4.00	147.16	5694.500	.191
	Coworking	54	4.00	141.99			4.00	132.95		

Source: Field Survey

A median score of 4 has been reported for the responses from different startup categories, indicating that startups of different categories agree that they have a startup team with qualified members. According to the Mann-Whitney U Test, there is no significant difference between the various startup categories based on their DPIIT registration (P = .369 & .050), KSUM registration (P = .475 &.058) and status in the incubator (P = .788 &.191) with respect to having a startup team and the presence of qualified and competent personnel.

- **Availability of Skilled and Qualified Personnel in Kerala**

According to the Global Startup Ecosystem Report 2022 by Startup Gnome, Kerala has been ranked first in Asia for affordable talent. The state of Kerala is full with talented people, but it's crucial for businesses to have access to the proper personnel. The availability of talent is important as, in the event that entrepreneurs in Kerala are unable to find suitable workers, they may have to search outside of the state or perhaps the nation. The Kruskal-Wallis H test and the Mann-Whitney U test are used to determine whether there are any notable differences between the various startup categories in Kerala with respect to the ease of access to skilled and qualified labour. The test results are listed below.

Table 5.56

Availability of Skilled and Qualified Personnel in Kerala – Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	96.45	10.490	.033*
	Validation	41	3.00	133.12		
	Early Traction	141	3.00	140.37		
	Scale-up	85	3.00	158.13		
	Maturity	10	4.00	186.45		
Nature of Business	Technology	244	3.00	141.41	2.493	.288
	Non-Technology	31	3.00	159.45		
	Both technology & non-technology	13	4.00	166.92		
Type of Technology	IT	142	3.00	144.34	2.397	.494
	Non-IT	76	3.00	136.07		
	Both IT & non-IT	38	3.00	147.49		
	None	32	3.00	161.69		
Nature of Output	Product oriented	148	3.00	141.98	.976	.614
	Service oriented	38	3.00	156.20		
	Both product & service oriented	102	3.00	143.80		

Source: Field Survey
*Significant at 5% level of significance

The majority of startup categories have responded with a median value of 3, which means that most categories of startups neither agree nor disagree about the availability of skilled personnel in Kerala. As the P value is less than .05, results of the Kruskal-Wallis H test show that there is a notable difference between startup categories based on stages of the startup life cycle (P = .033) with relation to the availability of skilled and qualified persons in Kerala. There is no significant difference in the availability of competent and talented workers in Kerala between various startup groups based on their nature of business (P = .288), type of technology (P = .494) and nature of output (P = .614). Startups in different phases of their life cycle are compared pairwise and the pairs that show a valid difference are listed in the table below.

Table 5.57

Pairwise Comparison – Availability of Skilled and Qualified Personnel in Kerala

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Scale-up	-61.675	.016
	Ideation and Maturity	-89.995	.010

Source: Field Survey

Table below exhibits the results of Mann-Whitney U test:

Table 5.58

Availability of Skilled and Qualified Personnel in Kerala – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.00	146.17	9040.500	.624
	No	99	3.00	141.32		
KSUM Registration	Yes	143	3.00	150.02	9578.500	.243
	No	145	3.00	139.06		
Status in Incubators	Incubatee	234	3.00	143.43	6067.000	.634
	Coworking	54	3.00	149.15		

Source: Field Survey

The replies from different startup categories have a median value of 3, indicating a neutral attitude from different categories of startups about the availability of skilled personnel in Kerala. Mann-Whitney U test shows that there is no statistically significant difference in the availability of skilled and qualified personnel in Kerala between the different categories of startups based on their DPIIT registration (P = .624), KSUM registration (P = .243) and status in incubators (P = .634).

The summary of hypothesis testing about the human resource employed by different categories of startups is presented in the below table.

Table 5.59

Hypothesis Testing - Human Resources

Hypothesis	Statements	Group for which H_0 is rejected
There is no significant difference among the various categories of startups with regard to the human resource employed.	There is a team of members in different positions working for the startup	Stages of startup life cycle
	Startup team members are qualified and skilled for their positions	Stages of startup life cycle
	Skilled and qualified personnel are easily available in Kerala	Stages of startup life cycle

Source: Field Survey

❖ Business Knowledge

Business knowledge indicates the skill and expertise that is needed by the startup team to run the business. Business knowledge is an important intangible resource that can be attained through learning and experience. Startups in incubation centres can acquire business knowledge through the trading and coaching provided by the incubators. Three statements regarding acquiring business knowledge through training, coaching and business experience have been identified to study business knowledge. The agreement of startups with these statements is recorded on a five-point Likert scale. In order to know if there is a significant difference among the various categories of startups with regard to their responses to these statements, hypothesis testing needs to be done. The statistical tests and results for each statement of business knowledge are as follows:

- **Coaching and Training**

"Coaching is a collaboration process when coaches direct individuals/groups, help to accomplish goals, develop skills, achieve results through guidance, support and motivation" (Garvey et al., 2017). The goal of coaching is to help startups improve their current knowledge and abilities. Coaching is an extended, informal process. During the coaching process, startups receive individualised attention to help them identify their difficulties and build skills, particularly to address those problems. A coach is a skilled somebody who offers coaching. Startups should receive coaching from their incubators. "Training is the process of teaching new employees the basic skills they need to perform their jobs" (Dessler & Varkkey, 2020). With respect to startups, training focuses on giving entrepreneurs new information and skill development. Training is a structured, condensed procedure. It is the incubators' duty to provide startups with training. With the assistance of mentors and other industry professionals, incubators often provide training to all of their incubatees together. Kruskal-Wallis H test and Mann-Whitney U test are employed to determine whether there are any meaningful differences between different startup categories in terms of learning business through coaching and training.

Table 5.60

Coaching and Training - Kruskal-Wallis H Test

Categories of Startups		N	Coaching				Training			
			Median	Mean Rank	χ^2	Sig.	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.00	130.91	7.287	.121	4.00	122.09	9.471	.050
	Validation	41	3.00	131.77			3.00	124.95		
	Early Traction	141	3.00	137.05			3.00	139.15		
	Scale-up	85	3.00	163.19			4.00	165.11		
	Maturity	10	3.00	157.80			3.50	149.55		
Nature of Business	Technology	244	3.00	144.10	1.629	.443	3.00	144.80	2.646	.266
	Non-Technology	31	3.00	136.73			3.00	130.10		
	Both technology & non-technology	13	4.00	170.54			4.00	173.27		
Type of Technology	IT	142	3.00	146.11	.384	.943	3.50	144.03	1.064	.786
	Non-IT	76	3.00	146.32			3.50	147.82		
	Both IT & non-IT	38	3.00	139.33			4.00	150.04		
	None	32	3.00	139.20			3.00	132.14		
Nature of Output	Product oriented	148	3.00	152.59	8.824	.012*	4.00	154.08	11.421	.003**
	Service oriented	38	2.00	108.89			2.50	104.57		
	Both product & service oriented	102	3.00	146.03			4.00	145.48		

Source: Field Survey
**Significant at 1% level of significance

The above table shows that, with the exception of both technology & non-technology startups (median = 4) and service oriented startups (median = 2 & 2.50), the replies of startups from different categories have a median value of 3, which shows their neutral response towards acquiring business knowledge through coaching and training. The

Kruskal-Wallis H Test results indicate that there is a notable difference (P = .012 & .003) between the different startup categories with respect to the nature of their output when it comes to acquiring business knowledge through coaching and training since the P value is less than .05. This means that based on the nature of product there is a difference in the coaching and training received by startups. However, there is no discernible difference between the various startup categories based on stages of the startup life cycle (P = .121 & .050), nature of business (P = .443 & .266) and type of technology (P = .943 & .786) with respect to acquiring business knowledge through coaching and training. The table below provides a pair-wise comparison for various startup types based on their nature output and the pairings with significant differences.

Table 5.61

Pairwise Comparison - Coaching and Training

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Coaching			
Nature of Output	Service oriented and Product oriented	43.693	.009
	Service oriented and Both product & service oriented	-37.135	.048
Training			
Nature of Output	Service oriented and Product oriented	49.515	.023
	Service oriented and Both product & service oriented	-40.910	.008

Source: Field Survey

The response of service oriented startups is significantly different from the response of product oriented and both product & service oriented startups about acquiring business knowledge through coaching and training. This can be because the benefits of coaching and training are not received by service oriented startups as product oriented and both product & service oriented startups.

The Mann-Whitney U Test has been conducted and the results are as follows:

Table 5.62

Coaching and Training – Mann-Whitney U Test

Categories of Startups		N	Coaching				Training			
			Median	Mean Rank	Mann-Whitney χ^2	Sig.	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.00	151.13	8102.500	.055	4.00	149.71	8370.000	.130
	No	99	3.00	131.84			3.00	134.55		
KSUM Registration	Yes	143	3.00	147.75	9903.000	.500	3.00	149.95	9588.000	.255
	No	145	3.00	141.30			3.00	139.12		
Status in Incubators	Incubatee	234	3.00	158.67	3002.500	<0.01**	4.00	161.86	2256.000	<0.01**
	Coworking	54	2.00	83.10			2.00	69.28		

Source: Field Survey
**Significant at 1% level of significance

Test results show that there is a notable difference between startups based on their status in incubators (P = <0.01) when it comes to acquiring business knowledge through coaching. Based on their DPIIT registration (P = .055) and KSUM registration (P = .500), there is no notable difference between the various startup categories when it comes to acquiring business knowledge through coaching. Mann-Whitney U test shows that there is a valid difference between startups depending on their status in incubators (P = <0.01) when it comes to learning business knowledge through training. Based on their DPIIT registration (P = .130) and KSUM registration (P = .255), there is no notable difference between the different startup categories when it comes to learning business knowledge through training. The significant difference in the response of coworking startups can be because they do not receive coaching or training from incubators.

- **Experience and Business Knowledge**

The founders of startups may have experience operating businesses, which they have gained from previous ventures or from the current one. This experience helps them know what to anticipate and what not to do in the future. Knowledge obtained by carrying out business operations cannot be obtained from any other source. The Kruskal-Wallis H test and the Mann-Whitney U test are used to determine if different types of startups differ noticeably in terms of learning through business experience. The test results are listed below.

Table 5.63

Experience and Business Knowledge – Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life cycle	Ideation	11	2.00	50.41	36.041	<0.01**
	Validation	41	2.00	107.16		
	Early Traction	141	5.00	150.65		
	Scale-up	85	5.00	164.22		
	Maturity	10	5.00	50.41		
Nature of Business	Technology	244	5.00	142.43	1.360	.507
	Non-Technology	31	5.00	157.98		
	Both technology & non-technology	13	5.00	151.27		
Type of Technology	IT	142	3.50	129.49	12.679	.005**
	Non-IT	76	5.00	155.88		
	Both IT & non-IT	38	5.00	168.71		
	None	32	5.00	155.34		
Nature of Output	Product oriented	148	5.00	145.79	.941	.625
	Service oriented	38	5.00	133.82		
	Both product & service oriented	102	5.00	146.61		

Source: Field Survey
**Significant at 1% level of significance

When it comes to learning business knowledge through experience, the Kruskal-Wallis H Test shows that there are valid differences between startup categories based on stages of the startup life cycle (P = <0.01) and technology type (P = .005) because the P values are less than .05. This can be because startups at early stages have less experience than startups at later stages; similarly, IT startups, which are new, may lack enough business experience as many students establish IT startups. However, when it comes to learning through business experience, there is no significant difference between various startup categories depending on their nature of business (P = .507) and nature of output (P = .625). A pairwise comparison is conducted for groups with a P value less than .05 and pairs of startup categories with significant differences are given in the below table:

Table 5.64

Pairwise Comparison – Experience and Business Knowledge

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Early Traction	-100.240	<0.01
	Ideation and Scale-up	-113.809	<0.01
	Ideation and Maturity	-96.391	.026
	Validation and Early Traction	-43.490	.008
	Validation and Scale-up	-57.059	<0.01
Type of Technology	IT and Both IT & non-IT	-39.225	.020

Source: Field Survey

Results after conducting Mann-Whitney U test are as follows:

Table 5.65

Experience and Business Knowledge – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann-Whitney χ^2	Sig.
DPIIT Registration	Yes	189	5.00	149.19	8469.500	.133
	No	99	5.00	135.55		
KSUM Registration	Yes	143	5.00	152.33	9248.500	.072
	No	145	5.00	136.78		
Status in Incubators	Incubatee	234	5.00	146.19	5923.000	.415
	Coworking	54	5.00	137.19		

Source: Field Survey

Based on the DPIIT registration (P = .133), KSUM registration (P = .072) and status in incubators (P = .415), the various categories of startups do not significantly differ from one another when it comes to learning business know ledge through experience, according to the results of the Mann-Whitney U test.

The summary of hypothesis testing for the business knowledge of startup team is given in the below table.

Table 5.66

Hypothesis Testing – Business Knowledge

Hypothesis	Statements	Group for which H_0 is rejected
There is no significant difference among the various categories of startups with regard to the business knowledge of the startup team.	Business knowledge is acquired through coaching from incubation centre	Nature of output and status in incubators
	Business knowledge is acquired through training from incubation centre	Nature of output and status in incubators
	Business knowledge is acquired through various business activities	Stages of startup life cycle and type of technology

Source: Field Survey

❖ Technological Resources

Technological resources include assets that are developed using any type of technology or that give the right to use a technology. For the purpose of the study, three important technological resources have been identified: software or applications developed by startups, license agreements that allow the startups to use a particular technology and a technology or design exclusive to the startup that has been developed and patented by the startup. Technological resources may be either already developed (or acquired) by the startup, under the process of development (or acquisition), or not developed (or acquired) by the startup. The details of the technological resources of startups under study are as follows:

Table 5.67

Technological Resources

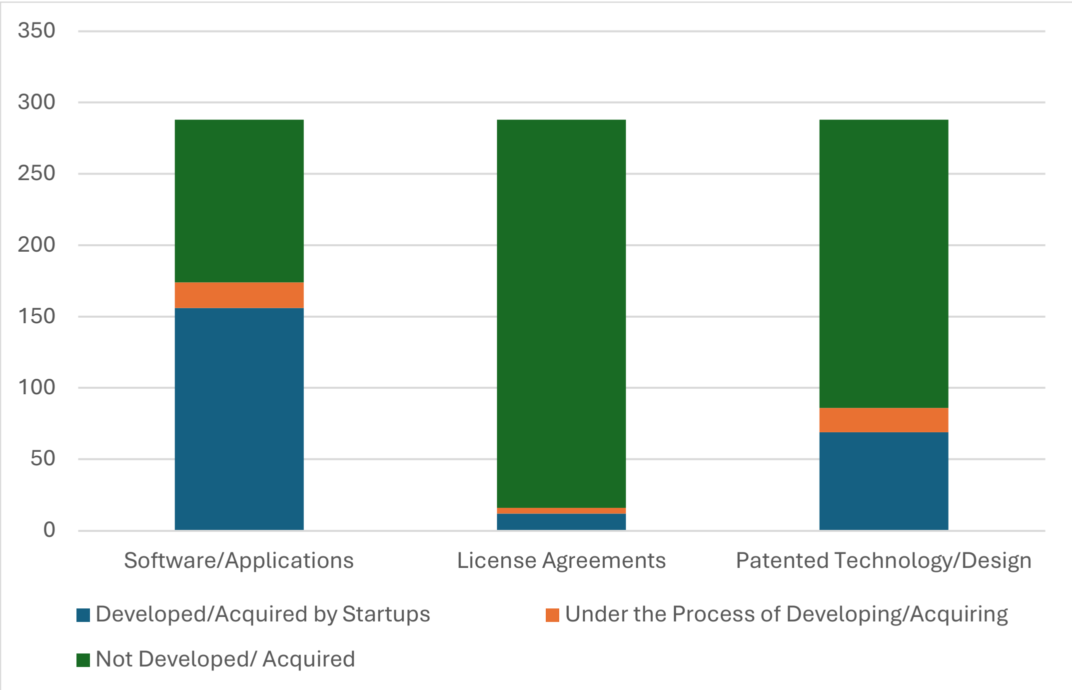
Technological Resources	Developed/ Acquired by Startups	Under the Process of Developing/ Acquiring	Not Developed/ Acquired	Total
Software/Applications	156 (54.2%)	18 (6.3%)	114 (39.6%)	288 (100%)
License Agreements	12 (4.2%)	4 (1.4%)	272 (94.4%)	288 (100%)
Patented Technology/Design	69 (24%)	17 (5.9%)	202 (70.1%)	288 (100%)

Source: Field Survey
Figures in Parentheses indicate Column Percentages

The aforesaid table indicates that 54.2% of startups have already developed their own software/ application. 6.3% are in the process of development and 39.6% have not developed a software/application. 94.4% of startups have never acquired a license agreement. 1.4% of startups are in the process of acquiring and 4.2% have already acquired license agreements to use technology. 70.1% of startups under the study don't have a patented technology/design. But 24% of startups already own patented technology/design and 5.9% of startups are in the process of acquiring them. It can be understood that the technological resources that are developed by most of the startups under the study are softwares/applications. The technological resources of the startups in the study are graphically presented in the graph given below.

Chart 5.2

Technological Resources



❖ Other Intangible Resources

Brand name and logo are those intangible resources that provide identity and brand value to the startups in the market. A brand name is the unique name of a product that will help customers identify and distinguish it from a competitor's product. A logo is a symbol or a small design that represents the brand and gives the product an identity. Customers identify startups and their products through their brand name as well as logo. But not all startups have a brand name and logo. The details of the number of startups with a brand name and logo under the study are given below.

Table 5.68

Other Intangible Resources

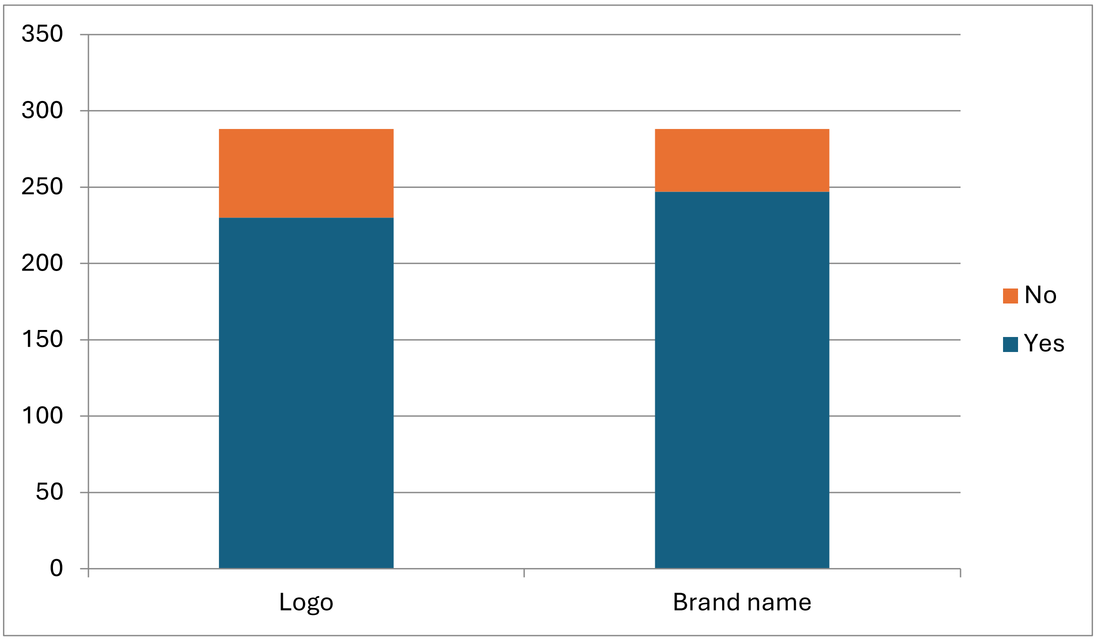
Other Intangible Resources	Yes	No	Total
Logo	230 (79.9%)	58 (20.1%)	288 (100%)
Brand name	247 (85.8%)	41 (14.2%)	288 (100%)

Source: Field Survey
Figures in Parentheses indicate Column Percentages

From the analysis of startups with brand names and logos, it can be found that 79.9% of startups have a logo and 85.8% have a brand name. 20.1% of startups in the study don't have a logo and 14.2% don't have a brand name. We can understand that logos and brand names are considered important by startups since a large majority of startups have them. The graphical presentation of other intangible resources using a bar chart is given below.

Chart 5.3

Other Intangible Resources



5.4 Chapter Summary

The Kerala startup ecosystem comprises startups from various categories. Startups in the study are mostly registered in DPIIT and almost half in KSUM. The majority of the startups are technology-based, with IT being the most common technology used. Product oriented startups are more prevalent, with most incubated in incubation centres. The startups are mostly private limited companies, predominantly in health/life sciences and IT/software sectors. There is a significant association between DPIIT registration, KSUM registration, stages of the startup life cycle, business nature, technology type, output nature and status in incubators of startups. According to Actor-Resources-Activity model, individual actors are analysed by using their activity structure, organisation structure and resource collection. The activity structure of startups is classified into six groups, such as activities associated with market research & business formation, revenue generation & performance evaluation, planning & team building, product modeling & networking, funding & IP registration and physical resource & expertise seeking. With regard to market research & business formation, revenue generation & performance evaluation and planning & team building activities, there is a significant difference among startups at various stages of the life cycle, especially startups at the ideation and validation stages, with startups at later stages. Performance of product modeling & networking and funding & IP registration activities are also significantly different among startups based on their DPIIT registration, KSUM registration, stages of the startup life cycle, nature of business, type of technology, nature of output and status in incubators. Organisation structure of startups is substantially different only based on the different phases of the startup life cycle and registration status in DPIIT as well as KSUM. The resource collection of startups included the analysis of financial resources, physical infrastructure, human resources, business knowledge, technological resources and other intangible resources. From the analysis of financial resources, it is found that bootstrapping and earnings of startups are the most commonly used sources of finance by various startup categories. Apart from stock/raw materials and plant & machinery, most of the physical infrastructure needed by startups is provided by incubation centres.

Chapter 6

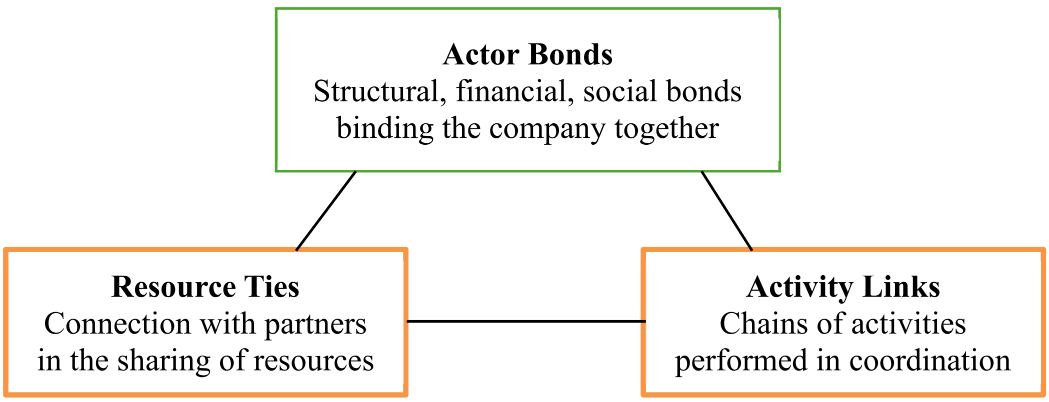
Components of Business Relationships - Startups

6.1 Introduction

In the previous chapter, we discussed the components that define an individual actor. Accordingly, the activity structure, organisation structure and resource collection of startups were analysed in detail. After understanding the individual actor, it is important to examine their business relationships according to the Actor-Resources-Activity model (Hakansson & Snehota, 1995). The ARA model has an important layer known as substance in business relationships. This layer explains the interplay of activity links, resource ties and actor bonds in a business relationship.

Figure 6.1

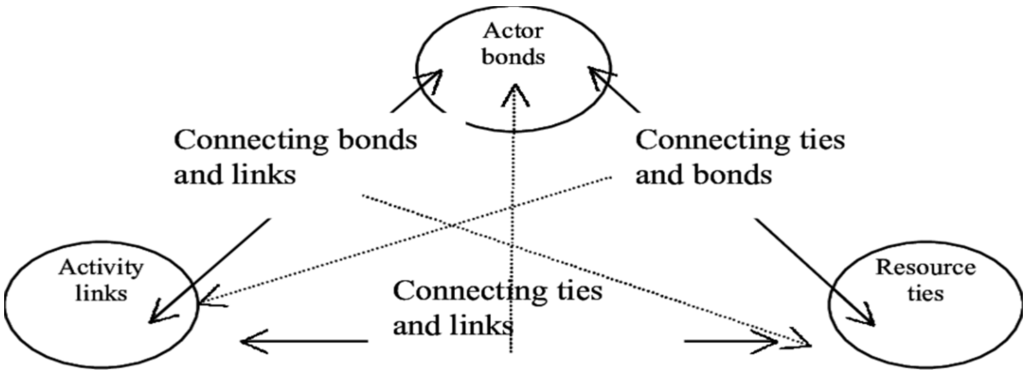
Components of Dyadic Business Relationships



"Activity Links can be explained as the specific connections in activities between companies. Interdependencies are caused by activity links in business relationships. Business relationships between two companies connect their resources. A relationship between two companies can tie together more or less tightly some of their resources in a specific way. Bonds arise in business relationships as two related actors mutually acquire meaning in their reciprocal acts and interpretations." – Hakansson & Snehota, 1995.

Figure 6.2

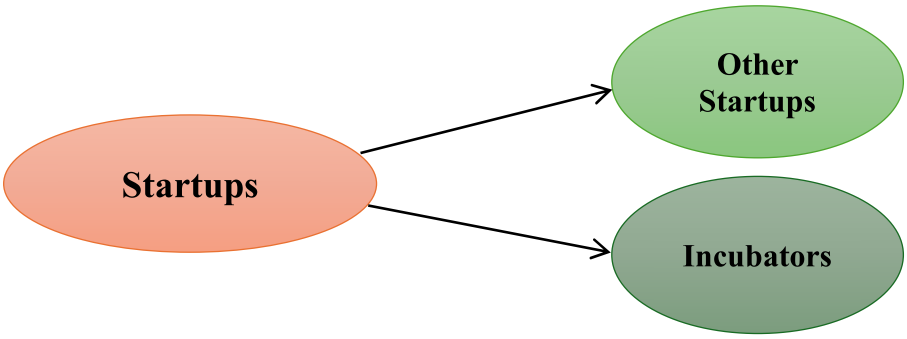
Dimensions of Change in Business Networks. (Hakansson & Snehota, 1995)



As explained in ARA model, in any dyad business relationship, there will be two actors. Actors are the firms or companies that are part of the business network. Activity links are formed between the actors when the activities performed by them are connected to one another. The connection between activities will lead to the sharing of resources. Therefore, resource ties are developed between the concerns. In a dyadic relationship, bonds will arise between actors through business and social interactions. The interplay between activity links, resource ties and actor bonds in business relationships shows whether they are dependent on one another. This chapter discusses activity links, resource ties and actor bonds from two different dimensions: one between startups and other startups and another between startups and incubators.

Figure 6.3

Dyadic Business Relationships of Startups



The three dimensions of business relationships (activity links, actor bonds and resource ties) are examined in detail for various categories of startups in the chapter. This helps to know if there is a significant difference in the activity links, resource ties and actor bonds of various startup categories with other startups as well as incubators. The Kruskal-Wallis and Mann-Whitney U tests are used for analysis here. Correlation and multiple regression analysis are used to evaluate the relationship and dependency between activity links, resource ties and actor bonds of startups with other startups as well as incubators.

6.2 Activity Links, Actor Bonds and Resource Ties with Other Startups and Incubators

This section of the chapter focuses on analysing the activity links, actor bonds and resource ties that startups share with other startups and incubators. Startups are the most important actors in the startup ecosystem and support from fellow startups is one of the most crucial factors for their survival. Incubators are the supporting organisations that help startups survive the competition in the business environment and succeed in their businesses. In order to understand the business relationship of various startup categories with other startups and incubators in the same ecosystem, we are analysing the level of coordination startups have with other startups and incubators in the performance of different activities, bonds shared by them on a structural, economic and social basis, as well as the strength of resource sharing.

Exploratory factor analysis of activity links, actor bonds and resource ties of startups with other startups and incubators is conducted for the grouping of data. Kruskal-Wallis H test and Mann-Whitney U test are used to examine if there is a notable difference in the activity links, actor bonds and resource ties of various startup categories with other startups and incubators. The analysis of activity links, actor bonds and resource ties are presented below.

6.2.1 Activity Links with Other Startups

Startups that function within the same incubator or even the same ecosystem help each other perform various activities. A startup in their ideation stage can take help from other startups in the same or higher stage with regard to accessing the feasibility of their idea or developing a prototype model. Coexisting with each other is an important aspect of startup survival in an ecosystem. Startups perform numerous activities in their lifetime and the activity links indicate the linkage between the different activities performed by startups. For analysing the link between activities performed by startups, the level of coordination a startup has with other startups while performing an activity is measured. The level of coordination is measured on a five-point scale from very high to very low. Eighteen activities performed by startups were taken into account for analysing the activity links with other startups.

❖ **Exploratory Factor Analysis - Activity Links with Other Startups**

Eighteen activities performed by startups have been selected for analysing activity links with other startups. Exploratory factor analysis is conducted for summarising and grouping activities based on the level of coordination startups have with other startups in the performance of these activities. The suitability of data for factor analysis is measured by using the Kaiser-Meyer-Olkin test and Bartlett's test of Sphericity is used to test the null hypothesis that sample data are uncorrelated. The results of both tests are given in the below table:

Table 6.1

KMO and Bartlett's Test – Activity Links with Other Startups

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.765
	Approx. Chi-Square	848.129
Bartlett's Test of Sphericity	DF	153
	Sig.	<0.01

Source: Field Survey

The result of the KMO test of sample adequacy is .765. For EFA, sampling can be deemed sufficient if the KMO value falls between 0.7 and 0.79. P value of Bartlett's Test of Sphericity is less than .05 (P = <0.01), indicating a substantial correlation between the sample data. Principal component analysis and exploratory factor analysis are carried out since the KMO test guarantees sample adequacy and Bartlett's test of Sphericity guarantees correlation between sample data.

Table 6.2

Total Variance Explained – Activity Links with Other Startups

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.056	28.087	28.087	5.056	28.087	28.087
2	2.465	13.693	41.780	2.465	13.693	41.780
3	1.996	11.087	52.867	1.996	11.087	52.867
4	1.273	7.072	59.939	1.273	7.072	59.939
5	1.164	6.466	66.405	1.164	6.466	66.405
Extraction Method: Principal Component Analysis						

Source: Field Survey

The total variance extracted after principal component analysis can be understood from the above table. The results indicate that there are five factors with an Eigenvalue greater than 1, which together explain 66.405% of the variance extracted, which is considered to be great for factorisation. As a result of EFA, five factors are identified for grouping activities based on their activity links with other startups. The factors and factor loadings are given in the table below.

Table 6.3

Factors and Factor Loadings – Activity Links with Other Startups

Factors	Activities	Factor Loadings
Factor-1 (Marketing & Expertise Assistance)	Customer generation and care	.915
	Sales and revenue generation	.834
	Marketing of the product	.721
	Arranging assistance of professionals like accountants, lawyers etc.	.602
	Arranging the technical assistance needed for business	.594

Factors	Activities	Factor Loadings
Factor-2 (Idea Feasibility & Registration)	Developing a business idea	.909
	Conducting a market survey	.906
	Conducting a feasibility study	.834
	Formally registering a startup	.430
Factor-3 (Product Modeling & Team Building)	Hiring and training employees	.803
	Research and modeling of a prototype or sample	.755
	Organising a startup team	.611
Factor-4 (Business Development & Evaluation)	Evaluating the performance of startups	.769
	Arranging office infrastructure facilities	.730
	Devoting full time to business development	.592
Factor-5 (Mentoring & Resource Collection)	Purchasing stock or raw materials & arranging machinery/equipment	.831
	Applying for intellectual properties like patents, trademarks etc.	.764
	Arranging mentoring support	.478

Source: Field Survey

❖ Analysis of Activity links with Other Startups

As indicated in Table 6.3, there are five factors named as marketing & expertise assistance, idea feasibility & registration, product modeling & team building, business development & evaluation and mentoring & resource collection formed as the result of EFA. Therefore, the activity links of startups with other startups in the ecosystem are classified into these five groups. The factor loadings of each group are also given in the above table (Table 6.3). Activity links for various categories of startups can differ from one another. A product oriented startup may have a higher level of activity links with other startups than a service oriented startup. Based on the stages of startup lifecycle, nature of business, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators, the level of coordination that startups have with other startups in the performance of different activities can vary. In order to know if there is a significant difference in the activity links of various categories of startups with other startups, the following hypothesis is formulated:

H_0: There is no significant difference among various categories of startups with regard to their activity links with other startups.

The testing of hypothesis and results are as follows:

- **Factor 1 - Marketing & Expertise Assistance**

Marketing & expertise assistance encompasses the activity link for five key activities such as customer generation and care, sales and revenue generation, marketing of products, arranging assistance of professionals like accountants, lawyers etc and arranging technical assistance needed for business. Marketing involves attracting customers through various techniques, addressing their needs, ensuring sales and generating revenue. These activities will require the assistance of other startups that specialise in helping businesses market their products if there is no dedicated marketing team or sufficient marketing expertise within the startup team. Similarly, startups will require the assistance and expertise of technical experts, accountants, lawyers etc. in the course of their startup life to progress. Startups can arrange such assistance by either having these experts on their team or by having a network of connections with such experts. The Kruskal-Wallis H and Mann-Whitney U test are conducted to determine if there is a significant difference in the activity links among the various categories of startups for marketing & expertise assistance. The test results are provided in the table below.

Table 6.4

Marketing & Expertise Assistance - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.20	83.73	33.241	$<0.01^{**}$
	Validation	41	2.20	87.68		
	Early Traction	141	2.80	150.23		
	Scale-up	85	3.00	166.49		
	Maturity	10	3.40	176.55		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Nature of Business	Technology	244	2.80	145.53	17.691	<0.01**
	Non-Technology	31	2.40	104.95		
	Both technology & non-technology	13	3.60	219.50		
Type of Technology	IT	142	2.80	148.46	17.272	.001**
	Non-IT	76	2.60	130.89		
	Both IT & non-IT	38	3.10	185.84		
	None	32	2.80	110.16		
Nature of Output	Product oriented	148	2.60	139.16	6.911	.052
	Service oriented	38	2.60	122.83		
	Both product & service oriented	102	2.80	160.32		

Source: Field Survey
**Significant at 1% level of significance

Responses from startups indicate a moderate level of coordination among startups for marketing & expertise assistance. In terms of the stages of the life cycle, nature of business and type of technology (P = <0.01, P = <0.01 and P = .001) of startups, there is a significant difference in the level of coordination among startups for marketing & expertise assistance activities, according to the Kruskal-Wallis H test results. The activity link with other startups for marketing & expertise support does not, however, differ significantly based on the nature of output (P = .052) of startups, since the P value is more than .05. Which means that product oriented, service oriented and both product & service oriented startups have same level of coordination with other startups in the performance marketing & expertise assistance activities. For every group of startups with a P value smaller than .05, a pairwise comparison is conducted. The pairings in each group with a significant difference are shown in the table below.

Table 6.5

Pairwise Comparison - Marketing & Expertise Assistance

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Scale-up	-82.761	.019
	Validation and Early traction	-62.551	<0.01
	Validation and Scale-up	-78.805	<0.01
	Validation and Maturity	-88.867	.024
Nature of Business	Non-technology and Technology	40.577	.031
	Non-technology and Both technology & non-technology	-114.548	<0.01
	Technology and Both technology & non-technology	-73.971	.005
Type of Technology	None and Both IT & non-IT	-75.868	.001
	Non-IT and Both IT & non-IT	-54.947	.005

Source: Field Survey

Startups at early and later stages, as well as non-technology and technology startups, have different levels of coordination with other startups for marketing & expertise assistance activities. Similarly, startups that do not use any technology, non-IT startups and both IT & non-IT startups also do not have the same level of coordination for marketing & expertise assistance activities.

Results of Mann-Whitney U test conducted are given in the below table:

Table 6.6

Marketing & Expertise Assistance – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.00	160.67	6299.000	<0.01**
	No	99	2.60	113.63		
KSUM Registration	Yes	143	3.00	167.91	7020.500	<0.01**
	No	145	2.60	121.42		
Status in Incubators	Incubatee	234	2.80	148.98	5270.500	.057
	Coworking	54	2.40	125.10		

Source: Field Survey
**Significant at 1% level of significance

Based on DPIIT registration (P = <0.01) and KSUM registration (P = <0.01) of startups, there is a significant difference in the activity link with other startups for marketing & expertise support, according to the Mann-Whitney U Test. However, there is no discernible difference in the activity link with other startups for marketing & expertise support based on status in incubators (P = .057) of startups. Therefore, it can be understood that the level of coordination of incubatee and coworking startups with other startups for marketing & expertise assistance activities is the same. But that of startups registered and not registered in DPIIT and KSUM is significantly different.

- **Factor 2 - Idea Feasibility & Registration**

Idea feasibility & registration involve four activities: developing a business idea, conducting a market survey, conducting feasibility study and formally registering the startup. Idea generation, feasibility study and market survey are activities carried out at the initial stage of a startup. Founders may seek assistance from other startups due to their lack of experience or insufficient resources to perform these activities independently. Later on, in order to establish themselves as a business entity, startups will need to register as a partnership firm, LLP, or private limited company. They may also require assistance from experienced professionals in the startup industry. The Kruskal-Wallis H test and Mann-Whitney U test are employed to determine if there are significant differences in the activity link for idea feasibility & registration with other startups across various startup categories.

Table 6.7

Idea Feasibility & Registration - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	130.32	4.122	.390
	Validation	41	1.75	122.13		
	Early Traction	141	2.00	148.63		
	Scale-up	85	2.00	150.15		
	Maturity	10	2.00	145.55		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Nature of Business	Technology	244	2.00	144.55	4.339	.114
	Non-Technology	31	1.75	127.50		
	Both technology & non-technology	13	2.00	184.08		
Type of Technology	IT	142	2.00	132.01	4.647	.052
	Non-IT	76	2.00	161.68		
	Both IT & non-IT	38	2.00	168.96		
	None	32	1.87	130.08		
Nature of Output	Product oriented	148	2.00	141.27	3.619	.164
	Service oriented	38	2.00	127.72		
	Both product & service oriented	102	2.00	155.44		

Source: Field Survey

With P values exceeding .05, the Kruskal-Wallis H test shows that the different startup categories, based on stages of the startup life cycle (P = .390), nature of business (P = .114), type of technology (P = .052) and nature of output (P = .164), do not significantly vary in their activity link with other startups for idea feasibility and registration. This means that the different categories of startups tested have the same level of coordination with other startups while performing idea feasibility and registration activities, but responses indicate that startups have a low level of coordination with other startups for idea feasibility and registration. The Mann-Whitney U test results are as follows:

Table 6.8

Idea Feasibility & Registration – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	151.47	8038.000	.157
	No	99	2.00	138.19		
KSUM Registration	Yes	143	2.00	152.38	9240.500	.106
	No	145	2.00	136.73		
Status in Incubators	Incubatee	234	2.00	147.28	5668.000	.233
	Coworking	54	2.00	132.46		

Source: Field Survey

There is no significant difference in the activity link of various startup categories with other startups for idea feasibility & registration, according to the Mann-Whitney U Test based on DPIIT registration (P = .157), KSUM registration (P = .106) and status in incubators (P = .233), as the P values are greater than .05. Therefore, various categories of startups have the same level of coordination for the performance of idea feasibility & registration activities and according to the responses, it is low.

- **Factor 3 - Product Modeling & Team Building**

Product modeling & team building include three activities: hiring and training employees, research and modeling prototypes/samples and organising a startup team. Human resources are one of the most important assets needed in a business. There should be a strong and efficient core team behind every startup and talent should be hired based on the specific requirements of the startups. To hire talented members and build an efficient team, startups can seek help from other startups that specialize in HR or have talent available for sharing. Similarly, startups need to develop models of their prototypes or sample products that they need to test and finalise. Startups may require technical assistance and they can seek help from experienced startups. In order to determine if there is a significant difference between various categories of startups in terms of their activity link for product modeling & team building with other startups, the Kruskal-Wallis H test and Mann-Whitney U test are conducted. The test results are provided below.

Table 6.9

Product Modeling & Team Building - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	100.45	13.804	.008**
	Validation	41	2.33	113.41		
	Early Traction	141	2.67	145.94		
	Scale-up	85	3.00	163.94		
	Maturity	10	2.16	134.90		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Nature of Business	Technology	244	2.67	149.94	13.830	.001**
	Non-Technology	31	2.00	93.11		
	Both technology & non-technology	13	2.67	164.85		
Type of Technology	IT	142	2.67	150.57	23.868	<0.01**
	Non-IT	76	2.33	132.57		
	Both IT & non-IT	38	3.00	187.20		
	None	32	2.00	95.22		
Nature of Output	Product oriented	148	2.33	136.57	18.250	<0.01**
	Service oriented	38	2.00	107.91		
	Both product & service oriented	102	3.00	169.64		

Source: Field Survey
**Significant at 1% level of significance

The results of the Kruskal-Wallis H test suggest a significant disparity in the activity link with other startups for product modeling & team building based on the stages of startups (P = .008), the nature of business (P = .001), the type of technology (P = <0.01) and the nature of output (P = <0.01). This is indicated by the fact that the P values are less than .05. This means that within all the major categories of startups, different startup categories have different levels of coordination with other startups while performing product modeling & team building activities. The responses from different categories of startups show a moderate to low level of activity link with other startups for product modeling & team building. A comparison is made between pairs of startup categories from groups with a P value of less than .05. The table below presents the pairs with significant differences in each group.

Table 6.10

Pairwise Comparison – Product Modeling & Team Building

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Validation and Scale-up	-50.817	.014
Nature of Business	Non-technology and Technology	56.832	.001
	Non-technology and Both technology & non-technology	-71.733	.026
Type of Technology	None and IT	-55.348	.004
	None and Both IT & non-IT	-91.979	<0.01
	Non-IT and Both IT & non-IT	-54.632	.005
Nature of Output	Service oriented and Both product & service oriented	-61.734	<0.01
	Product oriented and Both product & service oriented	-33.075	.006

Source: Field Survey

The activity link for product modeling & team building of product oriented startups and service oriented startups is significantly different from the activity links of both product & service oriented startups. Likewise, the level of coordination that non-technology startups have with other startups for product modeling & team building is not the same as technology and both technology & non-technology startups.

The Mann-Whitney U test has been conducted and the results are as follows:

Table 6.11

Product Modeling & Team Building – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.67	155.42	7292.000	.002**
	No	99	2.33	123.66		
KSUM Registration	Yes	143	2.67	155.86	8743.000	.021*
	No	145	2.33	133.30		
Status in Incubators	Incubatee	234	2.67	149.72	5095.500	.026*
	Coworking	54	2.00	121.86		

Source: Field Survey

*Significant at 5% level of significance, **Significant at 1% level of significance

The results of the Mann-Whitney U Test show a notable difference in the activity link with other startups for product modeling & team building based on DPIIT registration (P = .157) and KSUM registration (P = .002), as well as incubator status (P = .026) due to the P values being less than .05.Therefore, the level of coordination that DPIIT registered startups and startups not registered in DPIIT, KSUM registered startups and startups not registered in KSUM and that of incubatee startups and coworking startups for product modeling & team building are significantly different.

- **Factor 4 - Business Development & Evaluation**

Business development & evaluation includes three activities: evaluating performance of startups, arranging office infrastructure facilities and devoting full time for business development. Startups need to arrange office infrastructure facilities and founders need to dedicate their time to business development as part of the startup process. Office infrastructure is provided to startups by incubators, but items such as laptops are usually arranged by startups themselves. Startups can arrange any office equipment not provided by the incubator with the help of fellow startups or through other sources. Devoting full time to a business can be challenging for a founder who is involved in another business or employed elsewhere. In such cases, founders can outsource business development to startups that specialise in providing business development services. To evaluate the performance of startups, assistance can be sought from experienced startup founders or from startups that specialize in providing accounting services. The Kruskal-Wallis H and Mann-Whitney U tests are used to determine whether different startup categories remarkably differ in their activity link with other startups for business development & evaluation.

Table 6.12

Business Development & Evaluation - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	1.67	116.05	10.870	.053
	Validation	41	1.67	115.70		
	Early Traction	141	2.00	151.17		
	Scale-up	85	2.00	154.38		
	Maturity	10	1.67	115.95		
Nature of Business	Technology	244	2.00	144.03	4.372	.112
	Non-Technology	31	1.67	130.53		
	Both technology & non-technology	13	2.00	186.54		
Type of Technology	IT	142	2.00	130.53	13.872	.003**
	Non-IT	76	2.16	162.13		
	Both IT & non-IT	38	2.16	174.21		
	None	32	1.6667	129.34		
Nature of Output	Product oriented	148	2.00	146.68	4.314	.116
	Service oriented	38	1.6667	119.34		
	Both product & service oriented	102	2.00	150.71		

Source: Field Survey
**Significant at 1% level of significance

The table above indicates that various categories of startups have a low level of coordination with other startups in the performance of business development & evaluation activities. The results of the Kruskal-Wallis H test indicate a valid difference in the activity link with other startups for business development & evaluation based on the type of technology (P = .003) of startups. However, there is no significant difference in the activity link with other startups for business development & evaluation based on the stages of startups (P = .053), nature of business (P = .112) and nature of output (P = .116) of startups, as the P values are greater than .05. Therefore, startups belonging to these categories have the same level of coordination with other startups for business development & evaluation, which according to the responses is low. A comparative analysis was conducted for various startup categories, taking into account the type of technology utilised. The table below presents the pairs that exhibit significant differences with each other in the group.

Table 6.13

Pairwise Comparison - Business Development & Evaluation

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Type of Technology	IT and Non-IT	-31.603	.038
	IT and Both IT & non-IT	-43.682	.020

Source: Field Survey

The table below shows the results of the Mann-Whitney U test that was conducted.

Table 6.14

Activity Link for Business Development & Evaluation – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	155.75	7230.000	.001**
	No	99	1.67	123.03		
KSUM Registration	Yes	143	2.00	154.21	8979.000	.045*
	No	145	1.67	134.92		
Status in Incubators	Incubatee	234	2.00	150.65	4879.500	.008**
	Coworking	54	1.67	117.86		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

The table above demonstrates that there is a low level of coordination among startups for business development & evaluation. Additionally, the Mann-Whitney U test reveals a significant disparity in the activity link with other startups for business development & evaluation based on DPIIT registration (P = .001), KSUM registration (P = .045) and status in an incubator (P = .008), as indicated by the P values being less than .05. Even with a low level of coordination, there is a significant difference in the responses of startups within the major categories tested.

- **Factor 5 - Mentoring & Resource Collection**

Mentoring & resource collection include three activities: purchasing raw materials & arranging machinery/equipments, applying for intellectual properties such as patents and trademarks and arranging mentoring support. Raw materials, machinery and equipment are the tangible resources needed for manufacturing products. Similarly, patents, trademarks and other intangible assets are important resources for startups. Startups can acquire these resources by seeking support from other startups or by sharing resources. Mentors provide guidance, share their knowledge and offer other resources to startups. Experienced startups can mentor other new ones in the same field. Startups can seek mentoring assistance from other startups that are willing to help them, or they can arrange for mentoring support. The Kruskal-Wallis H test and Mann-Whitney U tests are used to determine whether different startup categories significantly differ in their activity link with other startups for mentoring & resource collection.

Table 6.15

Mentoring & Resource Collection - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	114.36	7.373	.117
	Validation	41	2.00	126.90		
	Early Traction	141	2.33	152.72		
	Scale-up	85	2.33	148.06		
	Maturity	10	1.83	103.65		
Nature of Business	Technology	244	2.33	145.50	.696	.706
	Non-Technology	31	2.00	133.50		
	Both technology & non-technology	13	2.00	151.96		
Type of Technology	IT	142	2.00	107.37	71.572	<0.01**
	Non-IT	76	3.00	189.64		
	Both IT & non-IT	38	3.00	202.97		
	None	32	2.00	132.59		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Nature of Output	Product oriented	148	2.33	156.22	19.979	<0.01**
	Service oriented	38	2.00	89.75		
	Both product & service oriented	102	2.33	147.89		

Source: Field Survey
**Significant at 1% level of significance

It can be observed that non-IT and both IT & non-IT startups have a moderate level of coordination with other startups for mentoring & resource collection while other categories have a low level of coordination. The results of the Kruskal-Wallis H test indicate a substantial difference in the activity link with other startups for mentoring & resource collection based on their type of technology (P = < 0.01) and nature of output (P < 0.01). There is no significant difference in the activity link with other startups for mentoring & resource collection based on the stage of startups (P = .117) and the nature of business (P = .706). A pairwise comparison was conducted for each group of startups, with a significance level (P value) of less than .05. The table below presents the pairs within each group that exhibited a significant difference.

Table 6.16

Pairwise Comparison - Mentoring & Resource Collection

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Type of Technology	IT and Non-IT	-82.271	<0.01
	IT and Both IT & non-IT	-95.600	<0.01
	None and Non-IT	-57.051	.006
	None and Both IT & non-IT	-70.380	.002
Nature of Output	Service oriented and Both product & service oriented	-58.142	.001
	Service oriented and Product oriented	66.470	<0.01

Source: Field Survey

The level of coordination that IT startups have with other startups while performing mentoring & resource collection activities is notably different from the level of coordination non-IT and both IT & non-IT startups have with other startups for the same. Similarly, service oriented startups also have a different level of coordination with other startups for mentoring & resource collection compared to product oriented and both product & service oriented startups.

The Mann-Whitney U test results are displayed in the table below.

Table 6.17

Mentoring & Resource Collection – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.33	154.42	7481.000	.005**
	No	99	2.00	125.57		
KSUM Registration	Yes	143	2.33	156.25	8687.000	.016*
	No	145	2.00	132.91		
Status in Incubators	Incubatee	234	2.3333	151.50	4679.000	.003**
	Coworking	54	2.00	114.15		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

The findings of the Mann-Whitney U test indicate a statistically significant difference in the activity link with other startups for mentoring & resource collection, based on their registration with DPIIT (P = .005) and KSUM (P = .016), as well as their status in an incubator (P = .003), as evidenced by the P values being less than .05. Hence, the level of coordination of different startup categories with other startups for mentoring & resource collection activities within a group is significantly different.

The summary of hypothesis testing for activity links with other startups is presented below.

Table 6.18

Hypothesis Testing - Activity Links with Other Startups

Hypothesis	Activity Links	Groups for which H_0 is rejected
There is no significant difference among various categories of startups with regard to their activity links with other startups.	Marketing & Expertise Assistance	Stages of startup life cycle, nature of business, type of technology, DPIIT registration and KSUM registration
	Idea Feasibility & Registration	Nil
	Product Modeling & Team Building	Stages of startup life cycle, nature of business, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators
	Business Development & Evaluation	Type of technology, DPIIT registration, KSUM registration and status in incubators
	Mentoring & Resource Collection	Type of technology, nature of output DPIIT registration, KSUM registration and status in incubators

Source: Field Survey

6.2.2 Actor Bonds with Other Startups

Actor bonds refer to the connections established between business entities through the interactions of individuals within them. Businesses are interdependent and rely on various environmental factors for their operations. The development of actor bonds between startups is facilitated by the establishment of structural, economic and social connections. The measurement of actor bonds with other startups is conducted using a five-point Likert scale consisting of twelve items, with four statements each pertaining to structural, economic and social bonds.

❖ **Exploratory Factor Analysis - Actor bonds with Other Startups**

EFA is conducted to categorise the twelve items related to actor bonds into three factors: structural bond, economic bond and social bond as outlined in the literature.

The adequacy of the sample for factor analysis is assessed using the Kaiser-Meyer-Olkin test and the presence of significant correlations within the sample data is tested using Bartlett's test. The results of both tests are provided in the table below.

Table 6.19

KMO and Bartlett's Test – Actor Bonds with Other Startups

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.843
Bartlett's Test of Sphericity	Approx. Chi-Square	1204.626
	DF	66
	Sig.	<0.01

Source: Field Survey

The outcome of the Kaiser-Meyer-Olkin (KMO) test for sample adequacy yields a value of .843, indicating that the sample meets the criteria for exploratory factor analysis (EFA) with a meritorious level of adequacy, as KMO values falling within the range of 0.8 to 0.89 are considered satisfactory. Furthermore, the Bartlett's test of Sphericity demonstrates a statistically significant correlation within the sample data, as evidenced by a P value of less than .05 (P = <0.01), thereby supporting its suitability for EFA. The result of statistical assumption tests suggests that the sample data is appropriate for factor analysis, thus leading to the implementation of principal component analysis.

Table 6.20

Total Variance Explained – Actor Bonds with Other Startups

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.459	53.829	53.829	6.459	53.829	53.829
2	1.876	15.629	69.458	1.876	15.629	69.458
3	1.194	9.949	79.407	1.194	9.949	79.407

Extraction Method: Principal Component Analysis

Source: Field Survey

The results of the principal component analysis reveal that there are three factors with Eigenvalues exceeding 1, collectively explaining 79.407% of the extracted variance. This level of variance is deemed adequate for factorisation. Consequently, three factors have been identified through Exploratory Factor Analysis (EFA) for the purpose of grouping and summarising items related to actor bond. The specific factors and their corresponding factor loadings are presented in the table below.

Table 6.21

Factors and Factor Loadings – Actor Bonds with Other Startups

Factors	Items	Factor Loadings
Factor-1 (Social Bond)	Personal attachment and friendship	.902
	Mutual interaction and communication	.884
	Mutual trust and belief	.875
	Commitment	.881
Factor-2 (Structural Bond)	Performing business activities with mutual support and coordination	.751
	Sharing of facilities, equipments and other resources	.830
	Formulating policies and programs that enhance business relationships	.878
	Developing value added partnerships and Collaborations	.792
Factor-3 (Economic Bond)	Capital investment in startup	.859
	Providing business credit/grant to startup	.818
	Providing facilities/goods/services at lower rate and other financial incentives	.817
	Joint investment in innovation projects	.650

Source: Field Survey

❖ Analysis of Actor Bonds with Other Startups

Table 6.21 shows that actor bond can be classified into three factors: social bond, structural bond and economic bond. Establishing a social bond with other startups indicates a personal relationship and commitment to them. The structural bond with other startups indicates business partnerships and resource sharing with other startups. Establishing economic ties with other startups involves capital investment and other financial transactions. The bond between actors in different categories of startups can vary. The bond between certain categories of startups may be stronger or weaker than others. In order to determine if there is a significant difference in the actor bond with other startups among the various categories of startups, the following hypothesis has to be tested:

H_0: There is no significant difference among various categories of startups with regard to their actor bonds with other startups.

Results of hypothesis testing conducted to determine if there is a significant difference among various startup categories in their actor bonds with other startups are presented in the following section.

- **Social Bond with Other Startups**

The social bond among startups encompasses four key components: personal attachment and friendship, mutual interaction and communication, mutual trust and belief and commitment. The nature of this social bond may vary across different types of startups, contingent upon the personal relationships established by the founders with others. The on-going interactions and personal connections among individuals involved in startups are instrumental in fostering the development of the social bond. The Kruskal Wallis H test and Mann Whitney U test are utilised to assess whether there are significant differences in the social bonding of various startup categories with other startups. The outcomes of these tests are presented below.

Table 6.22

Social Bond with Other Startups - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.50	94.91	20.056	<0.01**
	Validation	41	3.25	99.06		
	Early Traction	141	4.00	154.52		
	Scale-up	85	4.00	154.55		
	Maturity	10	4.00	158.65		
Nature of Business	Technology	244	4.00	146.97	5.277	.071
	Non-Technology	31	3.50	115.02		
	Both technology & non-technology	13	4.50	168.46		
Type of Technology	IT	142	3.75	132.29	17.696	.001**
	Non-IT	76	4.00	159.76		
	Both IT & non-IT	38	4.25	183.11		
	None	32	3.62	116.61		
Nature of Output	Product oriented	148	4.00	142.73	4.546	.103
	Service oriented	38	3.50	122.39		
	Both product & service oriented	102	4.00	155.30		

Source: Field Survey
**Significant at 1% level of significance

Responses from most categories of startups indicate a strong social bond between startups, but the Kruskal-Wallis H test shows a statistically significant difference in the social bond with other startups based on the stages of the startup life cycle (P = <0.01) and type of technology used (P = .001). This indicates that the social bond with other startups is stronger at later stages of the startup life cycle than in the in the early stages and both IT & non-IT startups have a stronger social bond with other startups. There is no notable difference in the social bond of various startup categories with other startups based on their nature of output (P = .103) and nature of business (P = .071). This means the social bond of different categories of startups in these major categories with other startups has the same strength. The table below presents a pairwise comparison for each group of startups with a P value less than .05 and pairs showing significant differences within each group.

Table 6.23

Pairwise Comparison – Social Bond with Other Startups

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Validation and Early traction	-55.460	.002
	Validation and Scale-up	-55.486	.004
Type of Technology	None and Both IT & non-IT	-66.496	.005
	IT and Both IT & non-IT	-50.817	.004

Source: Field Survey

The Mann-Whitney U test has been conducted and the results are as follows:

Table 6.24

Social Bond with Other Startups – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.00	153.89	7581.000	.008**
	No	99	3.75	126.58		
KSUM Registration	Yes	143	4.00	159.03	8290.000	.003**
	No	145	3.75	130.17		
Status in Incubators	Incubatee	234	4.00	148.38	5411.000	.097
	Coworking	54	4.00	127.70		

Source: Field Survey
**Significant at 1% level of significance

The Mann-Whitney U Test indicates a notable disparity in the social bond with other startups based on DPIIT registration (P = .008) and KSUM registration (P = .003) of startups and from the responses it can be understood that startups registered in DPIIT and KSUM have a stronger social bond with other startups. However, there is no significant difference in the social bond with other startups based on the status in incubators (P = .097) of startups. Therefore, the social bond of incubatee and coworking startups with other startups is equally strong.

- **Structural Bond with Other Startups**

Structural bond is measured through four items, such as performing business activities with mutual support and coordination, sharing facilities, equipment's and other resources, formulating policies and programs that enhance business relationships and developing value added partnerships and collaborations**.** Startups survive with the help and support of other elements in the ecosystem; of which other startups are one of the important elements. Startups can take help from other startups for performing their activities, arranging various resources and building business partnerships also. The Kruskal-Wallis H test and Mann-Whitney U test are employed to evaluate the presence of statistically significant variations in the structural bonds of different startup categories with other startups. The results of these analyses are displayed below.

Table 6.25

Structural Bond with Other Startups - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	1.75	73.36	27.329	<0.01**
	Validation	41	2.25	98.70		
	Early Traction	141	3.00	149.06		
	Scale-up	85	3.25	166.24		
	Maturity	10	3.37	161.45		
Nature of Business	Technology	244	3.12	146.69	5.098	.078
	Non-Technology	31	2.75	116.21		
	Both technology & non-technology	13	3.50	170.85		
Type of Technology	IT	142	3.00	133.73	17.772	<0.01**
	Non-IT	76	3.25	153.48		
	Both IT & non-IT	38	3.62	189.36		
	None	32	2.87	117.70		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Nature of Output	Product oriented	148	3.00	144.97	12.843	.002**
	Service oriented	38	2.50	102.89		
	Both product & service oriented	102	3.25	159.31		

Source: Field Survey
**Significant at 1% level of significance

Different categories of startups have moderately strong structural bond with other startups. The results of the Kruskal-Wallis H test indicate a substantial disparity in the structural bond with other startups based on the stages of the startup life cycle (P = <0.01), type of technology (P = <0.01) and nature of output (P = .002). Startups at later stages, both IT & non-IT startups and both product & service oriented startups have stronger structural bonds with other startups. However, there is no significant difference in the structural bond with other startups based on the nature of business (P = .078) of startups. Technology startups, non-technology startups and both technology & non-technology startups have equally strong structural bonds with other startups. A pairwise comparison was conducted for each group of startups, with a significance level of p < .05. The table below displays the pairs within each group that exhibited a statistically significant difference.

Table 6.26

Pairwise Comparison – Structural Bond with Other Startups

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Early traction	-75.679	.035
	Ideation and Scale-up	-88.086	.005
	Validation and Early traction	-50.365	.006
	Validation and Scale-up	-67.546	<0.01
Type of Technology	None and Both IT & non-IT	-71.652	.002
	IT and Both IT & non-IT	-55.626	.001
Nature of Output	Service oriented and Both product & service oriented	-56.419	.001
	Service oriented and Product oriented	42.078	.016

Source: Field Survey

The outcomes of the Mann-Whitney U test are presented as follows:

Table 6.27

Structural Bond with Other Startups – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.25	159.57	6506.500	<0.01**
	No	99	2.75	115.72		
KSUM Registration	Yes	143	3.25	163.31	7678.000	<0.01**
	No	145	3.00	125.95		
Status in Incubators	Incubatee	234	3.25	150.57	4896.500	.010**
	Coworking	54	2.62	118.18		

Source: Field Survey
**Significant at 1% level of significance

The table above indicates that there is a moderately strong structural bond between startups. The results of the Mann-Whitney U test demonstrate a notable disparity in the structural association with other startups based on DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and incubator status (P = .010) of startups, as the P values for these groups are less than 0.05. Hence it indicates that startups registered in DPIIT, KSUM and incubatee startups have stronger structural bonds with other startups compared to startups not registered in DPIIT, not registered in KSUM and coworking startups.

- **Economic Bond with Other Startups**

The economic relationship between startups encompasses several components, including capital investment in new ventures, the provision of business credit or grants, offering facilities, goods, or services at reduced rates and other financial incentives, as well as joint investment in innovative projects. Funding is crucial for the survival and growth of any business and this is especially true for startups. Economic ties between startups are established through the support of business ideas, joint investments and financial assistance in various forms. It is important to note that the nature of economic bonds may vary among different categories of startups. For instance, product-based startups may have stronger economic connections with each other compared to service-based startups, as they require more funding for product development and physical infrastructure. To assess the presence of statistically significant differences in the structural bonds of various startup categories with other startups, the Kruskal-Wallis H test and Mann-Whitney U test were utilized. The findings of these analyses are presented below.

Table 6.28

Economic Bond with Other Startups - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	1.00	97.23	10.446	.054
	Validation	41	1.50	118.02		
	Early Traction	141	2.00	148.23		
	Scale-up	85	2.00	157.68		
	Maturity	10	1.87	140.35		
Nature of Business	Technology	244	2.00	145.90	4.241	.120
	Non-Technology	31	1.50	121.19		
	Both technology & non-technology	13	2.25	173.85		
Type of Technology	IT	142	1.75	123.31	32.299	<0.01**
	Non-IT	76	2.25	168.34		
	Both IT & non-IT	38	2.25	194.46		
	None	32	1.75	122.58		
Nature of Output	Product oriented	148	2.00	144.24	7.109	.029*
	Service oriented	38	1.62	114.51		
	Both product & service oriented	102	2.00	156.05		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

Based on the type of technology (P = <0.01) and nature of output (P = .029) of startups, there is a substantial difference in the economic bond with other startups, according to the Kruskal-Wallis H test. Even though the responses indicate a weak economic bond among startups; non-IT startups, both IT & non-IT startups and both product & service oriented startups have comparatively better economic bond with other startups. However, since the P value of these groups is greater than .05, there is no significant difference in the economic bond with other startups based on the stages of the startup life cycle (P = .054) and the nature of business (P = .120) of startups. For every group of startups having a P value less than .05, a pairwise comparison is conducted. The pairings in each group that have a notable difference are shown in the table below.

Table 6.29

Pairwise Comparison – Economic Bond with Other Startups

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Type of Technology	None and Non-IT	-45.757	.049
	None and Both IT & non-IT	-71.882	.002
	IT and Non-IT	-45.022	.001
	IT and Both IT & non-IT	-71.147	<0.01
Nature of Output	Service oriented and Both product & service oriented	-41.541	.023

Source: Field Survey

The outcomes of the Mann-Whitney U Test are presented in the following table.

Table 6.30

Economic Bond with Other Startups – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	156.82	7026.500	<0.01**
	No	99	1.75	120.97		
KSUM Registration	Yes	143	2.00	159.17	8269.000	.003**
	No	145	1.75	130.03		
Status in Incubators	Incubatee	234	2.00	150.26	4969.500	.013*
	Coworking	54	1.75	119.53		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

The table above reveals that the median value of responses across different startup categories is 2 or lower, indicating a weak economic bond between startups. The Mann-Whitney U Test demonstrates a notable disparity in the economic bond with other startups, as indicated by the DPIIT registration (P = <0.01), KSUM registration (P = .003) and incubator status (P = .013), given that the P values are less than .05. Therefore, startups registered in DPIIT and KSUM as well as incubatee startups, have a better economic bond with other startups.

The summary of hypothesis testing for actor bonds with other startups is given the below table.

Table 6.31

Hypothesis Testing – Actor Bonds with Other Startups

Hypothesis	Actor Bonds	Groups for which H_0 is rejected
There is no significant difference among various categories of startups with regard to their actor bonds with other startups.	Social Bond	Stages of startup life cycle, type of technology, DPIIT registration and KSUM registration
	Structural Bond	Stages of startup life cycle, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators
	Economic Bond	Type of technology, DPIIT registration, KSUM registration and status in incubators

Source: Field Survey

6.2.3 Resource ties with Other Startups

Resources include both tangible and intangible resources. Resources can be scarce and sharing available resources is the way to survive in a business environment. A startup shares its resources with another startup or helps them arrange needed resources when they share certain relationships with one another. Continuous resource sharing is often the result of strong relationships with other startups. Resource ties with other startups indicate the strength of their relationship with other startups with regard to their resource sharing. Resource ties with other startups are measured on the basis of five resources: financial resources, human resources, physical infrastructure resources, business knowledge and technological resources. Startups were asked to indicate their strength of relationship with other startups with regard to the sharing of these five resources on a five-point Likert scale from very strong to very weak.

❖ Exploratory Factor Analysis - Resource Ties with Other Startups

Five resources have been selected for measuring the resource ties with other startups and to ensure that the strength of relationship with other startups in sharing these five resources can explain the resource ties with other startups, EFA is conducted. Sample adequacy for factor analysis is measured by using Kaiser-Meyer-Olkin test and whether the correlation between the sample data is significant is tested by using Bartlett's Test. The result of both tests is given in the below table:

Table 6.32

KMO and Bartlett's Test – Resource Ties with Other Startups

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	189.509
	DF	10
	Sig.	<0.01

Source: Field Survey

The table above displays the results of the KMO and Bartlett's Test, indicating that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy has a value of .769. For factor analysis, sample data that has a KMO value between .70 and .79 is deemed sufficient. The statistical significance of the correlation between the sample data is shown by the P value of Bartlett's Test of Sphericity (P = <0.01). Principal component analysis was carried out as sample data is acceptable for factor analysis, according to the results of statistical assumption tests.

Table 6.33

Total Variance Extracted - Resource Ties with Other Startups

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.132	62.638	62.638	3.132	62.638	62.638
2	.708	14.151	76.789			
3	.573	10.453	87.242			
4	.316	7.326	94.568			
5	.272	5.432	100.000			
Extraction Method: Principal Component Analysis						

Source: Field Survey

Principal component analysis results show that there is a single component that collectively accounts for 62.638% of the extracted variance and has an Eigenvalue greater than 1. A single component has been identified for the purpose of assessing the resource ties with other startups based on the findings of the exploratory factor analysis. The table below lists the factor and factor loading:

Table 6.34

Factors and Factor Loadings – Resource Ties with Other Startups

Factor	Resources	Factor Loadings
Resource Ties with Other Startups	Financial Resources	.694
	Physical Infrastructure Resources	.591
	Human Resources	.736
	Business Knowledge	.823
	Technological Resources	.764

Source: Field Survey

❖ Analysis of Resource Ties with Other Startups

Through EFA, it has been ensured that resource ties with other startups can be measured by a single factor. The strength of relationships with other startups with regard to the sharing of financial resources, physical infrastructure resources, human resources, business knowledge and technological resources is considered for measuring the resource ties with other startups. Resource ties may differ between different categories of startups. Physical resources may be more shared between non-IT startups than IT startups because they may require to produce physical products. Therefore, in order to know if there is a significant difference between the resource ties of various categories of startups, the following hypothesis needs is formulated:

H_0: There is no significant difference among various categories of startups with regard to their resource ties with other startups.

The Kruskal-Wallis H test is used to analyse if there is a significant difference among various categories of startups based on their stages in startup life cycle, nature of business, type of technology and nature of output with regard to resource ties with other startups. The result of the testing is as follows:

Table 6.35

Resource Ties with Other Startups - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	1.60	89.95	21.774	<0.01**
	Validation	41	2.20	102.44		
	Early Traction	141	2.40	147.89		
	Scale-up	85	2.80	166.90		
	Maturity	10	2.40	138.75		
Nature of Business	Technology	244	2.60	148.05	13.112	.001**
	Non-Technology	31	2.20	98.95		
	Both technology & non-technology	13	3.00	186.42		
Type of Technology	IT	142	3.00	131.67	33.315	<0.01**
	Non-IT	76	2.40	156.36		
	Both IT & non-IT	38	2.60	204.59		
	None	32	2.20	101.92		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Nature of Output	Product oriented	148	2.40	146.67	18.764	<0.01**
	Service oriented	38	2.00	92.72		
	Both product & service oriented	102	2.60	160.64		

Source: Field Survey
**Significant at 1% level of significance

It is understood from the responses that the resource ties that most categories of startups have with other startups are weak. Based on the stages of life cycle (P = <0.01), nature of business (P = .001), type of technology (P = <0.01) and nature of output (P = <0.01) of startups, the results of the Kruskal-Wallis H test show a significant difference in the resource ties with other startups. Startups at scale-up stage, both technology & non-technology startups, IT startups and both product & service oriented startups have comparatively better economic bonds with other startups. A pair wise comparison of each group of startups with a P value less than .05 is performed and the pairings in each group with a meaningful difference are shown in the table below.

Table 6.36

Pairwise Comparison - Resource Ties with Other Startups

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Ideation and Scale-up	-76.945	.038
	Validation and Early traction	-45.451	.020
	Validation and Scale-up	-64.461	.000
Nature of Business	Non-technology and Technology	49.102	.006
	Non-technology and Both technology & non-technology	-87.471	.004
Type of Technology	None and Non-IT	-54.433	.011
	None and Both IT & non-IT	-102.670	<0.01
	IT and Both IT & non-IT	-72.923	<0.01
	Non-IT and Both IT & non-IT	-48.237	.021

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Nature of Output	Service oriented and Product oriented	53.945	.001
	Service oriented and Both product & service oriented	-67.918	<0.01

Source: Field Survey

Mann-Whitney U Test has been employed and results are as follows:

Table 6.37

Resource Ties with Other Startups – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.60	159.52	6517.500	<0.01**
	No	99	2.40	115.83		
KSUM Registration	Yes	143	2.60	165.47	7368.500	<0.01**
	No	145	2.40	123.82		
Status in Incubators	Incubatee	234	2.60	153.63	4180.500	<0.01**
	Coworking	54	2.20	104.92		

Source: Field Survey
**Significant at 1% level of significance

Based on DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P = <0.01) of startups, the Mann-Whitney U Test shows a substantial difference in resource ties with other startups. This is because the P values are less than .05. Hence, even though the resource ties among startups are weak, startups registered in DPIIT, startups registered in KSUM and incubatee startups have better resource ties with other startups.

The hypothesis that there is no significant difference among various categories of startups with regard to their resource ties with other startups is rejected for all the major categories of startups, indicating that there is significant difference in the resource ties among various categories of startups in all the groups.

6.2.4 Activity links with Incubators

Activity links means linking activities performed. Since incubators serve as support system for startups, many of their operations will be connected to those carried out by startups. A five-point Likert scale, which ranges from "very high to very low," is used to collect data from startups on the degree of coordination they have with their incubators in carrying out various activities. This allows the researcher to analyse the activities of startups linked to incubators. Twenty startup activities were identified in order to analyse the activity links between startups and incubators.

❖ **Exploratory Factor Analysis - Activity Links with Incubators**

A selection of twenty startup-performed activities has been chosen for analysis of the activity links with incubators. Exploratory factor analysis is used to summarise and categorise activities according to how closely startups collaborate with their incubators to carry out these tasks. The sampling adequacy is assessed using the Kaiser-Meyer-Olkin test and the significant correlation between the sample data is evaluated using Bartlett's test. The table below shows the results of both tests:

Table 6.38

KMO and Bartlett's Test – Activity Links with Incubators

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.790
Bartlett's Test of Sphericity	Approx. Chi-Square	1972.644
	DF	190
	Sig.	<0.01

Source: Field Survey

We may infer from the preceding table that the sample adequacy KMO test result is .790. A KMO score of 0.79 to 0.7 is regarded as moderate and sampling in this range is sufficient for EFA. According to Bartlett's Test of Sphericity, the sampling data exhibits a strong correlation when the P value is less than .05. Principal component analysis is done as it is verified that the sample size is sufficient (KMO test) and that there is a substantial correlation (Bartlett's Test of Sphericity) between the sampling data.

Table 6.39

Total Variance Explained – Activity Links with Incubators

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.726	33.631	33.631	6.726	33.631	33.631
2	3.233	16.166	49.798	3.233	16.166	49.798
3	1.818	9.089	58.887	1.818	9.089	58.887
4	1.311	6.556	65.443	1.311	6.556	65.443
5	1.247	6.237	71.680	1.247	6.237	71.680
Extraction Method: Principal Component Analysis						

Source: Field Survey

Principal component analysis yielded five components with Eigenvalues larger than 1, which collectively account for 66.405% of the total variance extracted (Table 6.52), a criterion deemed satisfactory for factorisation. So as per the result of EFA, five factors are identified for grouping and summarization of activities based on the activity link of startups with incubators. The factors and factor loadings are given in the table below.

Table 6.40

Factors and Factor Loadings – Activity Links with Incubators

Factors	Activities	Factor Loadings
Factor-1 (Business Development & Team Building)	Devoting full time to business development	.801
	Preparing a business plan	.796
	Formally registering a startup	.736
	Organising a startup team	.684
	Arranging seed capital to start a business	.622
	Hiring and training employees	.549

Factors	Activities	Factor Loadings
Factor-2 (Marketing & Performance Evaluation)	Sales and revenue generation	.919
	Customer generation and care	.910
	Evaluating the performance of startups	.802
	Marketing of the product	.727
Factor-3 (Idea Generation & Feasibility Study)	Developing a business idea	.890
	Conducting a market survey	.865
	Conducting a feasibility study	.823
Factor-4 (Funding & Professional Assistance)	Meeting investors and pitching for funds	.884
	Approaching financial institutions for credit	.800
	Arranging assistance of professionals like accountants, lawyers etc.	.579
Factor-5 (Product Modeling & Resource Collection)	Arranging the technical assistance needed for business	.803
	Research and modeling of prototype or sample	.698
	Purchasing stock or raw materials & arranging machinery/equipment	.638
	Applying for intellectual properties like patents, trademarks etc.	.555

Source: Field Survey

❖ Analysis of Activity Links with Incubators

Business development & team building, marketing & performance evaluation, idea generation & feasibility study, funding & professional assistance and product modeling & resource collection are five factors identified after the EFA. These five factors can be used to classify startup activities according to how well-coordinated their performances are with incubators. The way that different startup categories coordinate their performance of various activities with incubators may vary. A statistical test must be performed to see whether there are any discernible differences in the activity links of different startup categories with incubators in the execution of various activities. The following hypothesis is formulated.

H_0: There is no significant difference among various categories of startups with regard to their activity links with incubators.

Based on the hypothesis, different groups of activities need to be tested for various categories of startups to know if there is any relevant difference regarding the activity links with incubators. These tests and results are shown as follows:

- **Factor 1 - Business Development & Team Building**

Business development and team building include six activities such as devoting full time to business development, preparing a business plan, formally registering a startup, organising a startup team, arranging seed capital to start a business and hiring and training employees. Incubators provide space to entrepreneurs where they can spend time working on their businesses. Incubators are normally open and available 24 hours a day. Entrepreneurs who are new to startups will need assistance in making business plans and incubators can assist them with the various procedures of registering a business. Many incubators provide seed capital assistance to startups to support them at the initial stage. Team building focuses on building a startup team through recruiting a talented work force. Incubators can connect startups to talents available with other startups in the incubator and can also help them with recruitment procedures. Kruskal-Wallis H test and Mann-Whitney U test are used to understand if there is a significant difference in the activity link for business development & team building with incubators among various startup categories.

Table 6.41

Business Development & Team Building - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	185.50	4.882	.300
	Validation	41	2.00	145.18		
	Early Traction	141	2.00	136.75		
	Scale-up	85	2.00	151.36		
	Maturity	10	1.83	147.55		
Nature of Business	Technology	244	2.00	144.24	1.046	.593
	Non-Technology	31	2.00	138.02		
	Both technology & non-technology	13	2.00	164.77		
Type of Technology	IT	142	2.00	144.51	.259	.967
	Non-IT	76	2.00	147.43		
	Both IT & non-IT	38	2.00	143.12		
	None	32	2.00	139.13		
Nature of Output	Product oriented	148	2.00	148.83	2.545	.280
	Service oriented	38	2.00	154.11		
	Both product & service oriented	102	2.00	134.64		

Source: Field Survey

The above table shows that the activity link of different categories of startups with their incubators is weak, indicating a low level of coordination between startups and incubators in the performance of business development & team building activities. Based on stages of life cycle (P = .300), business nature (P = .593), technology type (P = .967) and startup output (P = .280), there is no substantial difference among startup categories in the activity link with incubators for business development & team building, according to the results of the Kruskal-Wallis H test. Therefore, different categories of startups have the same level of coordination with incubators for business development & team building, which is low.

Mann-Whitney U test has been conducted and test results are displayed in the table below.

Table 6.42

Business Development & Team Building – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	142.29	8938.000	.516
	No	99	2.00	148.72		
KSUM Registration	Yes	143	2.00	139.27	9619.500	.269
	No	145	2.00	149.66		
Status in Incubators	Incubatee	234	2.00	148.61	5356.500	.069
	Coworking	54	2.00	126.69		

Source: Field Survey

The above table indicates a low level of coordination between startups and incubators for business development & team building activities. Based on DPIIT registration (P = .516), KSUM registration (P = .269) and status in incubators (P = .069) of startups, the Mann-Whitney U test results indicate that there is no significant difference in the activity link with incubators for business development & team building. This is because the P values of these groups are more than .05. Hence, the level of coordination that various categories of startups have with incubators for business development & team building is the same without any significant difference.

- **Factor 2 - Marketing & Performance Evaluation**

Marketing & Performance Evaluation includes four activities such as marketing of products, customer generation and care, sales and revenue generation and evaluating the performance of startups. Product marketing and customer generation are activities that are performed when the product is ready to be taken to customers. Incubators can help startups select the most suitable marketing technique and media. In customer generation, incubators also play an important role because they can directly and indirectly convince customers to purchase the products of startups. Customer generation leads to revenue generation, whereby startups begin to earn their income.

Finally, performance evaluation is a routine procedure used by incubators to make sure that there is progress in the growth of startups. To determine if there is a notable difference in the activity link for marketing & performance evaluation with incubators among various startup categories, the Kruskal-Wallis H test and Mann-Whitney U test are used.

Table 6.43

Marketing & Performance Evaluation - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	110.55	12.189	.016*
	Validation	41	2.00	108.66		
	Early Traction	141	2.00	151.73		
	Scale-up	85	2.00	153.31		
	Maturity	10	2.17	152.00		
Nature of Business	Technology	244	2.00	144.04	1.998	.368
	Non-Technology	31	2.00	136.03		
	Both technology & non-technology	13	2.67	173.35		
Type of Technology	IT	142	2.00	149.68	4.015	.260
	Non-IT	76	2.00	130.78		
	Both IT & non-IT	38	2.00	157.97		
	None	32	2.00	138.11		
Nature of Output	Product oriented	148	2.00	142.46	11.133	.004**
	Service oriented	38	1.83	109.58		
	Both product & service oriented	102	2.00	160.47		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

Startups at maturity stage, both technology & non-technology startups and both product & service oriented startups, have better activity links with incubators for marketing & performance evaluation, but the responses indicate that startups have a low level of coordination with incubators for the same. Due to the fact that the P values are less than .05, the Kruskal-Wallis H test demonstrates a significant difference in the activity link with incubators for marketing & performance evaluation based on stage of startup life cycle (P = .016) and nature of output (P = .004) of startups. However, because the P values are more than .05, there is no discernible difference in the activity link with incubators for marketing & performance evaluation based on nature of business (P = .368) and type of technology (P = .260) of startups. Every group of startups with a P value less than .05 is compared pairwise and the pairings in each group that show a significant difference are listed in the table below.

Table 6.44

Pairwise Comparison – Marketing & Performance Evaluation

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Validation and Early traction	-43.072	.027
	Validation and Scale-up	-44.647	.037
Nature of Output	Service oriented and Both product & service oriented	-50.887	.003

Source: Field Survey

The activity link of service oriented startups with incubators for the performance of marketing & performance evaluation activities is weak when compared to both product & service oriented startups.

The table below presents the results of the Mann-Whitney U test.

Table 6.45

Marketing & Performance Evaluation – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.00	161.06	6226.500	<0.01**
	No	99	1.67	112.89		
KSUM Registration	Yes	143	2.00	166.37	7240.000	<0.01**
	No	145	1.67	122.93		
Status in Incubators	Incubatee	234	2.00	157.78	3210.000	<0.01**
	Coworking	54	1.33	86.94		

Source: Field Survey
**Significant at 1% level of significance

We might infer from the preceding data that startups have a low level of coordination with incubators for marketing & performance evaluation, but since the P values for these groups are less than .05., the results of the Mann-Whitney U Test indicate a notable difference in the activity link with incubators for marketing & performance evaluation based on DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P = <0.01) of startups. Startups registered in DPIIT, registered in KSUM and incubated startups have better activity links with incubators for marketing & performance evaluation compared to others.

- **Factor 3 - Idea Generation & Feasibility Study**

Idea generation & feasibility study have three activities, such as developing a business idea, conducting a market survey and conducting a feasibility study. A startup business begins with the formation of an idea and proceeds to study the market as well as the feasibility of the idea. These are activities usually done at the beginning of a startup and incubators can help startups develop their ideas into feasible ventures. To understand if there is a remarkable difference between various categories of startups with regard to activity link with incubators for idea generation & feasibility study, Kruskal-Wallis H test and Mann-Whitney U test are conducted.

Table 6.46

Idea Generation & Feasibility Study - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	96.86	26.197	<0.01**
	Validation	41	2.00	93.50		
	Early Traction	141	3.00	150.02		
	Scale-up	85	3.00	162.28		
	Maturity	10	3.33	177.00		
Nature of Business	Technology	244	2.67	147.35	4.070	.131
	Non-Technology	31	2.33	116.82		
	Both technology & non-technology	13	2.67	157.08		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Type of Technology	IT	142	2.67	145.67	11.093	.011*
	Non-IT	76	2.67	138.36		
	Both IT & non-IT	38	3.33	178.11		
	None	32	2.33	114.02		
Nature of Output	Product oriented	148	2.67	148.89	25.007	<0.01**
	Service oriented	38	2.00	83.64		
	Both product & service oriented	102	3.00	160.80		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

There is a low to moderate level of coordination between different categories of startups and incubators for idea generation & feasibility study. Based on the stage of the startup life cycle (P = <0.01), type of technology (P = .011) and nature of output (P = <0.01) of startups, the results of the Kruskal-Wallis H test indicate a significant difference in the activity link with incubators for idea generation & feasibility study. Startups at later stages, both IT & non-IT startups and product & service oriented startups have a moderate level of coordination with incubators for idea generation & feasibility study, while other categories of startups have a low level of coordination. However, there is no discernible variation in the activity link with incubators for idea creation & feasibility research depending on stage of nature of business (P = .131) of startups. For every group with a P value smaller than .05, a pairwise comparison is performed and the pairings with notable differences are displayed in the table below.

Table 6.47

Pairwise Comparison – Idea Generation & Feasibility Study

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Validation and Early traction	-56.521	.001
	Validation and Scale-up	-68.782	<0.01
	Validation and Maturity	-83.500	.042
Type of Technology	None and Both IT & non-IT	-64.090	.007
Nature of Output	Service oriented and Product oriented	65.247	<0.01
	Service oriented and Both product & service oriented	-77.154	<0.01

Source: Field Survey

The outcomes of the Mann-Whitney U test can be seen in the table below.

Table 6.48

Idea Generation & Feasibility Study – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.00	165.81	5327.000	<0.01**
	No	99	2.00	103.81		
KSUM Registration	Yes	143	3.00	174.70	6048.500	<0.01**
	No	145	2.33	114.71		
Status in Incubators	Incubatee	234	3.00	160.90	2481.500	<0.01**
	Coworking	54	2.00	73.45		

Source: Field Survey
**Significant at 1% level of significance

The above table shows that startups registered in DPIIT, KSUM and incubated startups have a moderate level of coordination with incubators for idea generation & feasibility study. Whereas startups not registered in DPIIT, not registered in KSUM and coworking startups have a low level of coordination with incubators for the same. Therefore, based on DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and incubator status (P = <0.01) of startups, the results of the Mann-Whitney U Test show that there is an important distinction in the activity link with incubators for idea generation & feasibility study.

- **Factor 4 - Funding & Professional Assistance**

Funding & professional assistance include three activities, such as meeting investors and pitching for funds, approaching financial institutions for credit and arranging the assistance of professionals like accountants, lawyers etc. Funds are extremely important for startups. Incubators can host pitching events, which will help the startups meet investors and pitch their ideas. Incubators can also take the initiative to send their startups to pitching events organised by other institutions, which is again beneficial to startups. Arranging funds through credit institutions is difficult due to the tedious procedures involved and incubators can assist startups. Startups require the assistance of professionals like accountants and lawyers in their course of business, which can be arranged by incubators. The Mann-Whitney U test and the Kruskal-Wallis H test are employed to figure out whether there are any appreciable differences across various startup categories in terms of activity links with incubators for funding & professional assistance.

Table 6.49

Funding & Professional Assistance - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	4.00	113.36	3.413	.491
	Validation	41	4.00	134.93		
	Early Traction	141	4.00	145.89		
	Scale-up	85	4.00	147.64		
	Maturity	10	4.17	171.80		
Nature of Business	Technology	244	4.00	145.82	1.123	.570
	Non-Technology	31	4.00	130.44		
	Both technology & non-technology	13	4.00	153.31		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Type of Technology	IT	142	4.00	131.41	1.841	.606
	Non-IT	76	4.00	149.90		
	Both IT & non-IT	38	4.00	138.72		
	None	32	4.00	146.89		
Nature of Output	Product oriented	148	4.00	152.56	13.016	.001**
	Service oriented	38	3.33	99.91		
	Both product & service oriented	102	4.00	149.42		

Source: Field Survey
**Significant at 1% level of significance

The Kruskal-Wallis H test findings show that, with the P values being less than .05, there is a significant difference in the activity link with incubators for funding & professional assistance based on the nature of output (P = .001) of startups. This can be because service oriented startups have a moderate level of coordination with incubators for funding & professional assistance while other categories have a high level of coordination. However, since the P values are more than .05, there is no evident variation in the activity link with incubators for funding & professional assistance depending on the stages of startup life cycle (P = .491), nature of business (P = .570) and type of technology (P = .606) of startups. It indicates that different categories of startups within these groups have the same level of coordination with incubators for funding & professional assistance, which according to the responses is high. Based on the nature of output, a pairwise comparison is carried out across various startup categories; the pairings that show an important distinction are presented in the table below.

Table 6.50

Pairwise Comparison – Funding & Professional Assistance

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Nature of Output	Service oriented and Product oriented	52.650	.001
	Service oriented and Both product & service oriented	-49.514	.004

Source: Field Survey

The Mann-Whitney U test is performed and outcomes are shown in the table below.

Table 6.51

Funding & Professional Assistance – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.00	153.16	7718.000	.013*
	No	99	3.50	127.96		
KSUM Registration	Yes	143	4.00	159.17	8270.000	.003**
	No	145	3.50	130.03		
Status in Incubators	Incubatee	234	4.00	160.30	2621.000	<0.01**
	Coworking	54	2.67	76.04		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

In accordance with DPIIT registration (P = .013), KSUM registration (P = .003) and incubator status (P = <0.01) of startups, the Mann-Whitney U test results indicate a substantial disparity in the activity link with incubators for funding & professional assistance. The P values of these groups are less than .05. This is because startups registered in DPIIT and KSUM, as well as incubated startups, have better coordination with incubators for funding & professional assistance.

- **Factor 5 - Product Modeling & Resource Collection**

Product modeling & resource collection include four activities, such as arranging technical assistance needed for business, conducting research and modeling of prototypes or samples, purchasing stock or raw materials, arranging machinery or equipment and applying for intellectual properties like patents, trademarks, etc. Startups require resources to function. Resources may be raw materials, machinery, intangible resources, or technical assistance. Incubators have to identify the types of resources that are needed by startups and assist them in arranging those resources. Research is a relevant part of startups where they have to develop prototypes or samples of their product. Incubators should arrange the needed facilities for startups to conduct their research. The Mann-Whitney U test and the Kruskal-Wallis H test are employed to figure out whether there are any appreciable differences across various startup categories with regard to activity links with incubators for product modeling & resource collection.

Table 6.52

Product Modeling & Resource Collection - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	131.32	2.911	.573
	Validation	41	2.00	126.46		
	Early Traction	141	2.33	149.70		
	Scale-up	85	2.00	146.83		
	Maturity	10	2.00	139.80		
Nature of Business	Technology	244	2.00	140.99	7.481	.024*
	Non-Technology	31	2.00	146.76		
	Both technology & non-technology	13	3.00	205.00		
Type of Technology	IT	142	2.00	140.50	3.465	.325
	Non-IT	76	2.00	139.29		
	Both IT & non-IT	38	2.67	166.70		
	None	32	2.17	148.25		
Nature of Output	Product oriented	148	2.00	136.42	5.237	.073
	Service oriented	38	2.00	135.71		
	Both product & service oriented	102	2.33	159.50		

Source: Field Survey
*Significant at 5% level of significance

The responses from different startup categories, with the exception of technology & non-technology startups (median = 3), had a median value of 2.67 and below, indicating a low level of coordination with incubators for product modeling & resource collection. According to the nature of business, there is an important variation in the activity link with incubators for product modeling and resource collection (P = .024) of startups, according to the Kruskal-Wallis H test. This is because both technology & non-technology startups have a moderate level of coordination with incubators, while others have a low level of coordination. Nevertheless, as the P values are more than .05., there is no substantial variation in the activity link with incubators for product modeling & resource collection depending on stages of the life cycle (P = .573), type of technology (P = .325) and nature of output (P = .073) of startups. For several kinds of startups, depending on the nature of the business, a pair-wise comparison is done and pairs with notable differences are shown in the below table.

Table 6.53

Pair wise Comparison – Product Modeling & Resource Collection

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Nature of Business	Technology and Both technology & non-technology	-64.010	.019

Source: Field Survey

The Mann-Whitney U test is conducted and the results of the test are given in the below table.

Table 6.54

Product Modeling & Resource Collection – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.33	151.42	9047.500	.059
	No	99	2.00	141.29		
KSUM Registration	Yes	143	2.33	145.81	10179.500	.788
	No	145	2.00	143.20		
Status in Incubators	Incubatee	234	2.67	154.19	4051.000	<0.01**
	Coworking	54	2.00	102.52		

Source: Field Survey
**Significant at 1% level of significance

The preceding table shows that, the activity link for product modeling & resource collection between different startup categories and incubators is weak. As the P value is less than .05, the results of the Mann-Whitney U Test indicate an important distinction in the activity link with incubators for product modeling and resource collection with respect to status in incubators (P =<0.01) of startups. This means that the activity link of incubated startups with incubators is stronger than coworking startups. However, while the P values are more than .05, there is no significant difference in the activity link with incubators for product modeling & resource collection based on DPIIT registration (P = .059) and KSUM registration (P = .788) of startups.

The summary of hypothesis testing for activity links with incubators is presented in the below table.

Table 6.55

Hypothesis Testing - Activity Links with Incubators

Hypothesis	Activity Links	Groups for which H_0 is rejected
There is no significant difference among various categories of startups with regard to their activity links with incubators	Business Development & Team Building	Nil
	Marketing & Performance Evaluation	Stages of startup life cycle, nature of output, DPIIT registration, KSUM registration and status in incubators
	Idea Generation & Feasibility Study	Stages of startup life cycle, type of technology, nature of output, DPIIT registration, KSUM registration and status in incubators
	Funding & Professional Assistance	Nature of output, DPIIT registration, KSUM registration and status in incubators
	Product Modeling & Resource Collection	Type of technology and status in incubators

Source: Field Survey

6.2.5 Actor Bonds with Incubators

"Bonds arise in business relationships as two related actors mutually acquire meaning in their reciprocal acts and interpretations." (Hakansson & Snehota, 1995). Actor bonds are built through the mutual interactions and cooperation of at least two actors with one another. Startups and incubators are actors who closely interact with each other. Incubators exist to guide and ensure the growth and success of startups by helping them perform their activities and providing them with the resources they require. Incubators are like a baby walker for startups. During the initial stages of startups, when they cannot walk on their own, incubators help them take those baby steps. Without startups, there is no purpose for incubators and without incubators, it is difficult for a startup to survive and succeed. There is a bond that is mutually developed between startups and incubators through their communications and functions. Such bonds can be structural, social and economic in nature. Actor bonds with incubators are measured by using 12 statements, four each for structural, social and economic bonds. Startups were asked to rate the strength of their bond with incubators using a five-point Likert scale from “very strong” to “very weak."

❖ Exploratory Factor Analysis - Actor Bonds with Incubators

Exploratory Factor Analysis has been carried out to make sure that the twelve items that assess actor link with incubators can be categorised into the three factors - structural, economic and social that are listed in the literature. The Kaiser-Meyer-Olkin Test is used to determine whether the sample size is sufficient for factor analysis and Bartlett's Test of Sphericity is used to confirm that there is a substantial correlation between the sample data. The table below shows the results of both tests.

Table 6.56

KMO and Bartlett’s Test – Actor Bonds with Incubators

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.849
Bartlett's Test of Sphericity	Approx. Chi-Square	1333.245
	DF	66
	Sig.	<0.01

Source: Field Survey

The previous table indicates that the sample adequacy KMO test value is .849. Because a worthy KMO value falls between 0.8 and 0.89, the sample size is sufficient for EFA. According to Bartlett's Test of Sphericity, the sample data exhibits the substantial correlation required for EFA, with a P value less than .05 (P = <0.01). Since the sampling data is appropriate for EFA based on the results of statistical assumption tests, principal component analysis was carried out.

Table 6.57

Total Variance Explained – Actor Bonds with Incubators

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.904	49.201	49.201	5.904	49.201	49.201
2	1.700	14.165	63.366	1.700	14.165	63.366
3	1.103	9.195	72.562	1.103	9.195	72.562

Extraction Method: Principal Component Analysis

Source: Field Survey

Three factors have an Eigenvalue greater than 1 and when combined, they account for 72.562% of the extracted variance, according to the principal component analysis results. For factorization, this is seen to be desirable. Thus, three factors are found for categorising the items associated with actor bonds with incubators based on the outcome of the EFA. Given in the table below are the factors and factor loadings.

Table 6.58

Factors and Factor Loadings – Actor Bonds with Incubators

Factors	Items	Factor Loadings
Factor-1 (Social Bond)	Personal attachment and friendship	.787
	Mutual interaction and communication	.808
	Mutual trust and belief	.906
	Commitment	.868
Factor-2 (Structural Bond)	Performing business activities with mutual support and coordination	.807
	Sharing of facilities, equipments and other resources	.533
	Formulating policies and programs that enhance business relationships	.808
	Developing value added partnerships and Collaborations	.868

Factors	Items	Factor Loadings
Factor-3 (Economic Bond)	Capital investment in startup	.774
	Providing business credit/grant to startup	.763
	Providing facilities/goods/services at lower rate and other financial incentives	.708
	Joint investment in innovation projects	.581

Source: Field Survey

❖ **Analysis of Actor Bonds with Incubators**

Table 6.58 indicates that actor bond can be classified into three factors: social bond, structural bond and economic bond. The social bond with incubators indicates the personal friendship, attachment and commitment that exist between them. Business partnerships, coordinated functioning and resource sharing indicate a structural bond with incubators. Capital investments by incubators in startups, assistance in funding and other financial deals indicate the economic bond with incubators. The strength of the actor bond with incubators need not be the same for all the categories of startups. In order to know if there is a significant difference in the actor bond with incubators for various categories of startups, the following hypothesis is formulated:

H_0: There is no significant difference among various categories of startups with regard to their actor bonds with incubators.

The testing of the hypothesis for different groups of startups is explained as follows:

- **Social Bond with Incubators**

The social bond with incubators includes four items: personal attachment and friendship, mutual interaction and communication, mutual trust and belief and commitment. Along with the formal relationship, personal friendships and interactions also happen with incubators. Social bonding helps startups freely communicate with incubation managers and put forward their needs and wants. Whether there is a notable difference in this social bond based on the category of startups is what needs to be analysed. The Mann-Whitney U test and the Kruskal-

Wallis H test are used to determine whether there are any significant differences between various startup categories regarding the social bond with incubators.

Table 6.59

Social Bond with Incubators - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of startup Life Cycle	Ideation	11	3.00	151.18	3.221	.522
	Validation	41	3.25	129.93		
	Early Traction	141	3.25	141.09		
	Scale-up	85	3.50	154.26		
	Maturity	10	3.75	162.00		
Nature of Business	Technology	244	3.25	144.87	5.860	.053
	Non-Technology	31	2.50	122.95		
	Both technology & non-technology	13	4.00	188.88		
Type of Technology	IT	142	3.25	147.92	2.600	.457
	Non-IT	76	3.25	139.43		
	Both IT & non-IT	38	3.50	156.05		
	None	32	2.75	127.66		
Nature of Output	Product oriented	148	3.25	142.76	9.036	.011*
	Service oriented	38	2.87	112.20		
	Both product & service oriented	102	3.50	159.06		

Source: Field Survey
*Significant at 5% level of significance

It is clear from the above table that there is a moderate to strong social bond between various startup categories and incubators. The results of the Kruskal-Wallis H test show that there is a substantial difference in the social bond with incubators depending on the nature of output (P = .011) of startups. Service oriented startups have weaker social bond with incubators compared to product oriented and both product & service oriented startups. But as there is no notable difference in the social bond with incubators based on the stages of life cycle (P = .522), nature of business (P = .053) and type of technology (P = .457) of startups. This means that different categories of startups in these groups have equally strong social bond with incubators. Based on the type of output, a pairwise comparison is conducted among various startup categories; the pairings that show an important distinction are listed in the table below.

Table 6.60

Pairwise Comparison – Social Bond with Incubators

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Nature of Output	Service oriented and Both product & service oriented	-46.866	.009

Source: Field Survey

The following table displays the results of the Mann-Whitney U test.

Table 6.61

Social Bond with Incubators – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.50	154.78	7412.500	.004**
	No	99	3.00	124.87		
KSUM Registration	Yes	143	3.50	155.30	8823.000	.028*
	No	145	3.00	133.85		
Status in Incubators	Incubatee	234	3.50	157.02	3388.500	.000**
	Coworking	54	2.50	90.25		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

From the above table, it can be understood that there is a moderately strong social bond between different startup categories and incubators. According to DPIIT registration (P = .004), KSUM registration (P = .028) and status in incubators (P =<0.01) of startups, the test findings indicate a substantial difference in the social bond with incubators. This is because the P values are less than .05. Therefore, it can be inferred that startups registered in DPIIT, KSUM and incubated startups have stronger social bonds with incubators.

- **Structural Bond with Incubators**

Structural bond with incubators includes four items: performing business activities with mutual support and coordination; sharing facilities, equipment and other resources; formulating policies and programmes that enhance business relationships; and developing value-added partnerships and collaborations. Incubators and startups have a formal agreement between them when incubation starts. As a part of the incubation programme, incubators support startups in performing various activities and help them arrange the resources that are needed to function. Sometimes incubators enter into partnerships with startups as well. To determine if there are any significant variations in the structural bond with incubators among various startup types, the Kruskal-Wallis H test and the Mann-Whitney U test are employed.

Table 6.62

Structural Bond with Incubators - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.00	125.45	9.034	.060
	Validation	41	3.00	117.48		
	Early Traction	141	3.25	142.60		
	Scale-up	85	3.50	160.01		
	Maturity	10	3.87	171.25		
Nature of Business	Technology	244	3.25	145.08	3.453	.178
	Non-Technology	31	3.00	126.40		
	Both technology & non-technology	13	3.75	176.69		
Type of Technology	IT	142	3.25	145.37	1.600	.659
	Non-IT	76	3.25	145.42		
	Both IT & non-IT	38	3.50	152.86		
	None	32	3.12	128.53		
Nature of Output	Product oriented	148	3.50	152.57	13.202	.001**
	Service oriented	38	2.62	99.12		
	Both product & service oriented	102	3.25	149.70		

Source: Field Survey
**Significant at 1% level of significance

The aforementioned data indicates a moderately strong structural bond between startups and incubators. Based on the nature of the output, the Kruskal-Wallis H test results indicate a significant difference in the structural bond with incubators (P = .001). That can be because service oriented startups have weaker structural bond with incubators compared to product oriented and both product & service oriented startups. Whereas since the P values of these groups are more than .05, there is no discernible difference in the structural bond with incubators based on the stages of life cycle (P = .060), nature of business (P = .178) and type of technology (P = .659) of startups. Based on the nature of the output of startups, a pairwise comparison is conducted to identify the pairs with significant variations in their responses. The results of the comparative analysis are given in the below table.

Table 6.63

Pairwise Comparison – Structural Bond with Incubators

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Nature of Output	Service oriented and Both product & service oriented	-50.578	.004
	Service oriented and Product oriented	53.453	.001

Source: Field Survey

The following table presents the results of the Mann-Whitney U test.

Table 6.64

Structural Bond with Incubators – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.50	158.34	6740.000	<0.01**
	No	99	3.00	118.08		
KSUM Registration	Yes	143	3.50	157.91	8449.500	.006**
	No	145	3.00	131.27		
Status in Incubators	Incubatee	234	3.50	163.28	1923.500	<0.01**
	Coworking	54	2.00	63.12		

Source: Field Survey
**Significant at 1% level of significance

Responses from startups in different categories indicate a moderately strong structural bond with incubators. P values for DPIIT registration (P = <0.01), KSUM registration (P = .006) and status in incubators (P = <0.01) of startups show a substantial difference in the structural bond with incubators, according to the results of the Mann-Whitney U Test. This can be because startups registered in DPIIT, KSUM and incubated startups have a stronger structural bond with incubators compared to startups not registered in DPIIT, KSUM and coworking startups.

- **Economic Bond with Incubators**

Economic bond with incubators includes four items, such as capital investment in startups, providing business credit or grants to startups, providing facilities, goods or services at a lower rate and other financial incentives and joint investment in innovation projects. Funds are essential for startups at every stage of their life cycle. Incubators can help startups in many ways regarding funds. Incubators can be investors and invest funds in startups. Incubators can provide grants or business credit to startups. Incubators can provide their services at a discounted rate to startups and they can also make joint investments with startups. The Kruskal-Wallis H test and the Mann-Whitney U test are used to assess if there are any noteworthy differences in the economic bond with incubators across different startup categories.

Table 6.65

Economic Bond with Incubators - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	117.32	6.135	.189
	Validation	41	2.00	125.41		
	Early Traction	141	2.00	144.18		
	Scale-up	85	2.25	153.82		
	Maturity	10	2.62	177.95		
Nature of Business	Technology	244	2.00	144.88	7.234	.027*
	Non-Technology	31	2.00	120.82		
	Both technology & non-technology	13	2.50	193.88		

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Type of Technology	IT	142	2.25	148.59	6.296	.098
	Non-IT	76	2.00	138.24		
	Both IT & non-IT	38	2.25	164.16		
	None	32	2.00	117.86		
Nature of Output	Product oriented	148	2.25	148.86	13.010	.001**
	Service oriented	38	1.62	100.11		
	Both product & service oriented	102	2.25	154.71		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

The findings of the Kruskal-Wallis H test show that the economic bond with incubators varies significantly depending on the nature of output (P = .001) and business (P = .027) of startups. Both technology & non-technology startups have a better economic bond with incubators than technology and non-technology startups. Likewise, service oriented startups have a weaker economic bond with incubators compared to product oriented and both product & service oriented startups. But the responses from different categories of startups indicate a weak economic bond with incubators. The economic bond with incubators is not significantly different based on the stages of the life cycle (P = .189) or the type of technology (P = .098) of startups, since the P values are greater than .05. For groups with P values less than .05, a pairwise comparison is performed and the pairs that show a significant difference are included in the below table.

Table 6.66

Pairwise comparison – Economic Bond with Incubators

Categories of Startups	Pair wise Comparison	Test Statistics	Adj.Sig.
Nature of Business	Non-Technology and Both technology & non-technology	-73.062	.022
Nature of Output	Service oriented and Product oriented	48.760	.003
	Service oriented and Both product & service oriented	-54.601	.001

Source: Field Survey

The Mann-Whitney U test has been administered and the results are displayed in the table below.

Table 6.67

Economic Bond with Incubators – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.25	162.42	5969.000	<0.01**
	No	99	2.00	110.29		
KSUM Registration	Yes	143	2.25	168.59	6923.000	<0.01**
	No	145	2.00	120.74		
Status in Incubators	Incubatee	234	2.25	159.75	2750.500	<0.01**
	Coworking	54	1.00	78.44		

Source: Field Survey
**Significant at 1% level of significance

The median value of responses from various categories of startups except coworking startups (median = 1) is 2 and 2.25. This indicates a weak economic bond between different categories of startups and incubators. Mann-Whitney U test is conducted and results show that there is a valid difference in the economic bond with incubators based on DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P =<0.01) of startups because the P values of these groups are lower than .05. Hence, startups registered in DPIIT, registered in KSUM and coworking startups have a better economic bond with incubators.

The summary of hypothesis testing for actor bonds with incubators is given in the table below.

Table 6.68

Hypothesis Testing – Actor Bonds with Incubators

Hypothesis	Actor Bonds	Groups for which H_0 is rejected
There is no significant difference among various categories of startups with regard to their actor bonds with incubators.	Social Bond	Nature of output, DPIIT registration, KSUM registration and status in incubators
	Structural Bond	Nature of output, DPIIT registration, KSUM registration and status in incubators
	Economic Bond	Nature of business, nature of output, DPIIT registration, KSUM registration and status in incubators

Source: Field Survey

6.2.6 Resource Ties with Incubators

"Companies make use of resources; a combination of technical, personal, financial and other resources is always needed in a business enterprise. No company has all the resources needed; some have to be acquired from others" (Hakansson & Snehota, 1995). Resources are acquired as well as shared. Resource sharing happens when there is an established relationship between the parties. In the case of startups and incubators, as soon as incubators provide a work space for startups, resource sharing begins. Incubators share their physical resources, technical resources, business knowledge and talent with startups. They also assist startups with business financing. The resource ties of startups with incubators indicate the strength of the relationship between them with regard to the sharing of resources. Resource ties with incubators are measured on the basis of five resources: financial resources, human resources, business knowledge, technological resources and other intangible resources. Startups were asked to indicate their strength of relationship with incubators based on the sharing of these five resources on a five-point Likert scale from very strong to very weak.

❖ Exploratory Factor Analysis - Resource Ties with Incubators

To measure the resource ties between startups and incubators, five resources have been chosen. An Exploratory Factor Analysis (EFA) is then performed to make sure that the strength of the relationship between startups and incubators in sharing these five resources can be described by a single component. Bartlett's Test of Sphericity is used to verify that the sample data are correlated and the Kaiser-Meyer-Olkin Test is used to assess sample adequacy for factor analysis. The results of both tests are displayed in the table below.

Table 6.69

KMO and Bartlett's Test – Resource Ties with Incubators

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.811
Bartlett's Test of Sphericity	Approx. Chi-Square	217.076
	DF	10
	Sig.	<0.01

Source: Field Survey

From the above table, we can understand that the KMO test value is .811. A KMO value between 0.8 and 0.89 is considered meritorious and therefore sampling is adequate for EFA. The P value for Bartlett's Test of Sphericity is less than .05 (P = <0.01). Therefore, there is a significant correlation between the sampling data. The results of the KMO Test and Bartlett's Test of Sphericity indicate that the sampling data is suitable for EFA. Therefore, principal component analysis is conducted.

Table 6.70

Total Variance Explained - Resource Ties with Incubators

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.063	61.254	61.254	3.063	61.254	61.254
2	.740	14.795	76.049			
3	.542	10.842	86.891			
4	.365	7.290	94.181			
5	.291	5.819	100.000			
Extraction Method: Principal Component Analysis						

Source: Field Survey

The principal component analysis result indicates that a single factor with an Eigenvalue greater than 1 account for 61.254% of the extracted variance, which is deemed appropriate for factorization. Consequently, the exploratory factor analysis result indicates that a single factor is identified for the grouping of items to related resource ties of startups with incubators. The factor and factor loadings are provided in the table below.

Table 6.71

Factors and Factor Loadings – Resource Ties with Incubators

Factor	Resources	Factor Loadings
Resource Ties with Incubators	Financial Resources	.738
	Human Resources	.845
	Business Knowledge	.858
	Technological Resources	.711
	Other Intangible Resources	.751

Source: Field Survey

❖ Analysis of Resource Ties with Incubators

Exploratory factor analysis has ensured that resource ties with incubators can be measured using a single factor. The strength of the relationship with incubators with regard to the sharing of financial resources, human resources, business knowledge, technological resources and other intangible resources is considered when measuring the resource ties with incubators. The resource sharing of incubators should be similar to that of all the startups that are guided by them. But based on the requirements of startups and the relationships they share with incubators, there can be a notable difference in the resource ties between startups and incubators. We need to understand if there is a valid difference between various categories of startups based on their resource ties with incubators. For that, the following hypothesis should be tested:

H_0: There is no significant difference among various categories of startups with regard to their resource ties with incubators.

Kruskal-Wallis H test is used to analyse if there is substantial difference among various categories of startups based on their stages in life cycle, nature of business, type of technology and nature of output with regard to resource ties with incubators. The result of the test is as follows:

Table 6.72

Resource Ties with Incubators - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.00	110.50	13.509	.009**
	Validation	41	2.40	128.01		
	Early Traction	141	2.40	135.52		
	Scale-up	85	2.80	170.14		
	Maturity	10	2.50	158.25		
Nature of Business	Technology	244	2.60	147.88	14.804	.001**
	Non-Technology	31	2.00	97.52		
	Both technology & non-technology	13	3.20	193.08		
Type of Technology	IT	142	2.60	145.75	11.251	.010**
	Non-IT	76	2.60	151.34		
	Both IT & non-IT	38	2.80	162.86		
	None	32	2.00	100.89		
Nature of Output	Product oriented	148	2.60	148.95	16.523	<0.01**
	Service oriented	38	2.00	94.36		
	Both product & service oriented	102	2.80	156.73		

Source: Field Survey
**Significant at 1% level of significance

Startups at the scale-up stage, both technology & non-technology startups, both IT & non-IT startups and both product & service oriented startups have moderately strong and better resource ties with incubators, but other categories of startups have comparatively weaker resource ties with incubators. Therefore, based on the stages in the startup life cycle (P = .009), nature of business (P = .001), type of technology (P = .010) and nature of output (P = <0.01) of startups, there is a significant difference in the resource ties with incubators, according to the results of the Kruskal-Wallis H test. For each group with a P value smaller than .05, a pairwise comparison is conducted. The pairings that show a significant difference are displayed in the table below.

Table 6.73

Pair wise Comparison - Resource Ties with Incubators

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Stages of Startup Life Cycle	Early traction and Scale-up	-34.618	.024
Nature of Business	Non-technology and Technology	50.365	.004
	Non-technology and Both technology & non-technology	-95.561	.001
Type of Technology	None and IT	-44.863	.034
	None and Non-IT	-50.451	.023
	None and Both IT & non-IT	-61.965	.011
Nature of Output	Service oriented and Product oriented	54.591	.001
	Service oriented and Both product & service oriented	-62.375	<0.01

Source: Field Survey

To understand if there is a significant difference between various categories of startups based on their DPIIT registration, KSUM registration and status in incubators in terms of resource ties with incubators, a Mann-Whitney U test is conducted. The results of the test are given in the below table.

Table 6.74

Resource Ties with Incubators – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	2.80	158.47	6716.000	<0.01**
	No	99	2.20	117.84		
KSUM Registration	Yes	143	2.80	161.81	7892.500	<0.01**
	No	145	2.20	127.43		
Status in Incubators	Incubatee	234	2.60	160.83	2496.500	<0.01**
	Coworking	54	1.60	73.73		

Source: Field Survey
**Significant at 1% level of significance

The findings of the Mann-Whitney U Test indicate that there is a significant difference in the resource ties with incubators based on the DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P = <0.01) of startups, as the P values are lower than .05. This means that startups registered in DPIIT and KSUM as well as incubated startups, have better resource ties with incubators than other categories. Therefore, startups not registered in DPIIT, not registered in KSUM and coworking startups have weak resource ties with incubators.

The hypothesis that there is no significant difference among various categories of startups with regard to their resource ties with incubators is rejected for all the major categories of startups.

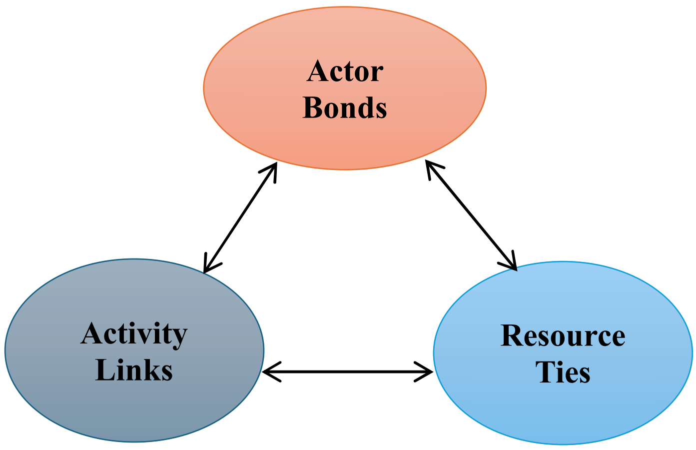
6.3 Interrelationship Analysis of Activity Links, Actor Bonds and Resource Ties

"Activity link, actor bond and resource ties are not independent; there is interplay between the actor bonds, activity links and resource tie." (Hakansson & Snehota, 1995). Actors perform activities and activities require resources. For coordinating the performance of activities and sharing resources, there should be an existing bond between the actors. "The existence of bonds between actors is a prerequisite for them to actively and consciously develop strong activity links and resource ties."

(Hakansson & Snehota, 1995). For actors to have activity links and resource ties, actor bonds are important. Similarly, activity links lead to the development of resource ties. Activity links and resource ties help to make the actor bonds stronger. Therefore, actor bonds, activity links and resource ties are interdependent. With regard to startups, their actor bonds, activity links and resource ties with other startups and incubators should be interdependent as well as interrelated. To know if there is a significant relationship between actor bonds, activity links and resource ties with other startups and incubators, correlation analysis and multiple regression analysis have to be conducted.

Figure 6.4

Interrelationship between Activity Links, Actor Bonds and Resource Ties



6.3.1 Activity Links, Actor Bonds and Resource Ties with Other Startups – Correlation Analysis

A correlation test is the first step in analysing the relationship between two variables. Whether the change in one variable causes a corresponding change in another variable can be understood through correlation. The strength and direction of the relationship between the variables is studied through correlation. Therefore, for analysing the interrelationship between activity links, actor bonds and resource ties, correlation analysis is important. Since the sample data for actor bond, resource ties and activity link are not normally distributed, Spearman's Rank Correlation test is used for testing the correlation between the variables. The hypothesis for testing correlation is as follows:

H$_0$: There is no significant correlation between activity links, actor bonds and resource ties of startups with other startups.

The results of Spearman's Rank Correlation test are as follows:

Table 6.75

Activity Links, Actor Bonds and Resource Ties with Other Startups – Correlation Analysis

Variables		N	Spearman's Correlation Coefficient	Sig.
Marketing & Expertise Assistance	Structural Bond	288	.701	<0.01**
	Economic Bond	288	.417	<0.01**
	Social Bond	288	.526	<0.01**
	Resource Ties	288	.592	<0.01**
Idea Feasibility & Registration	Structural Bond	288	.327	<0.01**
	Economic Bond	288	.327	<0.01**
	Social Bond	288	.283	<0.01**
	Resource Ties	288	.300	<0.01**
Product Modeling & Team Building	Structural Bond	288	.571	<0.01**
	Economic Bond	288	.428	<0.01**
	Social Bond	288	.455	<0.01**
	Resource Ties	288	.672	<0.01**
Business Development & Evaluation	Structural Bond	288	.363	<0.01**
	Economic Bond	288	.420	<0.01**
	Social Bond	288	.270	<0.01**
	Resource Ties	288	.369	<0.01**
Mentoring & Resource Collection	Structural Bond	288	.528	<0.01**
	Economic Bond	288	.518	<0.01**
	Social Bond	288	.437	<0.01**
	Resource Ties	288	.564	<0.01**
Resource Ties	Structural Bond	288	.700	<0.01**
	Economic Bond	288	.647	<0.01**
	Social Bond	288	.660	<0.01**

Source: Field Survey
**Significant at 1% level of significance

The aforesaid table indicates that there is a relatively strong positive correlation between activity link for marketing & expertise assistance and structural bond (r = .701). The correlation between activity link for marketing & expertise assistance and economic bond is moderately weak but positive (r = .417). Activity link for marketing & expertise assistance have a moderately strong positive correlation with both social bond (r = .526) and resource ties (r = .592). Activity link for idea feasibility & registration has a weak positive correlation with structural bond (r = .327), social bond (r = .283), economic bond (r = .327) and resource ties (r = .300). Activity link for product modelling & team building and resource ties have a strong positive correlation (r = .672). The correlation between activity link for product modelling & team building and structural bond is moderately strong and positive (r = .571). Activity link for product modelling & team building have a moderately weak but positive correlation with social bond (r = .455) and economic bond (r = .428). Structural bond (r = .363), social bond (r = .270), economic bond (r = .420) and resource ties (r = .369) have a weak but positive correlation with activity link for business development & evaluation. Activity link for mentoring and resource collection have a moderately positive correlation with structural bond (r = .528), economic bond (r = .518) and resource ties (r = .567). But the correlation between activity link for mentoring and resource collection and social bond with other startups is moderately weak but positive (r = .437). Resource ties and structural bond have a strong positive correlation (r = .700). The correlation of resource ties with social bond (r = .647) and economic bond (r = .660) is also strong and positive. All the correlation coefficients are positive and significant because P values (P = <0.01) are less than .05 in all the cases. Therefore, the null hypothesis that "There is no significant correlation between activity links, resource ties and actor bonds of various startup categories with other startups" is rejected.

6.3.2 Activity Links, Actor Bonds and Resource Ties with Other Startups – Regression Analysis

Correlation analysis indicates that there is a significant and positive correlation between actor bonds, resource ties and activity links with other startups. As stated before, actor bonds, resource ties and activity links are dependent on one another. Since the correlation is significant, it has been decided to further analyse the impact of actor bonds, resource ties and activity links with other startups on one another, for which regression analysis is performed. Multiple regression models are used to examine the impact of different variables on one another. There are three regression models where the variables of one construct are taken as dependent and others as independent for studying the impact of independent variables on the dependent variable. Partial Least Squares Structural Equation Modeling (PLS-SEM) using SMART-PLS is employed for conducting regression analysis. PLS-SEM models consist of only Lower Order Constructs (LOCs). The three regression models are as follows:

- **Regression Model - 1:** The dependent variable is activity links with other startups and the independent variables are actor bonds and resource ties with other startups.
- **Regression Model - 2:** The dependent variable is actor bonds with other startups and the independent variables are activity links and resource ties with other startups.
- **Regression Model - 3:** The dependent variable is resource ties with other startups and the independent variables are actor bonds and activity links with other startups.

Codes have been used to indicate different variables and items included in the regression models. Codes used by the researcher are as follows:

Table 6.76

Variables, Items and Codes: Regression Models - 1, 2 & 3

Variables	Codes	Items	Codes
Marketing & Expertise Assistance	MEA	Customer generation and care	AL.S.13.F1
		Sales and revenue generation	AL.S.18.F1
		Marketing of product	AL.S.20.F1
		Arranging assistance of professionals like accountants, lawyers etc	AL.S.21.F1
		Arranging technical assistance needed for business	AL.S.22.F1
Idea Feasibility & Registration	IFR	Developing a business idea	AL.S.1.F2
		Conducting a market survey	AL.S.2.F2
		Conducting feasibility study	AL.S.3.F2
		Formally registering startup	AL.S.5.F2

Variables	Codes	Items	Codes
Product Modeling & Team Building	PTB	Hiring and training employees	AL.S.10.F3
		Research and modeling of prototype/sample	AL.S.6.F3
		Organising a Startup team	AL.S.9.F3
Business Development & Evaluation	BDE	Evaluating Performance of startups	AL.S.15.F4
		Arranging office infrastructure facilities	AL.S.23.F4
		Devoting full time for business development	AL.S.7.F4
Mentoring & Resource Collection	MRC	Purchasing raw materials & arranging machinery/equipments	AL.S.14.F5
		Applying for intellectual properties like patent, trademark etc	AL.S.16.F5
		Arranging mentoring support	AL.S.19.F5
Structural Bond	SB	Performing business activities with mutual support and coordination	AB.S.SB.1
		Sharing of facilities, equipment's and other resources	AB.S.SB.2
		Formulating policies and programs that enhance business relationships	AB.S.SB.3
		Developing value added partnerships and Collaborations	AB.S.SB.4
Economic Bond	EB	Capital investment in startup	AB.S.EB.1
		Providing business credit/grant to startup	AB.S.EB.2
		Providing facilities/goods/services at lower rate and other financial incentives	AB.S.EB.3
		Joint investment in innovation projects	AB.S.EB.4
Social Bond	SOB	Personal attachment and friendship	AB.S.SOB.1
		Mutual interaction and communication	AB.S.SOB.2
		Mutual trust and belief	AB.S.SOB.3
		Commitment	AB.S.SOB.4
Resource Ties	RT	Business Knowledge	RT.S.BK
		Financial Resources	RT.S.FR
		Human Resources	RT.S.HR
		Physical Infrastructure Resources	RT.S.PR
		Technological Resources	RT.S.TR

Source: Field Survey

Note: *Five activities, such as preparing a business plan, arranging seed capital to start a business, approaching financial institutions for credit, meeting investors and pitching for funds and attending workshops and seminars, as well as one item from resource ties, i.e., resource ties for other intangible assets, have been deleted due to cross-loadings and validity concerns.*

❖ Regression Model - 1: Dependent Variable: Activity Links

Independent Variables: Actor Bonds and Resource Ties

Regression model - 1 has activity links with other startups as the dependent variable, which include activity links for marketing & expertise assistance, idea feasibility & registration, product modeling & team building, business development & evaluation, mentoring and mentoring & resource collection. Independent variables are structural bond, economic bond, social bond and resource ties with other startups. Confirmatory Factor Analysis is conducted for the model and the results are given below.

Figure 6.5

Confirmatory Factor Analysis: Regression Model - 1

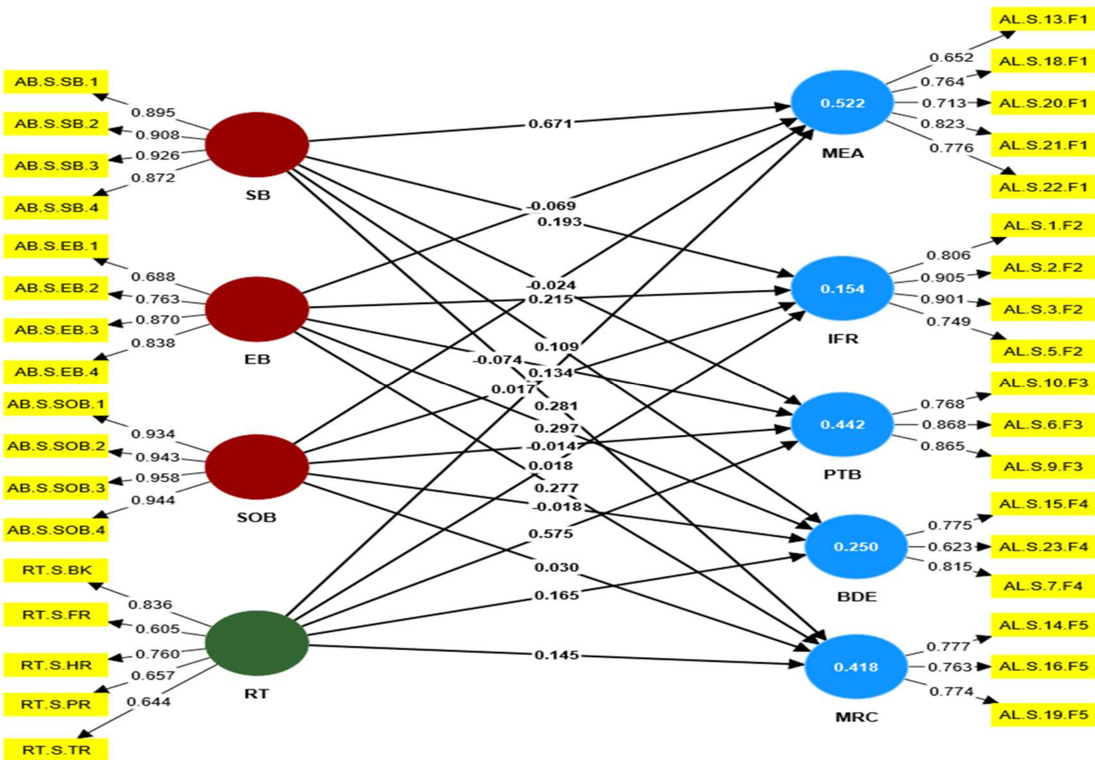
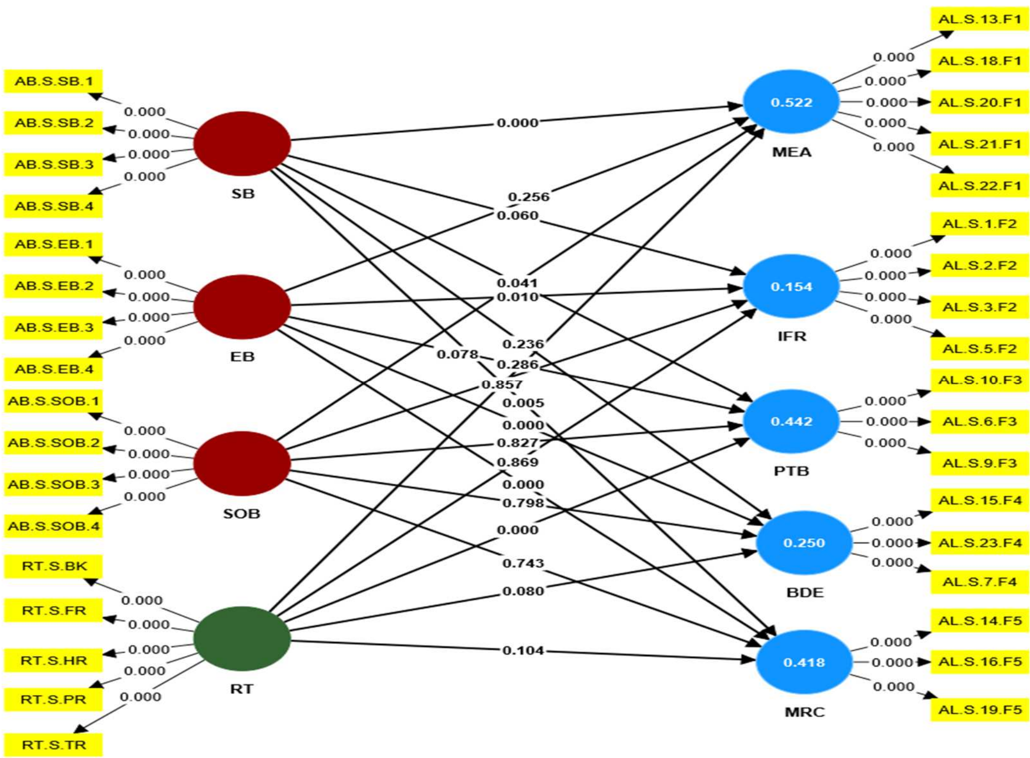


Figure 6.6

PLS-SEM: Regression Model - 1



- **Reliability and Convergent Validity: Regression Model - 1**

The Cronbach's Alpha, Composite Reliability and Average Variance Extracted of the model variables have been determined and are shown in the table below in order to verify the reliability and convergent validity of the regression model - 1.

Table 6.77

Reliability and Convergent Validity: Regression Model - 1

Variables	Item Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
MEA	AL.S.13.F1	.652	.801	.802	.559
	AL.S.18.F1	.764			
	AL.S.20.F1	.713			
	AL.S.21.F1	.823			
	AL.S.22.F1	.776			

Variables	Item Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
IFR	AL.S.1.F2	.806	.863	.871	.710
	AL.S.2.F2	.905			
	AL.S.3.F2	.901			
	AL.S.5.F2	.749			
PTB	AL.S.10.F3	.768	.781	.781	.697
	AL.S.6.F3	.868			
	AL.S.9.F3	.865			
BDE	AL.S.15.F4	.775	.712	.729	.551
	AL.S.23.F4	.623			
	AL.S.7.F4	.815			
MRC	AL.S.14.F5	.777	.769	.771	.595
	AL.S.16.F5	.763			
	AL.S.19.F5	.774			
SB	AB.S.SB.1	.895	.922	.927	.811
	AB.S.SB.2	.908			
	AB.S.SB.3	.926			
	AB.S.SB.4	.872			
EB	AB.S.EB.1	.688	.807	.849	.629
	AB.S.EB.2	.763			
	AB.S.EB.3	.870			
	AB.S.EB.4	.838			
SOB	AB.S.SOB.1	.934	.960	.962	.892
	AB.S.SOB.2	.943			
	AB.S.SOB.3	.958			
	AB.S.SOB.4	.944			
RT	RT.S.BK	.836	.745	.763	.530
	RT.S.FR	.605			
	RT.S.HR	.760			
	RT.S.PR	.657			
	RT.S.TR	.644			

Source: Field Survey

The names of different variables in the model, as well as the items included in each variable and their loadings, are given in the above table. It can be found that all the items have a loading greater than 0.5. Cronbach's Alpha and Composite Reliability for all the variables are greater than 0.7, which indicates that there is internal consistency between the items in a variable, which in turn ensures the reliability of the model. The Average Variance Extracted for the variables is 0.5 and above. AVE of 0.5 and above ensures the convergent validity of the model.

- **Discriminant Validity: Regression Model - 1**

The discriminant validity of the regression model is ensured by the Fornell-Larcker Criterion. Table given below are the square roots of the AVE of each variable and the correlation between the variables, which can be used to ensure discriminant validity according to the Fornell-Larcker Criterion.

Table 6.78

Discriminant Validity: Regression Model - 1

	BDE	**EB**	**IFR**	**MEA**	**MRC**	**PTB**	**RT**	**SB**	**SOB**
BDE	**0.742**								
EB	0.465	**0.793**							
IFR	0.555	0.354	**0.843**						
MEA	0.454	0.423	0.354	**0.748**					
MRC	0.513	0.563	0.362	0.436	**0.771**				
PTB	0.460	0.413	0.419	0.518	0.367	**0.835**			
RT	0.439	0.670	0.325	0.604	0.572	0.656	**0.707**		
SB	0.410	0.617	0.351	0.718	0.588	0.576	0.692	**0.901**	
SOB	0.311	0.501	0.271	0.496	0.457	0.437	0.634	0.699	**0.945**

Source: Field Survey

According to the Fornell-Larcker Criterion, the square root of AVE of a variable should be greater than the correlation of that variable with every other variable. From Table 6.42, we can see that the variables of regression model - 1 fulfil the Fornell-Larcker Criterion, thereby ensuring the discriminant validity of the model.

- **Multicollinearity: Regression Model -1**

In a regression model, multicollinearity exists if there is a high correlation between multiple independent variables. Variance Inflation Factor (VIF) denotes the amount of multicollinearity between the independent variables in a regression model. A VIF value below 5 is an indicator of unproblematic multicollinearity between the independent variables (James et al. 2014).

Table 6.79

Multicollinearity: Regression Model - 1

Independent Variables	VIF
SB	3.323
EB	1.889
SOB	2.031
RT	3.200

Source: Field Survey

The VIF values of independent variables in regression model -1 are less than 5, which is an acceptable amount of multicollinearity.

- **Path Coefficients: Regression Model - 1**

Figure 6.6 shows the PLS-SEM model for regression model - 1. The path coefficients for every path in the model are displayed by the PLS-SEM model. The path and relationship between the variables are significant if the P value is smaller than .05. The table below provides the path coefficients for every path in the regression model - 1:

Table 6.80

Path Coefficients: Regression Model - 1

Paths	T statistics	P values
SB -> BDE	1.184	0.236
SB -> IFR	1.879	0.060
SB -> MEA	**9.104**	**<0.01**
SB -> MRC	**2.828**	**0.005**
SB -> PTB	**2.039**	**0.041**
EB -> BDE	**4.165**	**<0.01**
EB -> IFR	**2.577**	**0.010**
EB -> MEA	1.136	0.256
EB -> MRC	**4.056**	**<0.01**
EB -> PTB	1.068	0.286
SOB -> BDE	0.256	0.798
SOB -> IFR	0.18	0.857
SOB -> MEA	0.325	0.745
SOB -> MRC	0.328	0.743
SOB -> PTB	0.218	0.827
RT -> BDE	1.751	0.080
RT -> IFR	0.164	0.869
RT -> MEA	1.761	0.078
RT -> MRC	1.628	0.104
RT -> PTB	**7.727**	**<0.01**

Source: Field Survey

The above table indicates that out of twenty paths in the regression model - 1; seven paths are significant with a P value less than .05 and T statistics above 1.96. The structural bond has a significant impact on the activity links for marketing & expertise assistance, mentoring & resource collection and product modeling & team building. The economic bond has a significant impact on the activity links for business development & evaluation and idea feasibility & registration. Resource ties have a significant impact on the activity link for product modelling & team building. The social bond has no impact on any of the variables of activity links. Therefore, it can be understood that activity links with other startups are significantly impacted by actor bonds and resource ties with other startups only in certain cases.

❖ **Regression model - 2: Dependent variable: Actor Bonds**

Independent Variables: Activity Links & Resource Ties

Regression model - 2 has the variables of actor bonds as dependent variables, which are structural bond, economic bond and social bond. Independent variables are activity links for marketing & expertise assistance, idea feasibility & registration, product modeling & team building, business development & evaluation, mentoring & resource collection and resource ties. The confirmatory factor analysis and PLS-SEM model of the regression analysis are given below:

Figure 6.7

Confirmatory Factor Analysis: Regression Model - 2

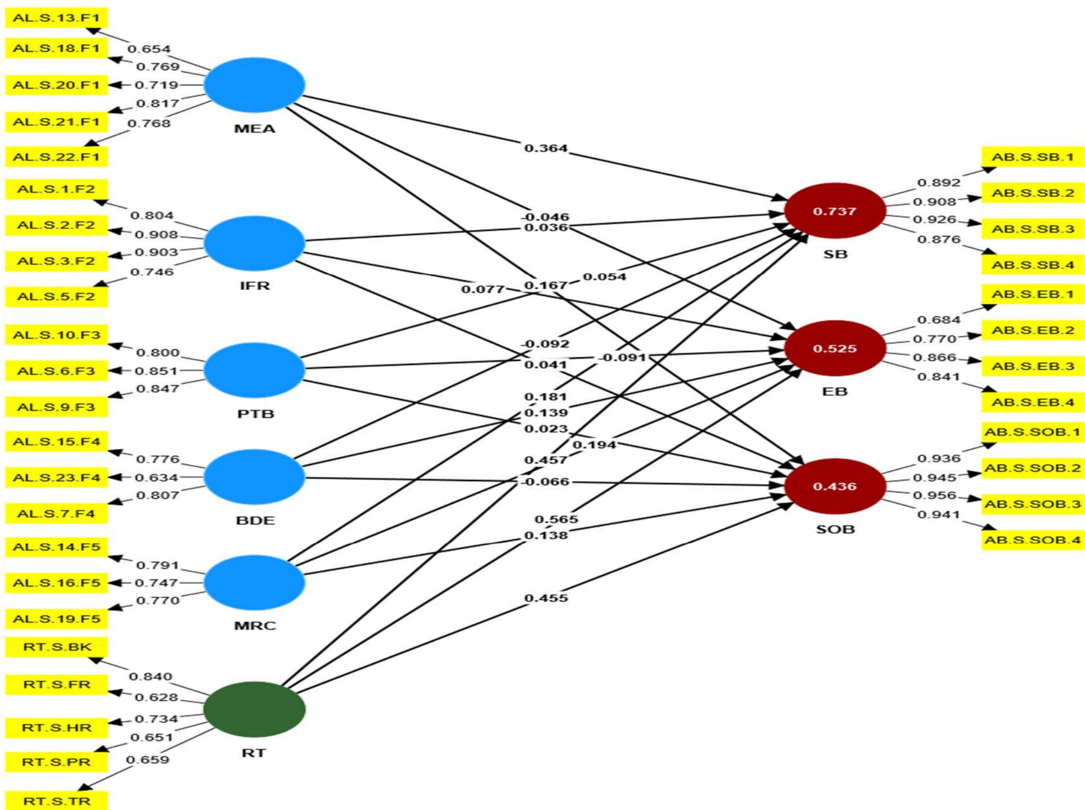
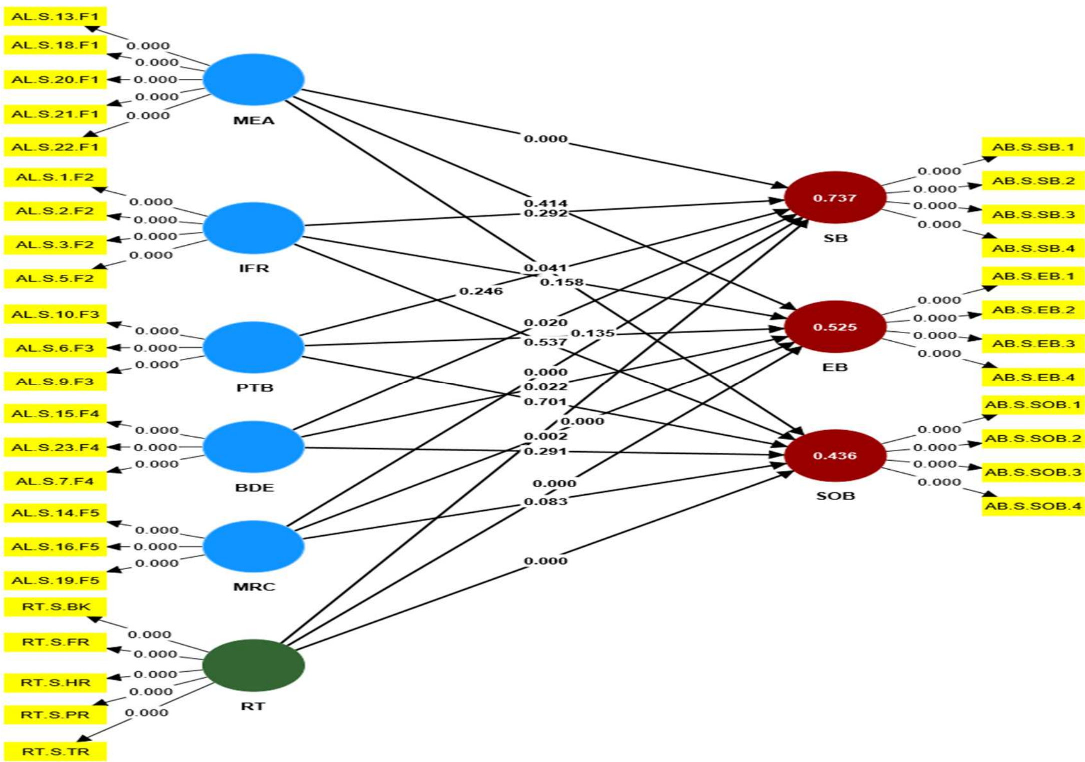


Figure 6.8

PLS-SEM: Regression Model - 2



- **Reliability and Convergent Validity: Regression Model - 2**

For ensuring the reliability and convergent validity of regression model - 2, Cronbach's Alpha, Composite Reliability and Average Variance Extracted from the model variables are determined and are given in the table below.

Table 6.81

Reliability and Convergent Validity: Regression Model - 2

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
MEA	AL.S.13.F1	.654	.801	.802	.558
	AL.S.18.F1	.769			
	AL.S.20.F1	.719			
	AL.S.21.F1	.817			
	AL.S.22.F1	.768			

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
IFR	AL.S.1.F2	.804	.863	.872	.711
	AL.S.2.F2	.908			
	AL.S.3.F2	.903			
	AL.S.5.F2	.746			
PTB	AL.S.10.F3	.800	.781	.783	.694
	AL.S.6.F3	.851			
	AL.S.9.F3	.847			
BDE	AL.S.15.F4	.776	.712	.727	.552
	AL.S.23.F4	.634			
	AL.S.7.F4	.807			
MRC	AL.S.14.F5	.791	.768	.776	.592
	AL.S.16.F5	.747			
	AL.S.19.F5	.770			
SB	AB.S.SB.1	.892	.922	.925	.811
	AB.S.SB.2	.908			
	AB.S.SB.3	.926			
	AB.S.SB.4	.876			
EB	AB.S.EB.1	.684	.807	.843	.629
	AB.S.EB.2	.770			
	AB.S.EB.3	.866			
	AB.S.EB.4	.841			
SOB	AB.S.SOB.1	.936	.960	.960	.892
	AB.S.SOB.2	.945			
	AB.S.SOB.3	.956			
	AB.S.SOB.4	.941			
RT	RT.S.BK	.840	.745	.761	.532
	RT.S.FR	.628			
	RT.S.HR	.734			
	RT.S.PR	.651			
	RT.S.TR	.659			

Source: Field Survey

The table above shows the names of different variables and items included in each variable, along with their loadings. From the table, it can be seen that all the items have a loading greater than 0.5. Cronbach's Alpha and Composite Reliability for all the variables are greater than 0.7, which ensures the internal consistency between different items in a variable and, therefore, guarantees the reliability of the model. The Average Variance Extracted for the variables is 0.5 and above. AVE of 0.5 and above ensures the convergent validity of the model.

- **Discriminant Validity: Regression Model - 2**

To ensure that the regression model has discriminant validity, Fornell-Larcker Criterion has been applied. The square roots of the AVE for each variable and the correlation between them are displayed in the table below, which may be used to verify discriminant validity in accordance with the Fornell-Larcker Criterion.

Table 6.82

Discriminant Validity: Regression Model - 2

	BDE	EB	IFR	MEA	MRC	PTB	RT	SB	SOB
BDE	**0.743**								
EB	0.461	**0.793**							
IFR	0.551	0.351	**0.843**						
MEA	0.457	0.425	0.356	**0.747**					
MRC	0.510	0.563	0.364	0.445	**0.769**				
PTB	0.462	0.417	0.422	0.528	0.381	**0.833**			
RT	0.432	0.676	0.321	0.605	0.576	0.641	**0.707**		
SB	0.409	0.616	0.350	0.721	0.593	0.581	0.688	**0.901**	
SOB	0.310	0.502	0.270	0.500	0.464	0.442	0.634	0.699	**0.945**

Source: Field Survey

The square root of AVE of a variable should be bigger than its correlation with all other variables, according to the Fornell-Larcker Criterion. Variables of regression model - 2, as shown in Table 6.45, satisfy the Fornell-Larcker Criterion, confirming the model's discriminant validity.

- **Multicollinearity: Regression Model -2**

If many independent variables in a regression model have a strong correlation with one another, this is known as multicollinearity. The degree of multicollinearity between the independent variables in a regression model is indicated by the Variance Inflation Factor (VIF). According to James et al. (2014), a VIF score of less than five indicates a low level of multicollinearity amongst the independent variables.

Table 6.83

Multicollinearity: Regression Model - 2

Independent Variables	VIF
BDE	1.839
IFR	1.533
MEA	1.770
MRC	1.746
PTB	1.971
RT	2.429

Source: Field Survey

Independent variables in the regression model – 2 have VIF values below 5, which is an acceptable amount of multicollinearity.

- **Path Coefficients: Regression Model - 2**

The PLS-SEM model for regression model - 2 is given in figure 6.8. The path coefficients of each path are shown in the PLS-SEM model. If the P value is less than .05, then the path and the relationship between the variables are significant. Path coefficients for each path in regression model - 2 are given in the below table:

Table 6.84

Path Coefficients: Regression Model - 2

Paths	T statistics	P values
BDE -> EB	**2.297**	**0.022**
BDE -> SB	**2.336**	**0.020**
BDE -> SOB	1.056	0.291
IFR -> EB	1.411	0.158
IFR -> SB	1.054	0.292
IFR -> SOB	0.618	0.537
MEA -> EB	0.816	0.414
MEA -> SB	**8.733**	**<0.01**
MEA -> SOB	**2.047**	**0.041**
MRC -> EB	**3.164**	**0.002**
MRC -> SB	**4.536**	**<0.01**
MRC -> SOB	1.733	0.083
PTB -> EB	1.496	0.135
PTB -> SB	1.16	0.246
PTB -> SOB	0.384	0.701
RT -> EB	**8.875**	**<0.01**
RT -> SB	**9.014**	**<0.01**
RT -> SOB	**7.477**	**<0.01**

Source: Field Survey

The above table indicates that out of eighteen paths in the regression model - 2; nine paths are significant with a P value less than .05 and T statistics above 1.96. From the above table, we can understand that activity links for business development & evaluation and mentoring & resource collection have a significant impact on both structural bond and economic bond. Activity link for marketing & expertise assistance have a significant impact on structural and social bond. Activity links for product modelling & team building and idea feasibility & registration have no impact on actor bond. Resource ties have a significant impact on structural bond, social bond and economic bond. It can be understood that actor bond with other startups is significantly impacted by resource ties with other startups, but only three variables of activity link have a significant impact on actor bond with other startups.

❖ **Regression Model - 3: Dependent variable: Resource Ties**

Independent Variables: Activity Links & Actor bonds

Resource ties with other startups are the dependent variable in the regression model - 3. Independent variables are activity links for marketing & expertise assistance, idea feasibility & registration, product modeling & team building, business development & evaluation, as well as variables of actor bond such as structural bond, economic bond and social bond. CFA and PLS-SEM model of regression model - 3 are given below.

Figure 6.9

Confirmatory Factor Analysis: Regression Model - 3

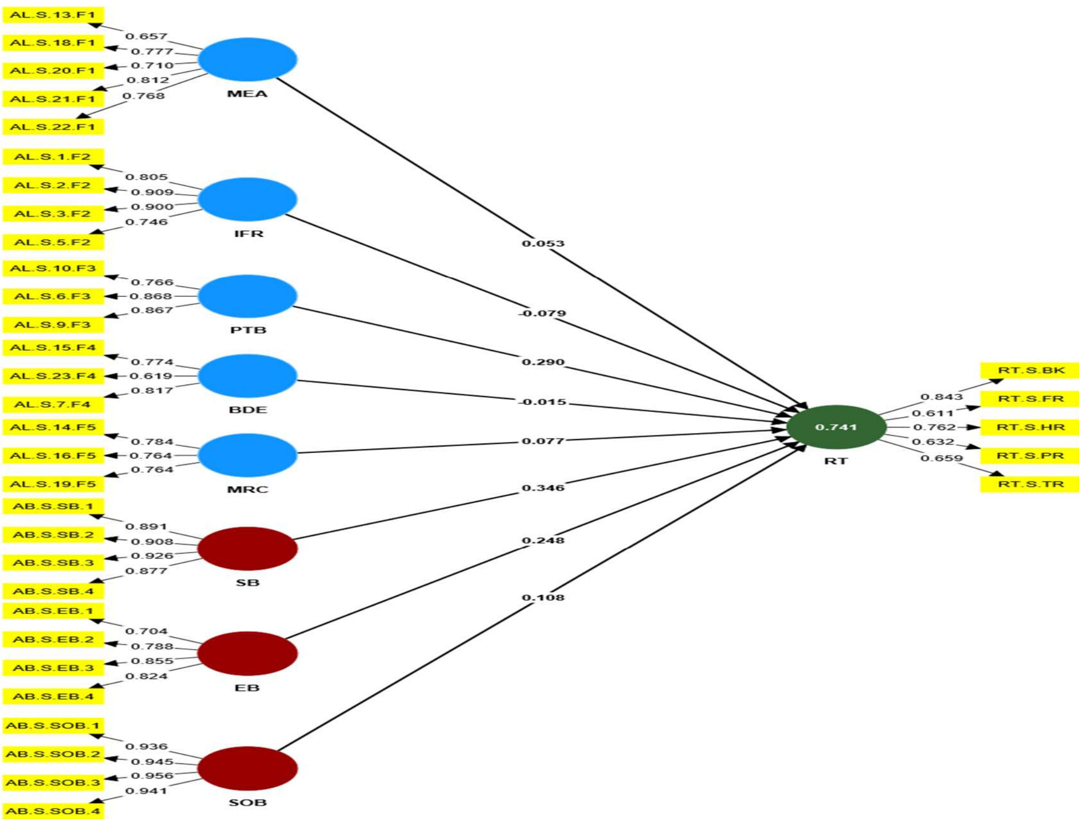
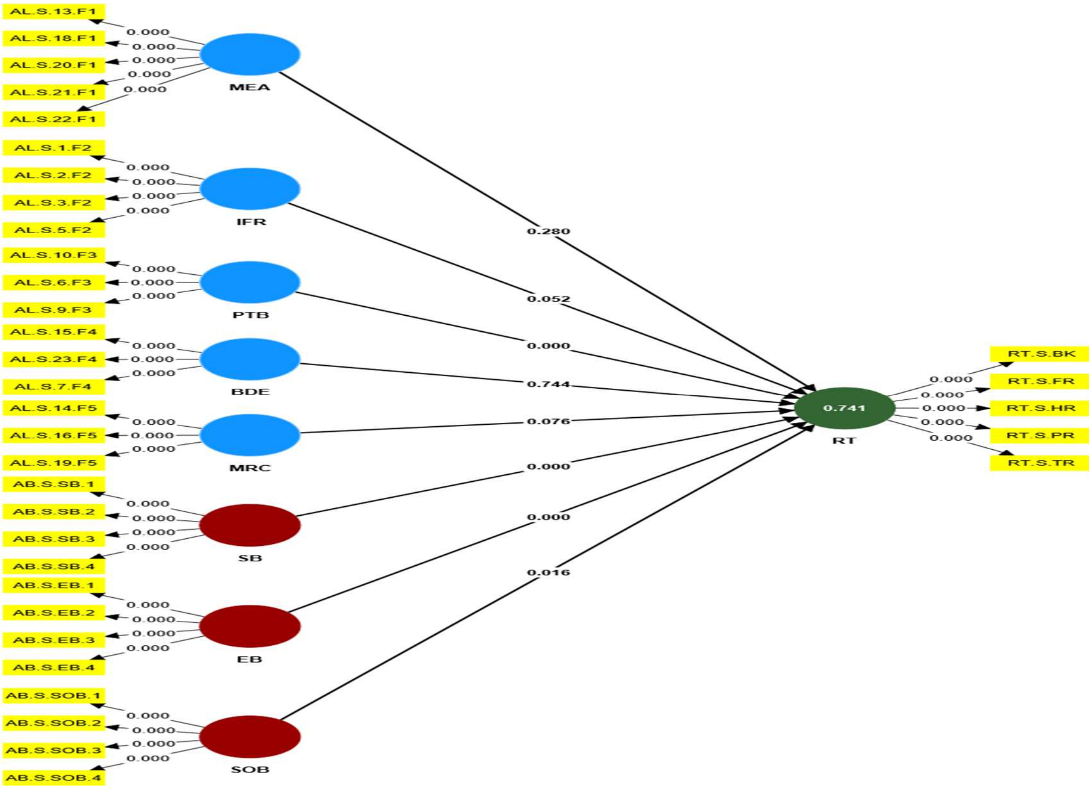


Figure 6.10

PLS-SEM: Regression Model - 3



- **Reliability and Convergent Validity: Regression Model - 3**

In order to verify the convergent validity and reliability of the regression model - 3, Cronbach's Alpha, Composite Reliability and Average Variance Extracted from the model variables are determined and are given in the table below.

Table 6.85

Reliability and Convergent Validity: Regression Model - 3

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
MEA	AL.S.13.F1	.657	.801	.805	.558
	AL.S.18.F1	.777			
	AL.S.20.F1	.710			
	AL.S.21.F1	.812			
	AL.S.22.F1	.768			

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
IFR	AL.S.1.F2	.805	.863	.870	.711
	AL.S.2.F2	.909			
	AL.S.3.F2	.900			
	AL.S.5.F2	.746			
PTB	AL.S.10.F3	.766	.781	.782	.697
	AL.S.6.F3	.868			
	AL.S.9.F3	.867			
BDE	AL.S.15.F4	.774	.713	.726	.550
	AL.S.23.F4	.619			
	AL.S.7.F4	.817			
MRC	AL.S.14.F5	.784	.766	.775	.594
	AL.S.16.F5	.764			
	AL.S.19.F5	.764			
SB	AB.S.SB.1	.891	.922	.924	.811
	AB.S.SB.2	.908			
	AB.S.SB.3	.926			
	AB.S.SB.4	.877			
EB	AB.S.EB.1	.704	.807	.831	.632
	AB.S.EB.2	.788			
	AB.S.EB.3	.855			
	AB.S.EB.4	.824			
SOB	AB.S.SOB.1	.936	.960	.960	.892
	AB.S.SOB.2	.945			
	AB.S.SOB.3	.956			
	AB.S.SOB.4	.941			
RT	RT.S.BK	.843	.745	.766	.534
	RT.S.FR	.611			
	RT.S.HR	.762			
	RT.S.PR	.632			
	RT.S.TR	.659			

Source: Field Survey

The variable names, items contained in each variable and their loadings are shown in the above table. It is evident from the table that every item has a loading that is higher than 0.5. All of the variables have Cronbach's Alpha and Composite Reliability values more than 0.7, indicating internal consistency between various items of a variable and ensuring the model's dependability. For the variables in the model, the Average Variance Extracted is 0.5 and above. The convergent validity of the model is guaranteed by an AVE of 0.5 and above.

- **Discriminant Validity: Regression Model - 3**

Discriminant validity of the model is ensured by using Fornell-Larcker Criterion. The square roots of the AVE for each variable and the correlation between them are displayed in the table below, which may be used to verify discriminant validity in accordance with the Fornell-Larcker Criterion.

Table 6.86

Discriminant Validity: Regression Model - 3

	BDE	EB	IFR	MEA	MRC	PTB	RT	SB	SOB
BDE	**0.742**								
EB	0.461	**0.795**							
IFR	0.555	0.349	**0.843**						
MEA	0.457	0.428	0.356	**0.747**					
MRC	0.515	0.551	0.364	0.446	**0.771**				
PTB	0.460	0.410	0.418	0.523	0.369	**0.835**			
RT	0.429	0.663	0.318	0.614	0.561	0.654	**0.707**		
SB	0.410	0.612	0.349	0.721	0.588	0.573	0.690	**0.901**	
SOB	0.310	0.494	0.270	0.500	0.457	0.436	0.635	0.699	**0.945**

Source: Field Survey

According to the Fornell-Larcker Criterion, square root of a variables AVE must be higher than its correlation with all other variables in order for a model to be considered discriminant valid. The variables of regression model - 3 satisfy the Fornell-Larcker Criterion, as can be seen from the above table, guaranteeing the discriminant validity of the model.

- **Multicollinearity: Regression Model – 3**

If there is a strong connection between several independent variables in a regression model, this is known as multicollinearity. In a regression model, the Variance Inflation Factor (VIF) indicates how multicollinear the independent variables are. Unproblematic multicollinearity between the independent variables is indicated by a VIF value less than 5 (James et al. 2014).

Table 6.87

Multicollinearity: Regression Model - 3

Independent Variables	VIF
BDE	1.948
IFR	1.533
MEA	2.297
MRC	1.879
PTB	1.724
SB	3.956
EB	1.870
SOB	1.993

Source: Field Survey

The VIF values of independent variables in the regression model – 3 indicates acceptable amount of multicollinearity since the values are below 5.

- **Path Coefficients: Regression Model - 3**

Figure 6.10 shows the PLS-SEM model for regression model - 3. The PLS-SEM model displays each path together with its path coefficients. A P value of less than .05 indicates that the relationship between variables and the path is significant. The following table lists the path coefficients for each path in the regression model - 3:

Table 6.88

Path Coefficients: Regression Model - 3

Paths	T statistics	P values
BDE -> RT	0.327	0.744
IFR -> RT	1.943	0.052
MEA -> RT	1.081	0.280
MRC -> RT	1.773	0.076
PTB -> RT	**6.791**	**<0.01**
SB -> RT	**5.405**	**<0.01**
EB -> RT	**5.095**	**<0.01**
SOB -> RT	**2.411**	**0.016**

Source: Field Survey

Based on the preceding data, only four of the eight routes in the regression model - 3 (with a P value less than .05. and T statistics above 1.96) are significant. It can be found that resource ties are significantly impacted by structural bond, economic bond, social bond and activity link for product modeling & team building. Therefore, it may be inferred that resource ties with other startups are significantly impacted by actor bond with other startups, but only one variable of activity links with other startups has an impact on resource ties.

6.3.3 Activity Links, Actor Bonds and Resource Ties with Incubators – Correlation Analysis

The purpose of a correlation test is to examine the association between the variables in a study. Whether the change in one variable leads to changes in another variable can be analysed through a correlation test. Therefore, for analysing the relationship between activity links, actor bonds and resource ties of startups with incubators, first a correlation analysis is conducted. Since the sample data is not normal, Spearman's Rank Correlation analysis is used. The hypothesis for testing the correlation is as follows:

H_0: There is no significant correlation between activity links, actor bonds and resource ties of startups with incubators.

The results of Spearman's Rank Correlation are as follows:

Table 6.89

Activity Links, Actor Bonds and Resource Ties with Incubators – Correlation Analysis

Variables		**N**	**Spearman's Correlation Coefficient**	**Sig.**
Business Development & Team Building	Structural Bond	288	.261	<0.01**
	Economic Bond	288	.166	<0.01**
	Social Bond	288	.245	<0.01**
	Resource Ties	288	.237	<0.01**
Marketing & Performance Evaluation	Structural Bond	288	.576	<0.01**
	Economic Bond	288	.470	<0.01**
	Social Bond	288	.517	<0.01**
	Resource Ties	288	.554	<0.01**
Idea Generation & Feasibility Study	Structural Bond	288	.620	<0.01**
	Economic Bond	288	.605	<0.01**
	Social Bond	288	.502	<0.01**
	Resource Ties	288	.612	<0.01**
Funding & Professional Assistance	Structural Bond	288	.572	<0.01**
	Economic Bond	288	.553	<0.01**
	Social Bond	288	.505	<0.01**
	Resource Ties	288	.505	<0.01**
Product Modelling & Resource Collection	Structural Bond	288	.466	<0.01**
	Economic Bond	288	.426	<0.01**
	Social Bond	288	.450	<0.01**
	Resource Ties	288	.463	<0.01**
Resource Ties	Structural Bond	288	.727	<0.01**
	Economic Bond	288	.690	<0.01**
	Social Bond	288	.693	<0.01**

Source: Field Survey

From the aforesaid table, we can understand that the activity link with incubators for business development & team building has a weak positive correlation with structural bond (r = .261), economic bond (r = .166), social bond (r = .245) and resource ties (r = .237). Activity link for marketing & performance evaluation has a moderately strong positive correlation with structural bond (r = .576), social bond (r = .517) and resource ties (r = .554) but a moderately weak correlation with economic bond (r = .470). The correlation of activity link for idea generation & feasibility study with structural bond (r = .620), economic bond (r = .605), social bond (r = .502) and resource ties (r = .612) is moderately strong and positive. Activity link for funding & professional assistance have a moderately strong and positive correlation with structural bond (r = .572), economic bond (r = .553), social bond (r = .505) and resource ties (r = .505).The correlation of activity link for product modelling & resource collection with structural bond (r = .466), economic bond (r = .426), social bond (r = .450) and resource ties (r = .463) is positive but moderately weak. The correlation of resource ties with structural bond (r = .727), economic bond (r = .690) and social bond (r = .693) is strong and positive. All the correlation coefficients are positive and significant because P values (P = <0.01) are less than .05. Therefore, the hypothesis that "There is no significant correlation between activity links, actor bonds and resource ties of startups with incubators" is rejected.

6.3.4 Activity Links, Actor Bonds and Resource Ties with Incubators – Regression Analysis

Correlation analysis has shown that there is a significant and positive correlation between the variables of actor bond, resource ties and activity link with incubators. Since there is a significant correlation, in order to determine if they are dependent on one another, a regression analysis is done. Three multiple regression models are used for analysing the dependency between the variables. In each model, variables of one construct will be dependent and variables of the other two constructs will be independent. Partial Least Squares Structural Equation Modeling (PLS-SEM) using SMART-PLS is employed for conducting regression analysis. PLS-SEM models consist of only Lower Order Constructs (LOCs). The regression models formed using PLS-SEM are given below:

- **Regression Model - 4:** The dependent variable is activity links with incubators and the independent variables are actor bonds and resource ties with incubators.

- **Regression Model - 5:** The dependent variable is actor bond with incubators and the independent variables are activity links and resource ties with incubators

- **Regression Model - 6:** The dependent variable is resource ties with incubators and the independent variables are actor bonds and activity links with incubators

Different codes have been used to indicate different variables and items included in the regression models. The codes used in the models are as follows:

Table 6.90

Variables, Items and Codes – Regression Models - 4, 5 & 6

Variables	Codes	Items	Codes
Business Development & Team Building	BDT	Arranging seed capital to start business	AL.I.4.F1
		Formally registering startup	AL.I.5.F1
		Organising a Startup team	AL.I.6.F1
		Devoting full time for business development	AL.I.7.F1
		Preparing a business plan	AL.1.8.F1
		Hiring and training employees	AL.1.9.F1
Marketing & Performance Evaluation	MPE	Marketing of product	AL.I.20.F2
		Customer generation and care	AL.I.21.F2
		Sales and revenue generation	AL.I.22.F2
		Evaluating Performance of startups	AL.I.23.F2
Idea Generation & Feasibility Study	IGF	Developing a business idea	AL.I.1.F3
		Conducting a market survey	AL.I.2.F3
		Conducting feasibility study	AL.I.3.F3
Funding & Professional Assistance	FPA	Meeting investors and pitching for fund	AL.I.11.F4
		Approaching financial institutions for credit	AL.I.12.F4
		Arranging assistance of professionals like accountants, lawyers etc	AL.I.18.F4

Variables	Codes	Items	Codes
Product Modelling & Resource Collection	PRC	Research and modeling of prototype/sample	AL.I.10.F5
		Arranging technical assistance needed for business	AL.I.13.F5
		Applying for intellectual properties like patent, trademark etc.	AL.I.16.F5
		Purchasing stock or raw materials & arranging machinery/equipment	AL.I.19.F5
Structural Bond	SB	Performing business activities with mutual support and coordination	AB.I.SB.1
		Sharing of facilities, equipment's and other resources	AB.I.SB.2
		Formulating policies and programs that enhance business relationships	AB.I.SB.3
		Developing value added partnerships and Collaborations	AB.I.SB.4
Economic Bond	EB	Capital investment in startup	AB.I.EB.1
		Providing business credit/grant to startup	AB.I.EB.2
		Providing facilities/goods/services at lower rate and other financial incentives	AB.I.EB.3
		Joint investment in innovation projects	AB.I.EB.4
Social Bond	SOB	Personal attachment and friendship	AB.I.SOB.1
		Mutual interaction and communication	AB.I.SOB.2
		Mutual trust and belief	AB.I.SOB.3
		Commitment	AB.I.SOB.4
Resource Ties	RT	Business Knowledge	RT.I.BK
		Financial Resources	RT.I.FR
		Human Resources	RT.I.HR
		Technological Resources	RT.I.TR
		Other Intangible Resources	RT.I.IR

Source: Field Survey

Note: *Three activities, such as arranging mentoring support, arranging office infrastructure facilities and attending workshops and seminars and one item from resource ties, i.e., resource ties for physical infrastructure resources, were eliminated from the PLS-SEM model due to validity concerns.*

❖ Regression Model – 4: Dependent Variable: Activity Links

Independent Variables: Actor Bonds and Resource Ties

Activity links for business development & team building, marketing & performance evaluation, idea generation & feasibility study, funding & professional assistance, product modeling & resource collection with incubators are the dependent variables of regression model - 4. The resource ties, social bond, economic bond and structural bonds with incubators are the independent variables. Confirmatory factor analysis is done for the model and the outcome is shown below.

Figure 6.11

Confirmatory Factor Analysis: Regression Model - 4

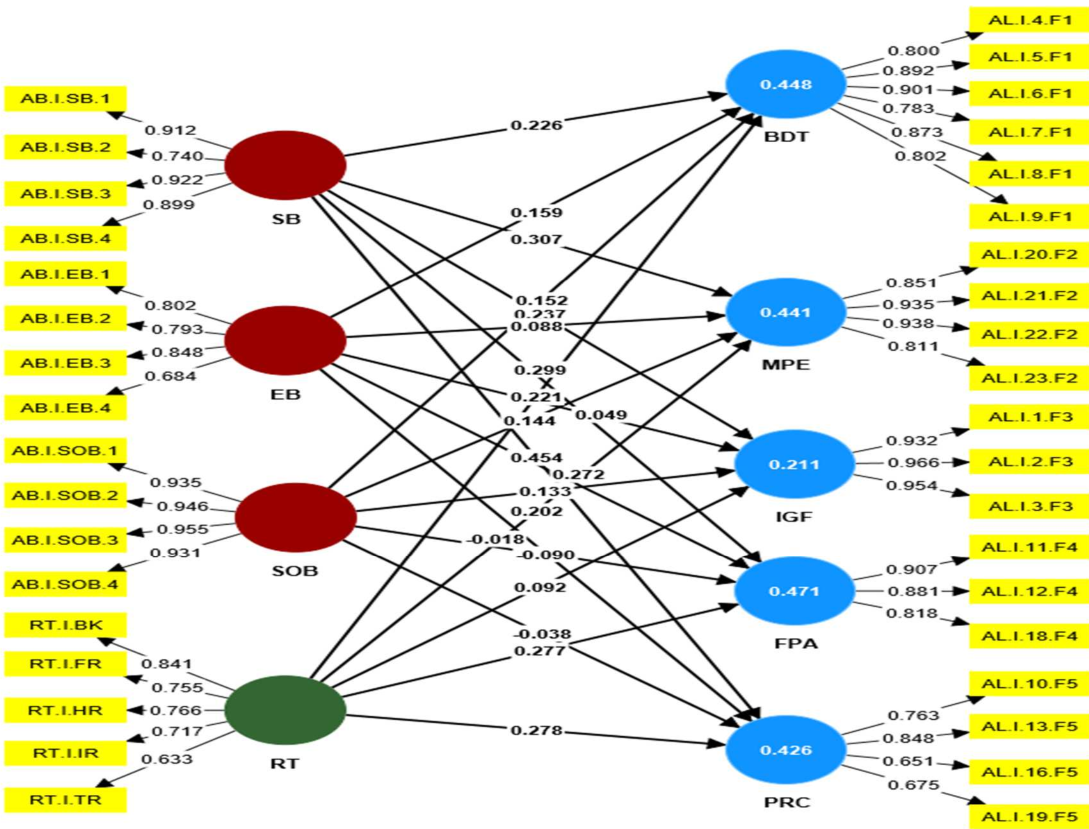
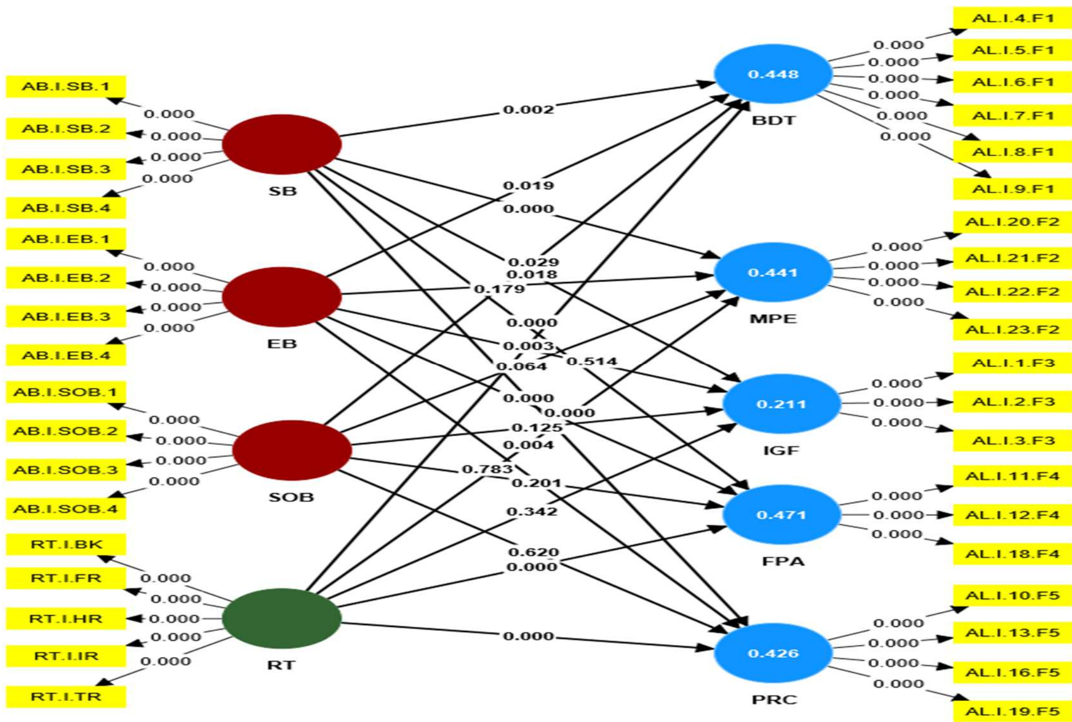


Figure 6.12

PLS-SEM: Regression Model - 4



- **Reliability and Convergent Validity: Regression Model - 4**

Cronbach's Alpha, Composite Reliability and Average Variance Extracted of the model variables have been determined in order to guarantee the convergent validity and reliability of regression model - 4. The table below displays the results.

Table 6.91

Reliability and Convergent Validity: Regression Model - 4

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
BDT	AL.I.4.F1	.800	.918	.921	.711
	AL.I.5.F1	.892			
	AL.I.6.F1	.901			
	AL.I.7.F1	.783			
	AL.1.8.F1	.873			
	AL.1.9.F1	.802			

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
MPE	AL.I.20.F2	.851	.907	.909	.784
	AL.I.21.F2	.935			
	AL.I.22.F2	.938			
	AL.I.23.F2	.811			
IGF	AL.I.1.F3	.932	.946	.946	.903
	AL.I.2.F3	.966			
	AL.I.3.F3	.954			
FPA	AL.I.11.F4	.907	.837	.837	.756
	AL.I.12.F4	.881			
	AL.I.18.F4	.818			
PRC	AL.I.10.F5	.763	.722	.757	.545
	AL.I.13.F5	.848			
	AL.I.16.F5	.651			
	AL.I.19.F5	.675			
SB	AB.I.SB.1	.912	.892	.907	.760
	AB.I.SB.2	.740			
	AB.I.SB.3	.922			
	AB.I.SB.4	.899			
EB	AB.I.EB.1	.802	.793	.812	.615
	AB.I.EB.2	.793			
	AB.I.EB.3	.848			
	AB.I.EB.4	.684			
SOB	AB.I.SOB.1	.935	.958	.958	.887
	AB.I.SOB.2	.946			
	AB.I.SOB.3	.955			
	AB.I.SOB.4	.931			
RT	RT.I.BK	.841	.799	.817	.556
	RT.I.FR	.755			
	RT.I.HR	.766			
	RT.I.IR	.717			
	RT.I.TR	.633			

Source: Field Survey

The above table displays the names of the various model variables as well as the items that are included in each variable and their loadings. Cronbach's Alpha and Composite Reliability for all the variables are greater than 0.7, which means there is internal consistency between the items of a variable, which ensures the reliability of the model. For the variables, the Average Variance Extracted is 0.5 and above. A minimum AVE of 0.5 guarantees the convergent validity of the model.

- **Discriminant Validity: Regression Model – 4**

To guarantee the discriminant validity of the model, the Fornell-Larcker Criterion is applied. The following table, which may be used to verify discriminant validity in accordance with the Fornell-Larcker Criterion, displays the square roots of the AVE for each variable as well as the correlation between the variables.

Table 6.92

Discriminant Validity: Regression model - 4

	BDT	EB	FPA	IGF	MPE	PRC	RT	SB	SOB
BDT	**0.843**								
EB	0.546	**0.784**							
FPA	0.410	0.584	**0.869**						
IGF	0.703	0.344	0.288	**0.951**					
MPE	0.514	0.507	0.556	0.357	**0.885**				
PRC	0.449	0.425	0.546	0.313	0.476	**0.738**			
RT	0.614	0.669	0.626	0.406	0.605	0.592	**0.745**		
SB	0.608	0.620	0.617	0.436	0.624	0.632	0.719	**0.871**	
SOB	0.582	0.652	0.508	0.405	0.573	0.486	0.730	0.732	**0.942**

Source: Field Survey

To establish discriminant validity for a model, the square root of AVE of a variable must be bigger than the correlation of that variable with all other variables, according to the Fornell-Larcker Criterion. As the table above shows, regression model - 4 satisfies the Fornell-Larcker Criterion, guaranteeing the discriminant validity of the model.

- **Multicollinearity: Regression Model – 4**

When there is a strong correlation between multiple independent variables in a regression model, this is known as multicollinearity. The degree of multicollinearity between the independent variables in a regression model is indicated by the Variance Inflation Factor, or VIF. Low level of multicollinearity between the variables that are independent is indicated by a VIF score less than 5 (James et al., 2014).

Table 6.93

Multicollinearity: Regression Model - 4

Independent Variables	VIF
SB	2.990
EB	2.056
SOB	2.706
RT	3.247

Source: Field Survey

VIF scores of the independent variables of regression model – 4 are less than 5 which denotes acceptable level of multicollinearity.

- **Path Coefficients: Regression Model – 4**

Figure 6.12 shows the PLS-SEM model for regression model - 4. Every path in the regression model has a path coefficient and the PLS-SEM model displays the P values for each path. A P value of less than .05 indicates statistical significance in the path and the influence of the independent variable on the dependent variable. The table below lists the path coefficients for each path in the regression model - 4:

Table 6.94

Path Coefficients: Regression Model - 4

Paths	T statistics	P values
SB -> BDT	**3.029**	**0.002**
SB -> FPA	**4.459**	**<0.01**
SB -> IGF	**2.364**	**0.018**
SB -> MPE	**4.227**	**<0.01**
SB -> PRC	**6.231**	**<0.01**
EB -> BDT	**2.349**	**0.019**
EB -> FPA	**4.342**	**<0.01**
EB -> IGF	0.652	0.514
EB -> MPE	1.344	0.179
EB -> PRC	0.275	0.783
SOB -> BDT	**2.184**	**0.029**
SOB -> FPA	1.278	0.201
SOB -> IGF	1.534	0.125
SOB -> MPE	1.853	0.064
SOB -> PRC	0.496	0.620
RT -> BDT	**2.943**	**0.003**
RT -> FPA	**3.839**	**<0.01**
RT -> IGF	0.951	0.342
RT -> MPE	**2.861**	**0.004**
RT -> PRC	**3.654**	**<0.01**

Source: Field Survey

From the above table, we can understand that out of 20 paths, 12 are significant with P values less than .05 and T statistics above 1.96. The structural bond with incubators has a significant impact on all the variables of activity links with incubators, such as business development & team building, marketing & performance evaluation, idea generation & feasibility study, funding & professional assistance and product modeling & resource collection. The economic bond has an impact only on activity links for business development & team building and funding & professional assistance. The social bond has an impact only on activity link for business development & team building. Resource ties have an impact on all the variables of the activity links except the activity link for idea generation & feasibility study. Therefore, regression analysis indicates that activity link for business development & team building is the only variable of activity links with incubators that is impacted by structural bond, economic bond, social bond and resource ties with incubators. We can also understand that the structural bond is the only independent variable having an impact on all the variables of activity links with incubators.

❖ **Regression Model – 5: Dependent Variable: Actor Bonds**

Independent Variables: Activity Links and Resource Ties

The dependent variables of regression model-5 are the structural, economic and social bonds with incubators. Independent variables include development & team building, marketing & performance evaluation, idea generation & feasibility study, funding & professional assistance, product modeling & resource collection and resource ties with incubators. The outcome of the model's confirmatory factor analysis is shown in the figure below.

Figure 6.13

Confirmatory Factor Analysis: Regression Model – 5

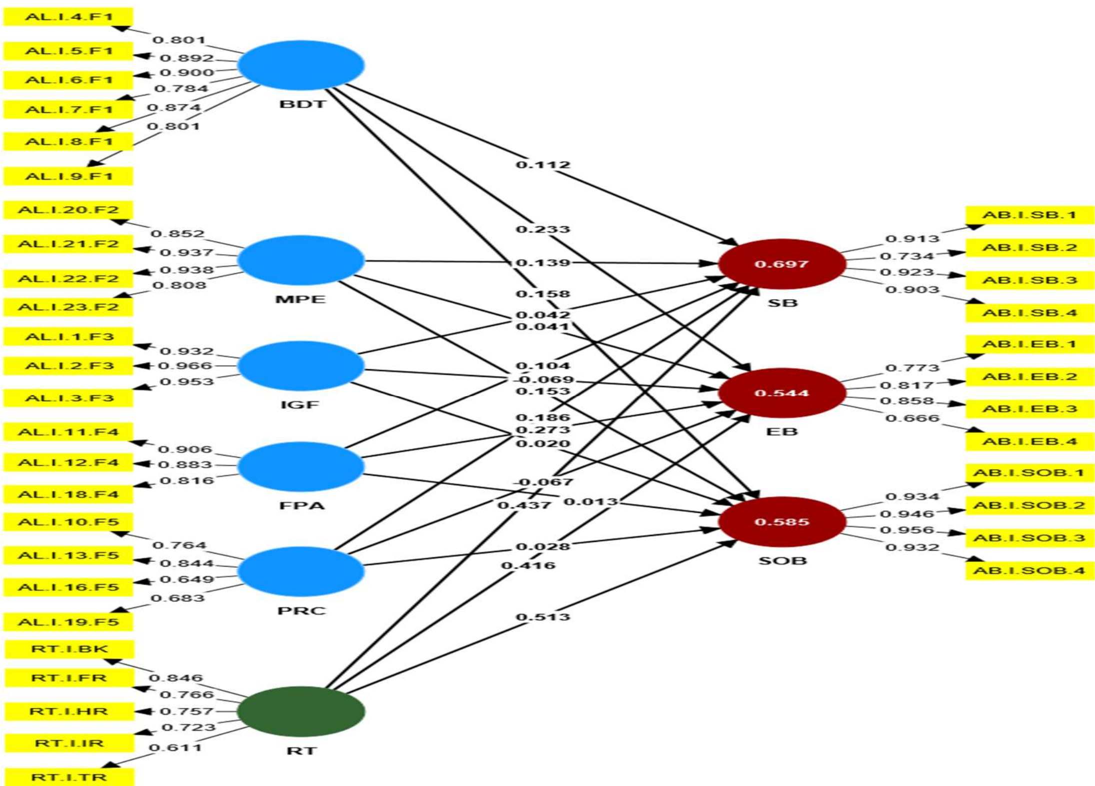
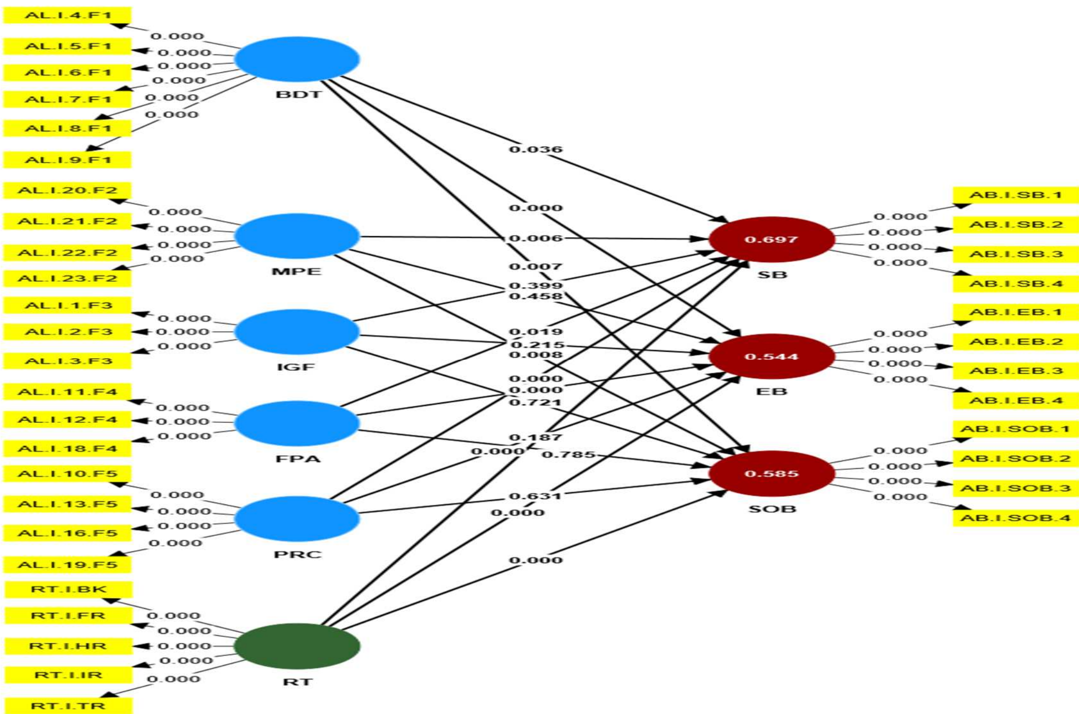


Figure 6.14

PLS-SEM: Regression Model - 5



- **Reliability and Convergent Validity: Regression Model – 5**

Reliability and convergent validity of regression model - 5 are ensured through Cronbach's Alpha, Composite Reliability and Average Variance Extracted from the model variables. These values are given in the table below.

Table 6.95

Reliability and Convergent Validity: Regression Model - 5

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
BDT	AL.I.4.F1	.801	.918	.921	.711
	AL.I.5.F1	.892			
	AL.I.6.F1	.900			
	AL.I.7.F1	.784			
	AL.1.8.F1	.874			
	AL.1.9.F1	.801			

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
MPE	AL.I.20.F2	.852	.907	.910	.784
	AL.I.21.F2	.937			
	AL.I.22.F2	.938			
	AL.I.23.F2	.808			
IGF	AL.I.1.F3	.932	.946	.946	.903
	AL.I.2.F3	.966			
	AL.I.3.F3	.953			
FPA	AL.I.11.F4	.906	.837	.836	.756
	AL.I.12.F4	.883			
	AL.I.18.F4	.816			
PRC	AL.I.10.F5	.764	.722	.752	.546
	AL.I.13.F5	.844			
	AL.I.16.F5	.649			
	AL.I.19.F5	.683			
SB	AB.I.SB.1	.913	.892	.910	.759
	AB.I.SB.2	.734			
	AB.I.SB.3	.923			
	AB.I.SB.4	.903			
EB	AB.I.EB.1	.773	.793	.829	.611
	AB.I.EB.2	.817			
	AB.I.EB.3	.858			
	AB.I.EB.4	.666			
SOB	AB.I.SOB.1	.934	.958	.958	.887
	AB.I.SOB.2	.946			
	AB.I.SOB.3	.956			
	AB.I.SOB.4	.932			
RT	RT.I.BK	.846	.799	.824	.554
	RT.I.FR	.766			
	RT.I.HR	.757			
	RT.I.IR	.723			
	RT.I.TR	.611			

Source: Field Survey

It can be seen from the above table that all the items have a loading greater than 0.5. The reliability of the model is ensured through Cronbach's Alpha and Composite Reliability. All the variables have Cronbach's Alpha and Composite Reliability greater than 0.7, which means the model is reliable and there is internal consistency between the items in each variable. Since the Average Variance Extracted for the variables is 0.5 and above, it ensures that the model has convergent validity.

- **Discriminant Validity: Regression Model - 5**

Fornell-Larcker Criterion is used for testing the discriminant validity of the model. According to the Fornell-Larcker Criterion, we may conclude that the model has discriminant validity if the square roots of the AVE of each variable are larger than the correlation of that variable with very other variables.

Table 6.96

Discriminant Validity: Regression model - 5

	BDT	EB	FPA	IGF	MPE	PRC	RT	SB	SOB
BDT	**0.843**								
EB	0.541	**0.782**							
FPA	0.410	0.597	**0.869**						
IGF	0.703	0.334	0.288	**0.950**					
MPE	0.514	0.508	0.556	0.357	**0.885**				
PRC	0.449	0.428	0.546	0.314	0.476	**0.739**			
RT	0.612	0.688	0.633	0.405	0.608	0.587	**0.744**		
SB	0.607	0.630	0.618	0.436	0.624	0.630	0.723	**0.871**	
SOB	0.582	0.655	0.508	0.406	0.573	0.486	0.735	0.733	**0.942**

Source: Field Survey

The table above indicates that the square root of each variable's AVE is higher than its correlation with all other variables. Thus, in accordance with the Fornell-Larcker Criterion, regression model - 5 exhibits discriminant validity.

- **Multicollinearity: Regression Model – 5**

Multicollinearity is the term used to describe when there is a high correlation between several independent variables in a regression model. The Variance Inflation Factor, or VIF, in a regression model indicates the level of multicollinearity between the independent variables. A VIF score of less than 5 indicates insignificant multicollinearity amongst the independent variables (James et al., 2014).

Table 6.97

Multicollinearity: Regression Model - 5

Independent Variables	VIF
BDT	2.748
FPA	1.926
IGF	1.981
MPE	1.825
PRC	1.699
RT	2.546

Source: Field Survey

The independent variables of the regression model - 5 have VIF values that are less than 5, indicating an acceptable level of multicollinearity.

- **Path Coefficients: Regression Model - 5**

The PLS-SEM model for regression model - 5 is displayed in figure 6.14. The PLS-SEM model displays the path coefficients for every path. The dependent variable is influenced by the independent variable and the path is significant if the P value is smaller than .05. The following table provides the path coefficients for every path in the regression model - 5.

Table 6.98

Path Coefficients: Regression Model - 5

Paths	T statistics	P values
BDT -> EB	**3.558**	**<0.01**
BDT -> SB	**2.092**	**0.036**
BDT -> SOB	**2.691**	**0.007**
FPA -> EB	**4.909**	**<0.01**
FPA -> SB	**2.344**	**0.019**
FPA -> SOB	0.273	0.785
IGF -> EB	1.239	0.215
IGF -> SB	0.844	0.399
IGF -> SOB	0.357	0.721
MPE -> EB	0.743	0.458
MPE -> SB	**2.773**	**0.006**
MPE -> SOB	**2.662**	**0.008**
PRC -> EB	1.32	0.187
PRC -> SB	**4.209**	**<0.01**
PRC -> SOB	0.48	0.631
RT -> EB	**6.841**	**<0.01**
RT -> SB	**7.872**	**<0.01**
RT -> SOB	**9.472**	**<0.01**

Source: Field Survey

It is found from the PLS-SEM model that out of eighteen paths in the model, eleven are significant with P values less than .05 and T statistics above 1.96. We can see that the activity link with incubators for business development & team building has a significant impact on the structural bond, economic bond and social bond with incubators. Activity link for funding & professional assistance have an impact on structural bond and economic bond. Activity link for marketing & performance evaluation have an impact on structural and social bond. Activity link for product modeling & resource collection have an impact only on the structural bond. Activity link for idea generation & feasibility study have no impact on actor bonds with incubators. Resource ties with incubators have an impact on structural, economic, as well as social bond with incubators. Therefore, from the regression model, we can understand that all the variables of activity links with incubators do not have a significant impact on all the variables of actor bonds with incubators. However, resource ties with incubators have an impact on actor bonds with incubators.

❖ **Regression model – 6: Dependent Variable: Resource Ties**

Independent Variables: Activity Links and Actor bonds

Resource ties with incubators are the dependent variable of the regression model - 6. Independent variables are activity links for business development & team building, marketing & performance evaluation, idea generation & feasibility study, funding & professional assistance, product modeling & resource collection as well as structural, economic and social bonds with incubators. Confirmatory factor analysis for the model is conducted and the result is given in the below figure 6.15.

Figure 6.15

Confirmatory Factor Analysis: Regression Model - 6

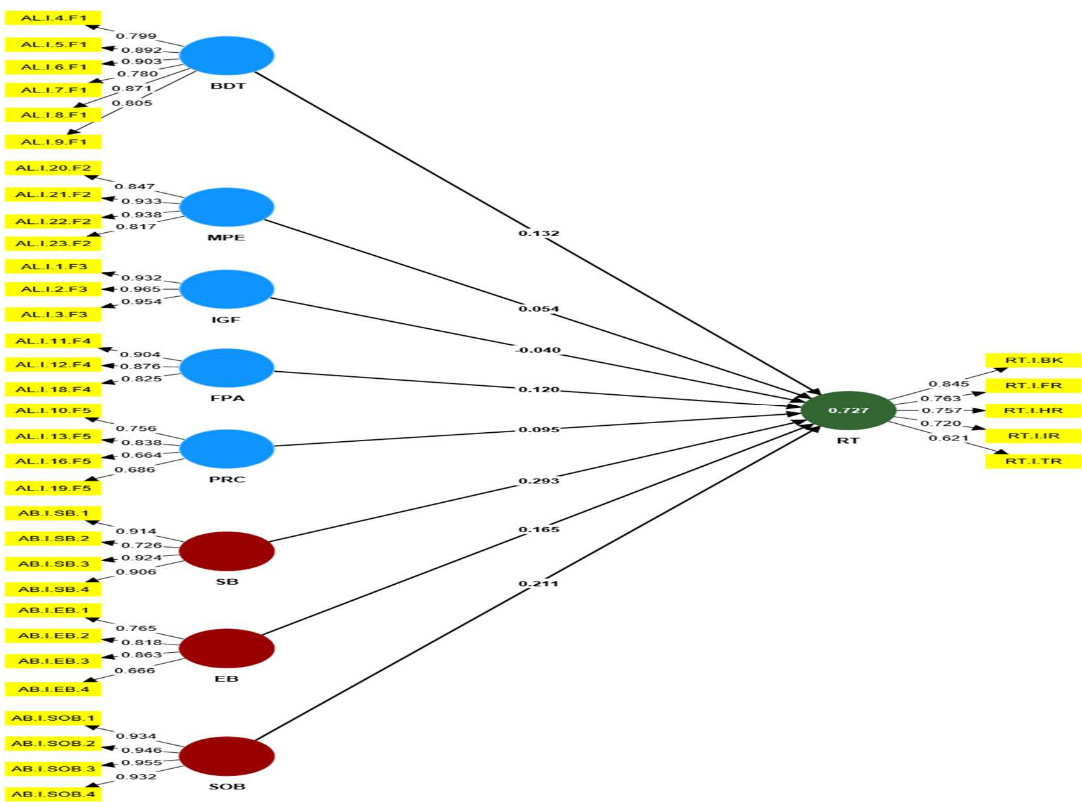
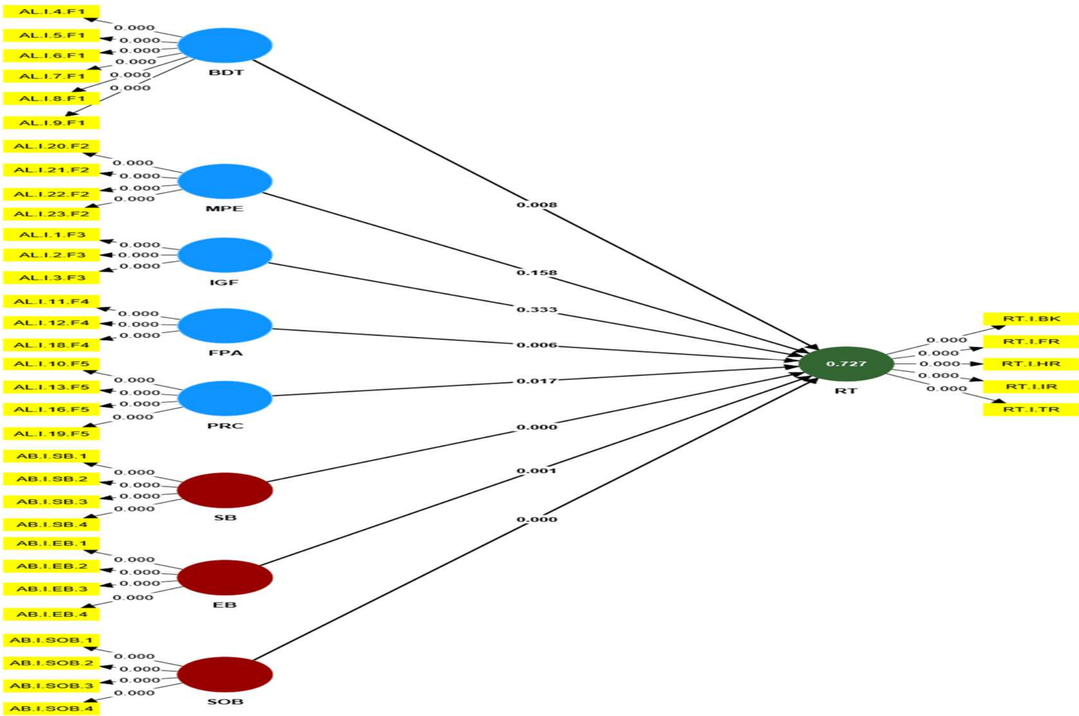


Figure 6.16

PLS-SEM: Regression Model - 6



- **Reliability and Convergent Validity: Regression Model – 6**

Cronbach's Alpha, Composite Reliability and Average Variance Extraction of the model variables is used to check the reliability and convergent validity of the regression model. These values are given in the table below.

Table 6.99

Reliability and Convergent Validity: Regression model - 6

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
BDT	AL.I.4.F1	.799	.918	.923	.711
	AL.I.5.F1	.892			
	AL.I.6.F1	.903			
	AL.I.7.F1	.780			
	AL.1.8.F1	.871			
	AL.1.9.F1	.805			

Variables	Loadings		Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted
MPE	AL.I.20.F2	.847	.907	.907	.784
	AL.I.21.F2	.933			
	AL.I.22.F2	.938			
	AL.I.23.F2	.817			
IGF	AL.I.1.F3	.932	.946	.947	.903
	AL.I.2.F3	.965			
	AL.I.3.F3	.954			
FPA	AL.I.11.F4	.904	.837	.838	.755
	AL.I.12.F4	.876			
	AL.I.18.F4	.825			
PRC	AL.I.10.F5	.756	.722	.745	.546
	AL.I.13.F5	.838			
	AL.I.16.F5	.664			
	AL.I.19.F5	.686			
SB	AB.I.SB.1	.914	.892	.915	.759
	AB.I.SB.2	.726			
	AB.I.SB.3	.924			
	AB.I.SB.4	.906			
EB	AB.I.EB.1	.765	.793	.833	.611
	AB.I.EB.2	.818			
	AB.I.EB.3	.863			
	AB.I.EB.4	.666			
SOB	AB.I.SOB.1	.934	.958	.958	.887
	AB.I.SOB.2	.946			
	AB.I.SOB.3	.955			
	AB.I.SOB.4	.932			
RT	RT.I.BK	.845	.799	.822	.555
	RT.I.FR	.763			
	RT.I.HR	.757			
	RT.I.IR	.720			
	RT.I.TR	.621			

Source: Field Survey

From the above table, it is evident that every item in each of the variables has a loading that is higher than 0.5. The model's reliability is guaranteed by the fact that all of the variables' Composite Reliability and Cornbach's Alpha are more than 0.7. Because the Average Variance Extracted for the variables is 0.5 and above, the model's convergent validity is also guaranteed.

- **Discriminant Validity: Regression Model – 6**

The discriminant validity of the model is tested by Fornell-Larcker Criterion. The square roots of each variable's AVE and its correlation with other variables are displayed in the table below. They are used to establish discriminant validity in accordance with the Fornell-Larcker Criterion.

Table 6.100

Discriminant Validity: Regression Model - 6

	BDT	EB	FPA	IGF	MPE	PRC	RT	SB	SOB
BDT	**0.843**								
EB	0.539	**0.782**							
FPA	0.412	0.599	**0.869**						
IGF	0.703	0.332	0.290	**0.950**					
MPE	0.516	0.508	0.559	0.358	**0.885**				
PRC	0.446	0.428	0.547	0.313	0.473	**0.739**			
RT	0.613	0.687	0.633	0.404	0.607	0.589	**0.745**		
SB	0.606	0.633	0.620	0.435	0.625	0.627	0.723	**0.871**	
SOB	0.583	0.656	0.509	0.405	0.572	0.485	0.733	0.734	**0.942**

Source: Field Survey

As per the Fornell-Larcker Criterion, the square root of the AVE of every variable should be greater than their correlation with every other variable. From the above table, we can understand that regression model - 6 fulfils the condition of the Fornell-Larcker Criterion, ensuring the discriminant validity of the model.

- **Multicollinearity: Regression Model – 6**

When a strong correlation exists among many independent variables in a regression model, it is referred to as multicollinearity. An indication of the degree of multicollinearity between the independent variables in a regression model is the Variance Inflation Factor, or VIF. Low level of multicollinearity between the independent variables is indicated by a VIF score of less than 5 (James et al., 2014).

Table 6.101

Multicollinearity: Regression Model – 6

Independent Variables	VIF
BDT	2.847
FPA	2.087
IGF	1.997
MPE	1.912
PRC	1.796
SB	3.317
EB	2.257
SOB	2.637

Source: Field Survey

There is an acceptable level of multicollinearity for the independent variables of the regression model – 6 since their VIF values are less than 5.

- **Path Coefficients: Regression Model – 6**

Figure 6.16 shows the PLS-SEM model for the regression model - 6. Path coefficients are also presented in the model. A path with a P value less than .05 is significant and indicates that independent variables have an important influence on the dependent variable. The table below provides the path coefficients for all six paths in the regression model:

Table 6.102

Path Coefficients: Regression model - 6

Paths	T statistics	P values
BDT -> RT	**2.633**	**0.008**
FPA -> RT	**2.74**	**0.006**
IGF -> RT	0.968	0.333
MPE -> RT	1.411	0.158
PRC -> RT	**2.383**	**0.017**
SB -> RT	**5.01**	**<0.01**
EB -> RT	**3.476**	**0.008**
SOB -> RT	**4.168**	**<0.01**

Source: Field Survey

The PLS-SEM model indicates that out of eight paths, six are significant with a P value less than .05 and T statistics above 1.96. Apart from activity link for idea generation & feasibility study and marketing & performance evaluation, every other variable of activity links has a significant impact on resource ties with incubators. All three variables of actor bonds, such as structural bond, economic bond and social bond have a significant impact on resource ties. From this, it may be inferred that activity links with incubators have an impact on resource ties only in selected aspects whereas actor bonds have a significant impact on resource ties with incubators in every aspect.

6.4 Chapter Summary

This chapter discusses activity links, resource ties and actor bonds that startups share with other startups and incubators. Activity links of startups with other startups are classified into activity links for marketing & expertise assistance, idea feasibility & registration, product modeling & team building, business development & evaluation, mentoring and mentoring & resource collection. There is no significant difference among various categories of startups in their activity link for idea feasibility & registration with other startups. But with regard to the other activity links, there are substantial differences. There is also a notable difference among various categories regarding actor bonds as well as resource ties with other startups. Significant as well as positive correlations exist between the activity links, actor bonds and resource ties with other startups. Actor bonds and resource ties with other startups significantly impact each other and are interdependent. But activity links with other startups are not dependent on resource ties and actors bond with other startups in all cases and vice versa. Activity links for startups with incubators are classified into five groups: activity links for business development & team building, marketing & performance evaluation, idea generation & feasibility study, funding & professional assistance and product modeling & resource collection. There is a significant difference among various startup categories in their activity links with incubators in all cases except for activity link for business development & team building. There is also a substantial difference among different types of startups in their strength of actor bond as well as their resource ties with incubators. There is a significant and positive correlation among the activity links, actor bonds and resource ties of startups with incubators. Actor bonds and resource ties of startups with incubators significantly impact each other. Activity links have no impact on actor bonds and only structural bond (between startups and incubators) have an impact on activity links with incubators. Resource ties are dependent on actor bonds and actor bonds are dependent on resource ties. So the chapter can be concluded by stating that activity links are not fully dependent on actor bonds and resource ties. Actor bonds and resource ties are partially dependent on activity links whereas resource ties and actor bonds are completely dependent on each other.

Chapter 7

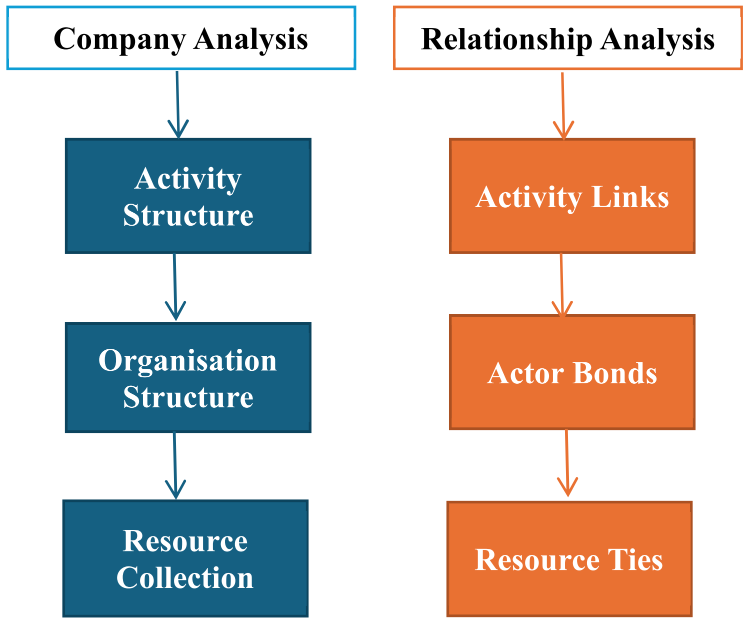
Components of Individual Actors and Business Relationships - Incubators

7.1 Introduction

Startups in their early stages are like newborn babies who need careful attention and nurturing. Startup founders are like those parents who have no experience handling their newborn baby and need the help of someone experienced to learn how to care for their newborn. The role of incubators is that of a supporting organisation that will help convert startup ideas into feasible business proposals. Business incubation programmes are provided by incubators established by the government, private companies, universities and other educational institutions. Incubators provide physical space, mentoring support, financial aid, marketing support and every other support that is needed by startups for the commercial growth and success of the business. Kerala has incubators established by the central government, either research centres or technology business incubators; the state government through the Kerala Startup Mission; universities and educational institutions; as well as private companies. Depending on the type of business incubator, there can be differences in their activities performed, level of coordination with other incubators and startups, organisation structure, bonding with other actors, resource collection and resource ties. This chapter discusses various types of incubators, which will help to understand whether there are any differences in how the incubation programme is provided by them.

Figure 7.1

Company Analysis and Relationship Analysis



Incubators and their business relationships are analysed based on Actor-Resource-Activity (ARA) model (Hakansson & Snehota, 1995). According to the ARA model, activity structure, organisation structure and resource collection defines the functions of individual actors in a relationship. While analysing the relationship of incubators with startups and other incubators, it is important to understand incubators as an individual actor through the activities performed by them, their organisation structure and resource collection. After that, the relationship of incubators with startups and other incubators is analysed on the basis of activity links, actor bonds and resource ties shared between them. The study of incubators is a population study with thirty-eight active incubators functioning in the Kerala startup ecosystem and descriptive analysis is used for analysing the various aspects regarding incubators. The measures of descriptive analysis that are used in this part of the study are as follows:

- Frequency
- Percentage analysis
- Mean

- Standard Deviation
- Maximum
- Minimum

7.2 Different Categories of Incubators

This section of the chapter discusses the different categories of incubators based on their supporting authority/organisation, stage from which startups are admitted for incubation programmes, nature of business and nature of output of startups that are associated with incubators. Incubators differ from one another in their characteristics and to get a clear idea of the functions of incubators in Kerala, it is important to analyse different categories of incubators in detail. Thirty-eight business incubators are classified into different categories and discussed in this study. Details of the categorisation of incubators are given below:

Table 7.1

Different Categories of Incubators

Categories of Incubators	Categories and Total	Frequency	Percentage
Supporting Authority/ Organisation	Central Government supported	8	21.1
	State Government supported	11	28.9
	University/Educational Institution supported	13	34.2
	Private/Corporate Business Incubator	6	15.8
	Total	**38**	**100**
Stage of Startup Life Cycle (Stage from which startups are taken for incubation)	Ideation	23	60.5
	Validation	9	23.7
	Early traction	6	15.8
	Scale-up	0	0
	Maturity	0	0
	Total	**38**	**100**

Categories of Incubators	Categories and Total	Frequency	Percentage
Nature of Business	Technology	26	68.4
	Non-Technology	0	0
	Both Technology & Non-Technology	0	0
	Any category	12	31.6
	Total	**38**	**100**
Nature of Output	Product Oriented	12	31.6
	Service Oriented	0	0
	Both Product & Service Oriented	0	0
	Any category	26	68.4
	Total	**38**	**100**

Source: Field Survey

The above table includes details of the different categories of incubators included in the study. From the table, it can be understood that out of the 38 incubators taken for the study, 34.2% are university or educational institution-based. 21.1% of central government-supported incubators and 28.9% of state-supported incubators are functioning in Kerala. 15.8% of incubators are private incubators. 60.5% of incubators take startups for an incubation programme during their ideation stage itself. 23.7% of incubators take startups at their validation stage and 15.8% of incubators enrol startups at their early traction stage for the incubation programme. 68.4% of incubators include only technology startups in their incubation programme. 31.6% of incubators take any category of startup based on their nature of business for incubation. Incubators that provide incubation facilities exclusively to non-technology startups, or both technology & non-technology startups are not there. 68.4% of incubators provide incubation programmes to any category of startup based on the nature of their output. 31.6% of incubators provide incubator programmes exclusively to product oriented startups.

7.2.1 Cross-Tabulation of Various Categories of Incubators

Cross-tabulating different categories of incubators would help us understand more about each type of incubator. The stage from which startups are taken for incubation, the nature of the business and the nature of the output of startups that are taken for incubation programmes by incubators based on different supporting authorities/ organisations can be understood through cross-tabulation. Details of the cross-tabulation are given in the following table.

Table 7.2

Cross-Tabulation of Different Categories of Incubators

Categories of Incubators		**Categories of Incubators based on Supporting Authority/Organisation**				
		Central Government supported	State Government supported	University/ Educational Institution supported	Private/ Corporate Business Incubator	Total
Stage of Startup Life Cycle	Ideation	7 (87.5%)	5 (45.5%)	7 (53.8%)	4 (66.7%)	23 (60.5%)
	Validation	0 (0%)	6 (54.5%)	3 (23.1%)	0 (0%)	9 (23.7%)
	Early Traction	1 (12.5%)	0 (0%)	3 (23.1%)	2 (33.3%)	6 (15.8%)
	Scale-up	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Maturity	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Nature of Business	Technology	6 (75%)	7 (63.6%)	11 (84.6%)	2 (33.3%)	26 (68.4%)
	Non-Technology	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Both technology & non-technology	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Any category	2 (25%)	4 (36.4%)	2 (15.4%)	4 (66.7%)	12 (31.6%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**

Categories of Incubators		Categories of Incubators based on Supporting Authority/Organisation				
		Central Government supported	State Government supported	University/ Educational Institution supported	Private/ Corporate Business Incubator	Total
Nature of Output	Product oriented	4 (50%)	5 (45.5%)	3 (23.1%)	0 (0%)	12 (31.6%)
	Service oriented	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Both product & service oriented	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Any category	4 (50%)	6 (54.5%)	10 (76.9%)	6 (100%)	26 (68.4%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**

Source: Field Survey
Figures in Parentheses indicate Column Percentages

From the above table, it can be seen that most of the central government supported incubators (87.5%) take startups at their ideation stage for incubation. 54.5% of state-supported incubators take startups at their validation stage for incubation. 53.8% of incubators supported by universities/educational institutions and 66.7% of private business incubators take startups at their ideation stage for incubation. 75% of the central government supported incubators, 63.6% of the state government supported incubators and 84.6% of universities/educational institutions supported incubators provide incubation facilities only to technology startups. 66.7% of private business incubators provide incubation facilities to any category of startups based on their nature of business. 50% of the centrally supported incubators incubate only product oriented startups and the other 50% incubate any category of startups, irrespective of their nature of output. 54.5% of state government supported incubators; 76.9% of universities/educational institutions supported incubators and 100% of private business incubators provide incubation to any category of startup based on their nature of output. 45.5% of state government supported incubators and 23.1% of universities/educational institutions supported incubators, provide incubation only to product oriented startups. Technology startups and product oriented startups have exclusive incubation facilities in Kerala, while other categories of startups don't.

7.3 Activity Structure, Organisation Structure and Resource Collection of Incubators

Every actor has a set of activities that are performed by them and are part of their functioning. Actors exist within an organisation structure which may be formal, informal, flexible, adaptable, etc. Similarly, for performing various activities, corresponding resources are needed. Before analysing the relationship of incubators with other incubators and startups, it is necessary that we study their activity structure, organisation structure and resource collection. The study of incubators as an individual actor is based on different types of incubators in the ecosystem. This will help to provide a detailed understanding on the different types of incubators in the Kerala startup ecosystem and a comparison of their activity structure; organisation structure as well as resource collection will be possible.

7.3.1 Activity Structure of Incubators

Activity structure means the chain of activities performed by an actor or a company. Activity structure shows the diverse categories of activities that are performed by an actor. The activities performed by incubators are identified based on the Costa-David, Malan & Lalkaka Incubation Model, 2002 and Bergek & Norman Incubation Model, 2008 (Business Incubation Models, 2014). According to Costa-David, Malan & Lalkaka Incubation Model (2002) incubation includes pre-incubation, incubation and after care stages. As per the Bergek & Norman Incubation Model (2008) incubation includes four stages, such as selection, business support, mediation and graduation. Accordingly, for the purpose of the study, activities performed by incubators are classified into three categories: pre-incubation activities, incubation activities and post-incubation activities. Incubators were provided with an interview schedule containing a list of twenty nine activities classified into three groups: pre-incubation, incubation and post-incubation activities. They were asked to rate, on a five-point scale, their agreement with regard to performing each activity. The analysis of the activity structure of incubators is discussed below:

- **Pre-Incubation Activities**

Pre-incubation activities refer to the activities performed by the incubator before starting the incubation programme. Seven activities are mainly included in the pre-incubation activities: providing induction programmes, providing a coworking space, providing training for entrepreneurial skill development, conducting feasibility analysis for different ideas, conducting technical need analysis for different teams, providing labs and research facilities for experimenting and providing assistance in business plan development and team building. Analysis of pre-incubation activities is done by grouping incubators into different types and by using descriptive statistical measures.

Table 7.3

Pre-Incubation Activities

Pre-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing induction programmes	Central Government supported	8	1.87	1.35620	1.00	4.00
	State Government supported	11	3.27	.90453	1.00	4.00
	University/Educational Institution supported	13	3.46	.87706	1.00	4.00
	Private/Corporate Business Incubator	6	2.66	1.03280	1.00	4.00
	Total/Average	**38**	**2.94**	**1.16125**	**1.00**	**4.00**
Providing a Coworking space	Central Government supported	8	1.62	1.06066	1.00	4.00
	State Government supported	11	3.54	.52223	3.00	4.00
	University/Educational Institution supported	13	2.07	.75955	1.00	4.00
	Private/Corporate Business Incubator	6	3.50	1.22474	1.00	4.00
	Total/Average	**38**	**2.63**	**1.17222**	**1.00**	**4.00**

Pre-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing training for entrepreneurial skill development	Central Government supported	8	2.00	1.30931	1.00	4.00
	State Government supported	11	3.36	.67420	2.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	3.00	1.09545	1.00	4.00
	Total/Average	**38**	**3.21**	**1.06943**	**1.00**	**4.00**
Conducting feasibility analysis for different ideas	Central Government supported	8	2.12	1.35620	1.00	4.00
	State Government supported	11	3.36	.67420	2.00	4.00
	University/Educational Institution supported	13	3.53	.87706	1.00	4.00
	Private/Corporate Business Incubator	6	2.83	.40825	2.00	3.00
	Total/Average	**38**	**3.07**	**1.02355**	**1.00**	**4.00**
Conducting technical need analysis for different teams	Central Government supported	8	2.62	.91613	2.00	4.00
	State Government supported	11	3.36	.67420	2.00	4.00
	University/Educational Institution supported	13	3.61	.65044	2.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.23**	**.78617**	**2.00**	**4.00**
Providing labs and research facilities for experimenting	Central Government supported	8	2.75	1.03510	2.00	4.00
	State Government supported	11	3.27	.64667	2.00	4.00
	University/Educational Institution supported	13	3.53	.66023	2.00	4.00
	Private/Corporate Business Incubator	6	2.83	.40825	2.00	3.00
	Total/Average	**38**	**3.18**	**.76601**	**2.00**	**4.00**

Pre-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing assistance in business plan development and team building	Central Government supported	8	2.62	.91613	2.00	4.00
	State Government supported	11	3.36	.67420	2.00	4.00
	University/Educational Institution supported	13	3.46	.77625	2.00	4.00
	Private/Corporate Business Incubator	6	2.83	.40825	2.00	3.00
	Total/Average	**38**	**3.15**	**.78933**	**2.00**	**4.00**

Source: Field Survey

Among the various pre-incubation activities, providing training for entrepreneurial skill development (mean = 3.21), conducting feasibility analysis for different ideas (mean = 3.07), conducting technical need analysis for different teams (mean = 3.23), providing labs and research facilities for experimenting (mean = 3.18) and providing assistance in business plan development and team building (mean = 3.15) are the activities with mean values above 3. These are the pre-incubation activities mostly performed by incubators. Incubators functioning in universities and educational institutions have a mean value greater than the average of total responses in the case of all these activities. Therefore, pre-incubation activities are performed by university/educational institution supported incubators better than other types of incubators.

- **Incubation Activities**

Incubation activities include the activities that are performed by the incubator during the tenure of the incubation programme. The incubation period is normally between 18-24 months. Fifteen activities are identified as incubation period activities of incubators. They are screening and selection of startups for incubation, proving physical infrastructural facilities to startups, providing accommodation facilities to startup teams, assisting startups in prototype development, organising workshops, seminars and events, providing financial incentives and seed capital to startups, help startups in recruiting skill full and talented human resource, providing technical support to startups, providing facilities for advanced research and development, assisting startups in applying for intellectual properties like patent, trademark etc., arranging assistance of professionals like accountants, lawyers etc, providing opportunity to meet investors and pitch for funding, assisting in product marketing and customer generation and conducting periodical reviews of startup performance. An analysis of the performance of incubation activities is given in the below table.

Table 7.4

Incubation Activities

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Screening and selection of startups for incubation	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	4.00	.00000	4.00	4.00
	Private/Corporate Business Incubator	6	3.67	.81650	2.00	4.00
	Total/Average	**38**	**3.94**	**.32444**	**2.00**	**4.00**
Proving physical infrastructural facilities to startups	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	4.00	.00000	4.00	4.00
	Total/Average	**38**	**3.97**	**.16222**	**3.00**	**4.00**
Providing accommodation facilities to startup teams	Central Government supported	8	2.00	1.19523	1.00	4.00
	State Government supported	11	2.63	1.12006	1.00	4.00
	University/Educational Institution supported	13	3.30	.75107	2.00	4.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**2.63**	**1.05064**	**1.00**	**4.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini mum	Maximum
Assisting startups in prototype development	Central Government supported	8	3.75	.70711	2.00	4.00
	State Government supported	11	2.81	1.16775	1.00	4.00
	University/Educational Institution supported	13	3.69	.63043	2.00	4.00
	Private/Corporate Business Incubator	6	3.50	.83666	2.00	4.00
	Total/Average	**38**	**3.42**	**.91921**	**1.00**	**4.00**
Organising workshops, seminars and events	Central Government supported	8	4.12	.35355	2.00	5.00
	State Government supported	11	4.00	.00000	3.00	4.00
	University/Educational Institution supported	13	4.07	.27735	2.00	3.00
	Private/Corporate Business Incubator	6	3.67	.81650	2.00	4.00
	Total/Average	**38**	**4.00**	**.40269**	**2.00**	**5.00**
Providing financial incentives and seed capital to startups	Central Government supported	8	2.87	1.12599	2.00	5.00
	State Government supported	11	3.54	.52223	3.00	4.00
	University/Educational Institution supported	13	2.84	.37553	2.00	3.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.07**	**.71212**	**2.00**	**5.00**
Help startups in recruiting skilled and talented human resource	Central Government supported	8	3.75	.88641	2.00	5.00
	State Government supported	11	3.81	.60302	2.00	4.00
	University/Educational Institution supported	13	3.53	.51887	3.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.57**	**.68306**	**2.00**	**5.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Arranging mentors to provide mentoring support to startups	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.84	.37553	3.00	4.00
	Private/Corporate Business Incubator	6	3.50	.83666	2.00	4.00
	Total/Average	**38**	**3.89**	**.45259**	**2.00**	**5.00**
Providing technical support to startups	Central Government supported	8	4.62	.51755	4.00	5.00
	State Government supported	11	3.81	.60302	2.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	3.16	.75277	2.00	4.00
	Total/Average	**38**	**3.92**	**.67310**	**2.00**	**5.00**
Providing facilities for advanced research and development	Central Government supported	8	4.50	.75593	3.00	5.00
	State Government supported	11	3.72	.64667	2.00	4.00
	University/Educational Institution supported	13	3.53	.51887	3.00	4.00
	Private/Corporate Business Incubator	6	2.83	.40825	2.00	3.00
	Total/Average	**38**	**3.68**	**.77478**	**2.00**	**5.00**
Assisting startups in applying for intellectual properties like patents, trademarks etc.	Central Government supported	8	4.50	.92582	3.00	5.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	3.30	.63043	2.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.68**	**.80891**	**2.00**	**5.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Arranging assistance of professionals like accountants, lawyers etc	Central Government supported	8	3.87	.64087	3.00	5.00
	State Government supported	11	3.81	.40452	3.00	4.00
	University/Educational Institution supported	13	3.23	.59914	2.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.50**	**.64724**	**2.00**	**5.00**
Providing opportunities to meet investors and pitch for funding	Central Government supported	8	2.75	.88641	2.00	4.00
	State Government supported	11	3.63	.50452	3.00	4.00
	University/Educational Institution supported	13	3.07	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.15**	**.63783**	**2.00**	**4.00**
Assisting in product marketing and customer generation	Central Government supported	8	3.37	.74402	3.00	5.00
	State Government supported	11	3.72	.64667	2.00	4.00
	University/Educational Institution supported	13	3.61	.65044	2.00	4.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.42**	**.79293**	**2.00**	**5.00**
Conducting periodical reviews of startup performance	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	3.81	.60302	2.00	4.00
	University/Educational Institution supported	13	3.76	.43853	3.00	4.00
	Private/Corporate Business Incubator	6	2.33	1.03280	1.00	4.00
	Total/Average	**38**	**3.63**	**.81940**	**1.00**	**5.00**

Source: Field Survey

Apart from providing accommodation facilities to startup teams, every other incubation activity is performed by most of the incubators. Screening and selection of startups for incubation, providing physical infrastructural facilities to startups and organising workshops and seminars are done by all the different types of incubators. In terms of assisting startups in prototype development, central government supported incubators (mean = 3.75) and universities/educational institutions supported incubators (mean = 3.69) are better than others. With regard to providing financial incentives and seed capital to startups (mean = 3.54) and providing opportunity to meet investors (mean = 3.63), state government funded incubators are better than other types of incubators. Centrally supported incubators provide greater technical support (mean = 4.62) and facilities for advanced research and development (mean = 4.50) to startups.

- **Post-Incubation Activities**

Post-incubation activities are the activities that incubators perform after the completion of the incubation programme. Some incubators extend the incubation support to startups even after they have completed the incubation programme. Post-incubation activities include developing a proper exit plan for incubatees, providing business advice and support for business development, providing extension to the graduated startups to continue using the incubation facilities if they need them, allowing the startups to continue using the lab and other research facilities, providing support in technology commercialisation, providing assistance in portfolio management and IPOs and providing support in business expansion and internationalisation. An analysis of post-incubation activities by incubators is given below:

Table 7.5

Post-Incubation Activities

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Developing a proper exit plan for incubatees	Central Government supported	8	3.12	1.35620	2.00	5.00
	State Government supported	11	3.36	.67420	2.00	4.00
	University/Educational Institution supported	13	3.15	.98710	2.00	4.00
	Private/Corporate Business Incubator	6	2.33	1.03280	1.00	4.00
	Total/Average	**38**	**3.07**	**1.02355**	**1.00**	**5.00**
Providing business advice and support for business development	Central Government supported	8	2.87	1.24642	2.00	5.00
	State Government supported	11	3.63	.80904	2.00	4.00
	University/Educational Institution supported	13	3.07	.95407	2.00	4.00
	Private/Corporate Business Incubator	6	2.83	.98319	1.00	4.00
	Total/Average	**38**	**3.15**	**1.00071**	**1.00**	**5.00**
Providing extension to the graduated startups to continue using the incubation facilities if they need	Central Government supported	8	3.75	.70711	2.00	4.00
	State Government supported	11	3.09	1.04447	2.00	4.00
	University/Educational Institution supported	13	2.46	.77625	2.00	4.00
	Private/Corporate Business Incubator	6	2.33	1.03280	1.00	4.00
	Total/Average	**38**	**2.89**	**1.00779**	**1.00**	**4.00**
Allowing the startups to continue using the lab and other research facilities	Central Government supported	8	3.75	.70711	2.00	4.00
	State Government supported	11	3.09	1.04447	2.00	4.00
	University/Educational Institution supported	13	2.15	.80064	1.00	4.00
	Private/Corporate Business Incubator	6	2.00	.63246	1.00	3.00
	Total/Average	**38**	**2.73**	**1.05739**	**1.00**	**4.00**

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing support in technology commercialisation	Central Government supported	8	3.62	.74402	2.00	4.00
	State Government supported	11	3.09	1.04447	2.00	4.00
	University/Educational Institution supported	13	2.15	.68874	1.00	3.00
	Private/Corporate Business Incubator	6	2.16	.98319	1.00	4.00
	Total/Average	**38**	**2.73**	**1.03151**	**1.00**	**4.00**
Providing assistance in portfolio management and IPO	Central Government supported	8	2.37	.74402	2.00	4.00
	State Government supported	11	3.09	1.04447	2.00	4.00
	University/Educational Institution supported	13	2.07	.64051	1.00	3.00
	Private/Corporate Business Incubator	6	2.16	.98319	1.00	4.00
	Total/Average	**38**	**2.44**	**.92114**	**1.00**	**4.00**
Support in business expansion and internationalisation	Central Government supported	8	2.50	.75593	2.00	4.00
	State Government supported	11	2.63	.67420	2.00	4.00
	University/Educational Institution supported	13	2.00	.57735	1.00	3.00
	Private/Corporate Business Incubator	6	2.16	.98319	1.00	4.00
	Total/Average	**38**	**2.31**	**.73907**	**1.00**	**4.00**

Source: Field Survey

Providing business advice and support for business development (mean = 3.15) and developing a proper exit plan for incubatees (mean = 3.07) are the only two post-incubation activities performed by incubators with a mean value above 3. Compared to other categories, state government supported incubators mostly perform these activities. About providing extensions to the graduated startups to continue using the incubation facilities (mean = 3.75) and allowing the startups to continue using the lab and other research facilities (mean = 3.75), centrally supported incubators have a mean value greater than other categories of startups.

7.3.2 Organisation Structure

"Organisation structure is conceived and established by the top management as a formal decision-making framework by which job tasks are divided, grouped and coordinated and formal reporting relationships between positions in the organisation are outlined" (Ghuman & Aswathappa, 2015). The organisation structure of a company should support the efficient performance of activities, build sustainable business relationships, enable effortless communication and be appropriate for achieving the goals of the business. The organisation structure of incubators is measured using seven statements that are related to formality, hierarchy, communication, flexibility, adaptability, appropriateness in achieving business goals and building relationships within the organisation structure. Incubators were provided with a five-point Likert scale and asked to rate their agreement with each statement. An analysis of the responses to statements regarding organisation structure by various types of incubators is given in the below table.

Table 7.6

Organisation Structure of Incubators

Organisation Structure	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
There is a formal organisation structure for the incubator	Central Government supported	8	4.75	.70711	3.00	5.00
	State Government supported	11	4.18	1.40130	2.00	5.00
	University/Educational Institution supported	13	4.15	.89872	2.00	5.00
	Private/Corporate Business Incubator	6	4.33	1.63299	1.00	5.00
	Total/Average	**38**	**4.31**	**1.14148**	**1.00**	**5.00**
The individual position of the members and hierarchy of positions is well defined	Central Government supported	8	4.75	.46291	4.00	5.00
	State Government supported	11	3.54	1.03573	2.00	5.00
	University/Educational Institution supported	13	3.69	1.37747	1.00	5.00
	Private/Corporate Business Incubator	6	4.00	1.09545	2.00	5.00
	Total/Average	**38**	**3.92**	**1.14801**	**1.00**	**5.00**

Organisation Structure	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
The communication within the incubator is formal and structured	Central Government supported	8	4.62	.74402	3.00	5.00
	State Government supported	11	3.63	1.12006	2.00	5.00
	University/Educational Institution supported	13	3.92	1.32045	1.00	5.00
	Private/Corporate Business Incubator	6	4.33	1.21106	2.00	5.00
	Total/Average	**38**	**4.05**	**1.16125**	**1.00**	**5.00**
Structure of the incubator is simple and flexible	Central Government supported	8	3.87	1.24642	2.00	5.00
	State Government supported	11	3.27	1.00905	2.00	4.00
	University/Educational Institution supported	13	3.69	.48038	3.00	4.00
	Private/Corporate Business Incubator	6	4.33	.51640	4.00	5.00
	Total/Average	**38**	**3.71**	**.89768**	**2.00**	**5.00**
Structure of incubator is adaptable to changing environment	Central Government supported	8	3.62	.91613	3.00	5.00
	State Government supported	11	3.27	1.00905	2.00	4.00
	University/Educational Institution supported	13	3.69	.63043	3.00	5.00
	Private/Corporate Business Incubator	6	4.33	.51640	4.00	5.00
	Total/Average	**38**	**3.65**	**.84714**	**2.00**	**5.00**
Structure of the incubator is appropriate for achieving the planned goals	Central Government supported	8	4.00	.75593	3.00	5.00
	State Government supported	11	3.81	.75076	3.00	5.00
	University/Educational Institution supported	13	4.15	.80064	3.00	5.00
	Private/Corporate Business Incubator	6	4.67	.51640	4.00	5.00
	Total/Average	**38**	**4.10**	**.76369**	**3.00**	**5.00**

Organisation Structure	Types of Incubators	N	Mean	Standard Deviation	Mini mum	Maximum
Structure of the incubator is appropriate for building business relationships	Central Government supported	8	4.00	.75593	3.00	5.00
	State Government supported	11	3.90	.70065	3.00	5.00
	University/Educational Institution supported	13	4.23	.83205	3.00	5.00
	Private/Corporate Business Incubator	6	4.83	.40825.	4.00	5.00
	Total/Average	**38**	**4.18**	**.76601**	**3.00**	**5.00**

Source: Field Survey

From the aforesaid table, it can be understood that all the different types of incubators have a formal organisation structure. The individual positions of the members and hierarchy of positions are well defined in central government supported incubators (mean = 4.75) and private business incubators (mean = 4.00). Private business incubators have a better organisation structure that is simple (mean = 4.33), adaptable to changing environments (mean = 4.33), appropriate for achieving planned goals (mean = 4.67) and building business relationships (mean = 4.83) compared to other types of incubators.

7.3.3 Resource Collection

Resources collection of an organisation includes both tangible and intangible resources, which are essential for performing various activities of the business. Incubators also require different types of resources for carrying out their functions and executing the incubation programme. The resources that are essential for incubators are identified as financial resources, physical infrastructure resources, human resources and other intangible resources such as business knowledge, business networks, business reputation and intellectual properties. Financial resources and physical infrastructure resources are treated as tangible resources and others as intangible resources including human resources. The analyses of different types of resources with various categories of incubators are explained as below.

- **Financial Resources (Sources of Funding)**

Finance is the most needed resource for executing any plan or programme. While planning to provide incubation facilities to startups, incubators need to make sure that they have the necessary office space, physical infrastructure, staff, training facilities, etc. All of these can be arranged only if there is sufficient funding for the incubator. Incubators are mostly funded by the respective government that has established them, either state or central, universities or educational institutions and in the case of private business incubators, it can be corporate bodies. Loans from financial institutions, own income, i.e., amounts collected as rent from incubated startups and other sources are also additional sources through which funds can be gathered for incubators. Incubators were provided with a five-point Likert scale and asked to rate their agreement regarding getting funds through each source. An analysis of the financial resources of incubators is given in the below table.

Table 7.7

Financial Resources of Incubators

Sources of Funding	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Central Government	Central Government supported	8	5.00	.00000	5.00	5.00
	State Government supported	11	1.54	.52223	1.00	2.00
	University/Educational Institution supported	13	2.00	1.41421	1.00	5.00
	Private/Corporate Business Incubator	6	1.50	.54772	1.00	2.00
	Total/Average	**38**	**2.42**	**1.62134**	**1.00**	**5.00**
State Government	Central Government supported	8	1.62	.51755	1.00	2.00
	State Government supported	11	5.00	.00000	5.00	5.00
	University/Educational Institution supported	13	3.23	1.16575	1.00	5.00
	Private/Corporate Business Incubator	6	1.50	.54772	1.00	2.00
	Total/Average	**38**	**3.13**	**1.57979**	**1.00**	**5.00**

Sources of Funding	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
University/Educational Institution	Central Government supported	8	1.87	.99103	1.00	4.00
	State Government supported	11	1.72	.90453	1.00	4.00
	University/Educational Institution supported	13	4.07	1.25576	1.00	5.00
	Private/Corporate Business Incubator	6	1.00	.00000	1.00	1.00
	Total/Average	**38**	**2.44**	**1.55437**	**1.00**	**5.00**
Fund from Corporate/Private Investors	Central Government supported	8	1.37	.51755	1.00	2.00
	State Government supported	11	1.45	.52223	1.00	2.00
	University/Educational Institution supported	13	2.15	.98710	1.00	4.00
	Private/Corporate Business Incubator	6	5.00	.00000	5.00	5.00
	Total/Average	**38**	**2.23**	**1.42249**	**1.00**	**5.00**
Loans from Banks and Other Financial Institutions	Central Government supported	8	1.25	.46291	1.00	2.00
	State Government supported	11	2.45	1.50756	1.00	4.00
	University/Educational Institution supported	13	1.92	.75955	1.00	4.00
	Private/Corporate Business Incubator	6	2.00	1.54919	1.00	4.00
	Total/Average	**38**	**1.94**	**1.16125**	**1.00**	**5.00**
Own Income	Central Government supported	8	4.75	.46291	4.00	5.00
	State Government supported	11	3.18	1.47093	1.00	5.00
	University/Educational Institution supported	13	4.00	1.00000	1.00	5.00
	Private/Corporate Business Incubator	6	4.83	.40825	4.00	5.00
	Total/Average	**38**	**4.05**	**1.18430**	**1.00**	**5.00**

Sources of Funding	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Other Sources	Central Government supported	8	1.50	.75593	1.00	3.00
	State Government supported	11	1.63	.50452	1.00	2.00
	University/Educational Institution supported	13	3.15	1.34450	1.00	5.00
	Private/Corporate Business Incubator	6	1.50	.83666	1.00	3.00
	Total/Average	**38**	**2.10**	**1.20336**	**1.00**	**5.00**

Source: Field Survey

The above table indicates the various sources of finance for different categories of incubators. Only central government supported incubators (mean = 5.00) are receiving funds from the central government. Similarly, state government supported incubators (mean = 5.00) receive funds from the state government. Incubators in universities and educational institutions (mean = 4.07) are funded by the organisation themselves. Private/corporate business incubators (mean = 5.00) are funded by corporate/private investors. Loans from banks and other financial institutions are not a source of funds for any of the incubators. Apart from state government supported incubators (mean = 3.18), own income is a relevant source of income for other types of incubators.

- **Physical Infrastructure Resources**

The tangible resources that incubation centres require in order to provide an incubation programme are known as physical infrastructure resources. Office space, office equipment, furniture, conference rooms, computer systems, internet/WIFI, kitchen/refreshment facilities, library, lab facility with equipment, plant & machinery, raw materials, electricity and security arrangements are the important physical infrastructure facilities that an incubator should offer to startups. For entrepreneurs, access to a range of physical facilities will be either free or cost-based. Additionally, there will be some physical resources that incubators do not offer to businesses. As a result, the physical infrastructure services that various kinds of incubators offer to startups are examined based on whether or not access to these services is free, paid for, or nonexistent. The following table presents an analysis of the physical infrastructure resources of incubators.

Table 7.8

Physical Infrastructure Resources

Physical Infrastructure Resources		Types of Incubators				
		Central Government supported	State Government supported	University/ Educational Institution supported	Private/ Corporate Business Incubator	Total
Office space	Paid access	8 (100%)	10 (90.9%)	11 (84.6%)	6 (100%)	35 (92.1%)
	Free access	0 (0%)	1 (9.1%)	1 (7.7%)	0 (0%)	2 (5.3%)
	No access	0 (0%)	0 (0%)	1 (7.7%)	0 (0%)	1 (2.6%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Office equipments, furniture and fittings	Paid access	8 (100%)	10 (90.9%)	11 (84.6%)	6 (100%)	35 (92.1%)
	Free access	0 (0%)	1 (9.1%)	1 (7.7%)	0 (0%)	2 (5.3%)
	No access	0 (0%)	0 (0%)	1 (7.7%)	0 (0%)	1 (2.6%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Conference rooms	Paid access	7 (87.5%)	10 (90.9%)	6 (46.2%)	6 (100%)	29 (76.3%)
	Free access	0 (0%)	1 (9.1%)	6 (46.2%)	0 (0%)	7 (18.4%)
	No access	1 (12.5%)	0 (0%)	1 (7.6%)	0 (0%)	2 (5.3%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Computer systems	Paid access	3 (37.5%)	9 (81.8%)	3 (23%)	1 (16.7%)	16 (42.1%)
	Free access	1 (12.5%)	0 (0%)	5 (38.5%)	0 (0%)	6 (15.8%)
	No access	4 (50%)	2 (18.2%)	5 (38.5%)	5 (83.3%)	16 (42.1%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**

Physical Infrastructure Resources		Types of Incubators				
		Central Government supported	**State Government supported**	**University/ Educational Institution supported**	**Private/ Corporate Business Incubator**	**Total**
Internet/WIFI	Paid access	8 (100%)	10 (90.9%)	9 (69.2%)	6 (100%)	33 (86.8%)
	Free access	0 (0%)	1 (9.1%)	3 (23.1%)	0 (0%)	4 (10.5%)
	No access	0 (0%)	0 (0%)	1 (7.7%)	0 (0%)	1 (2.7%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Kitchen/ Refreshment facilities	Paid access	4 (50%)	5 (45.5%)	11 (84.6%)	2 (100%)	22 (57.9%)
	Free access	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	No access	4 (50%)	6 (54.5%)	2 (15.4%)	4 (0%)	16 (42.1%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Library	Paid access	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Free access	5 (62.5%)	2 (18.2%)	12 (92.3%)	0 (0%)	19 (50%)
	No access	3 (37.5%)	9 (81.8%)	1 (7.7%)	6 (100%)	19 (50%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Lab facility with equipments	Paid access	5 (62.5%)	6 (54.5%)	1 (7.7%)	0 (0%)	12 (31.6%)
	Free access	3 37.5%)	1 (9.1%)	11 (84.6%)	0 (0%)	15 (39.5%)
	No access	0 (0%)	4 (36.4%)	1 (7.7%)	6 (100%)	11 (28.9%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**

Physical Infrastructure Resources		Types of Incubators				
		Central Government supported	State Government supported	University/ Educational Institution supported	Private/ Corporate Business Incubator	Total
Plant & Machinery	Paid access	5 (62.5%)	0 (0%)	2 (15.4%)	0 (0%)	7 (18.4%)
	Free access	0 (0%)	0 (0%)	1 (7.7%)	0 (0%)	1 (2.7%)
	No access	3 37.5%)	11 (100%)	10 (76.9%)	6 (100%)	30 (78.9%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Raw materials	Paid access	5 (62.5%)	0 (0%)	2 (15.4%)	0 0%)	7 (18.4%)
	Free access	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	No access	3 (37.5%)	11 (100%)	11 (84.6%)	6 (100%)	31 (81.6%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Electricity	Paid access	8 (100%)	7 (63.6%)	9 (69.2%)	6 (100%)	30 (78.9%)
	Free access	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	No access	0 (0%)	4 (36.4%)	4 (30.8%)	0 (0%)	8 (21.1%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Security arrangements	Paid access	3 (37.5%)	7 (63.6%)	2 (15.4%)	6 (100%)	18 (47.4%)
	Free access	5 (62.5%)	4 (36.4%)	10 (76.9%)	0 (0%)	19 (50%)
	No access	0 (0%)	0 (0%)	1 (7.7%)	0 (0%)	1 (2.6%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**

Source: Field Survey
Figures in Parentheses indicate Column Percentages

The table above shows that most of the incubators provide paid access to office space as well as office equipment, furniture and fittings to startups. Central government supported incubators (87.5%), state government supported incubators (90.9%) and private business incubators (100%) provide paid access to conference halls. 50% of central government supported incubators do not provide access to computer systems and 37.5% provide paid access. State government supported incubators (81.8%) mostly provide paid access to computer systems. All the various types of incubators mostly provide paid access to internet/WIFI facilities to startups. 50% of central government supported incubators provide paid access to kitchen/refreshment facilities and 50% do not provide any access. 45.5% of state government supported incubators provide paid access to kitchen/refreshment facilities and 54.5% do not provide any access. 81.8% of state government supported incubators and 100% of private business incubators do not provide access to libraries. 92.3% of universities/educational institutions supported incubators provide free access to libraries. 62.5% of central government supported incubators and 54.5% of state supported incubators provide paid access to lab facilities with equipment. 100% of state government supported incubators, 76.9% of universities/educational institutions supported incubators and 100% of private business incubators do not provide access to plant & machinery whereas 62.5% of central government supported incubators provide paid access to plant & machinery. State supported incubators (100%) and private business incubators (100%) do not provide access to raw materials. 62.5% of central government supported incubators provide paid access to raw materials. central government supported incubators (100%) and private business incubators (100%) provide startups with paid access to electricity. Private business incubators (100%) provide only paid access to security arrangements. 62.5% of the central government supported incubators and 76.9% of universities/educational institutions supported incubators, provide free access to security arrangements.

- **Human Resources**

Human resources refer to the skills within an organisation that are required to run a business. One of the organisation's most important intangible assets is talent. For the incubation programme to run smoothly, an incubation centre needs personnel at both the managerial and execution levels. It is important that qualified human talent is available at the right numbers so that existing staff are not overworked and the incubation programme can be executed efficiently. Incubators were provided with four statements relating to the staff members working at different positions, the appointment of staff through formal procedures, the sufficiency of the number of staff working and the qualification of the staff in the incubation centre. The agreement of incubators to these statements was recorded using a five-point Likert scale. An analysis of the responses of incubators regarding the statements about human resources is given below:

Table 7.9

Human Resources of Incubators

Statements	Types of Incubators	N	Mean	Standard Deviation	Mini mum	Maximum
There are staff members at various positions working within the incubator.	Central Government supported	8	4.50	.75593	3.00	5.00
	State Government supported	11	3.72	1.79393	1.00	5.00
	University/Educational Institution supported	13	3.07	1.25576	1.00	5.00
	Private/Corporate Business Incubator	6	4.67	.81650	3.00	5.00
	Total/Average	**38**	**3.81**	**1.41144**	**1.00**	**5.00**
The staff members are appointed through a formal appointment process.	Central Government supported	8	4.75	.46291	4.00	5.00
	State Government supported	11	3.27	1.48936	1.00	5.00
	University/Educational Institution supported	13	3.07	1.11516	2.00	5.00
	Private/Corporate Business Incubator	6	4.67	.51640	4.00	5.00
	Total/Average	**38**	**3.73**	**1.28787**	**1.00**	**5.00**

Statements	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
There are sufficient numbers of workers in the incubator.	Central Government supported	8	3.75	.70711	3.00	5.00
	State Government supported	11	2.00	.89443	1.00	4.00
	University/Educational Institution supported	13	3.15	1.14354	2.00	5.00
	Private/Corporate Business Incubator	6	4.00	1.09545	2.00	5.00
	Total/Average	**38**	**3.07**	**1.21659**	**1.00**	**5.00**
The staff members are skilled and qualified for their position	Central Government supported	8	4.25	.70711	3.00	5.00
	State Government supported	11	3.09	1.51357	1.00	5.00
	University/Educational Institution supported	13	3.61	.96077	2.00	5.00
	Private/Corporate Business Incubator	6	4.50	.54772	4.00	5.00
	Total/Average	**38**	**3.73**	**1.15511**	**1.00**	**5.00**

Source: Field Survey

Private business incubators do not face problems with human resources as responses to all the statements have a mean value above the average of total responses. Employees in central government supported incubators (mean = 4.75) and private business incubators (mean = 4.67) are appointed through a formal process. State government supported business incubators do not have sufficient numbers of workers (mean = 2.00). The staff members of central government supported incubators (mean = 4.25) and private business incubators (mean = 4.50) are skilled and qualified employees.

- **Other Intangible Resources**

Apart from human talent, there are other intangible resources that are important for incubators. These are business knowledge, business network, business reputation (Weele, Marjin.A.Wan et al., 2019) and intangible resources. Business knowledge indicates the knowledge as well as skills that are needed to operate and manage a business organisation. Business knowledge can be imparted by incubators to startups through coaching and training. Coaching is a long term activity where individual attention will be provided to startups and training is a short term process where startups are educated together. Coaching helps resolve the issues faced by startups and training helps to develop new skills. Some incubators provide only coaching, some provide only training and some provide both. Business networks are the web of relationships built by business organisations, which help them stay connected in the industry. Business incubators should essentially have a good business network for supporting startups. Incubators may have a strong internal network, a strong external network, or both. There are chances for incubators to have no networks if they are new to the business. Business reputation is the perception that others have about the operations of the business. The business reputation of the incubators can be measured based on their track record. The past achievements and performances of the incubators are considered their track record. A track record can be good, average, neutral or bad. Intellectual properties such as patents and trademarks can be owned by business incubators, which can also be used by the incubatees during the incubation period. The analysis of other intangible assets of different types of incubators is given in the table below.

Table 7.10

Other Intangible Resources

Variables		Types of Incubators				
		Central Government supported	**State Government supported**	**University/ Educational Institution supported**	**Private/ Corporate Business Incubator**	**Total**
Business Knowledge	Coaching only	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Training only	2 (25%)	2 (18.2%)	5 (38.5%)	3 (50%)	12 (31.6%)
	Coaching and Training	6 (75%)	9 (81.8%)	8 (61.5%)	2 (33.3%)	25 (65.8%)
	None	0 (0%)	0 (0%)	0 (0%)	1 (16.7%)	1 (2.6%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**

Variables		Types of Incubators: Central Government supported	State Government supported	University/ Educational Institution supported	Private/ Corporate Business Incubator	Total
Business Network	Strong Internal Network	1 (12.5%)	0 (0%)	2 (15.4%)	1 (16.7%)	4 (10.5%)
	Strong External Network	0 (0%)	0 (18.2%)	2 (15.4%)	0 (50%)	2 (5.3%)
	Strong Internal and External Network	7 (87.5%)	11 (100%)	9 (69.2%)	5 (83.3%)	32 (84.2%)
	None	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Business Reputation (Track Record)	Good	5 (62.5%)	7 (63.6%)	5 (38.5%)	1 (16.7%)	18 (47.4%)
	Average	3 (37.5%)	4 (36.4%)	5 (38.5%)	4 (66.6%)	16 (42.1%)
	Neutral	0 (0%)	0 (0%)	3 (23.1%)	1 (16.7%)	4 (10.5%)
	Bad	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Patents	Owned	4 (50%)	1 (9.1%)	1 (7.7%)	0 (66.7%)	6 (15.8%)
	Not owned	4 (50%)	10 (90.9%)	12 (92.3%)	6 (100%)	32 (84.2%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**
Trademark	Owned	8 (100%)	8 (72.7%)	1 (7.7%)	4 (66.7%)	21 (55.3%)
	Not owned	0 (0%)	3 (27.3%)	12 (92.3%)	2 (33.3%)	17 (44.7%)
	Total	**8 (100%)**	**11 (100%)**	**13 (100%)**	**6 (100%)**	**38 (100%)**

Source: Field Survey

According to the above table, 75% of incubators backed by the central government, 81.8% by state governments and 61.5% by universities and educational institutions offer both coaching and training to startups. However, 50% of private business incubators offer their incubatees only training. All of the incubators supported by the state government have strong internal and external business networks. The majority of incubators financed by the central government (87.5%), universities and other educational institutions (69.2%) and private businesses (83.3%) have strong internal and external networks. According to responses, 62.5% of incubators funded by the central government and 63.6% of incubators funded by state governments claim to have a good track record. 38.5% of universities and other educational institutions backed incubators said that they have a good track record, while another 38.5% said their track record was average. According to responses from 66.6% of private business incubators, their track record is also average. Half of the central government supported incubators own patents and the other half doesn't. 90.9% of state government supported incubators; 92.3% of universities/educational institutions supported incubators; and none of the private business incubators owned any patents. All of the central government supported incubators have their own trademark. 72.7% of state government supported incubators and 66.7% of private business incubators also have their own trademark. But 92.3% of incubators supported by universities/educational institutions don't have a trademark.

7.4 Activity Links, Actor Bonds and Resource Ties with Other Incubators

While analysing the business relationship between two actors, according to Actor-Resources-Activity model, there are three important variables that need to be studied. They are activity links, actor bonds and resource ties (Hakansson & Snehota, 1995). Activity links refer to the linkage of various activities performed by the actors. Actors bonds refer to the structural, economic and social relationships formed between the actors. Resource ties indicate the relationship between actors based on the strength of resource sharing between them. Analysing these three variables will help us understand how strong the relationship between two actors is. This section of the chapter analyses the business relations of incubators with other incubators based on activity links, actor bonds and resource ties between them.

7.4.1 Activity Links with Other Incubators

Actors perform different activities. There are various activities performed by incubators at the pre-incubation, incubation and post-incubation stages. These activities can be performed by incubators without any external support or with the help of other actors in the ecosystem. Incubators working in the same ecosystem can co-exist by supporting each other. This can be done by coordinating the activities they perform. Activity links indicate the connection or linkage between the activities performed by actors. Therefore, in order to understand if there is any connection between the activities performed by various incubators, the level of coordination incubators have with other incubators while performing different activities is measured by using a five-point Likert scale with options ranging from very low to very high. A detailed analysis of the activity links of incubators with other incubators is as follows:

- **Pre-Incubation Activities – Activity Links with Other Incubators**

Pre-incubation activities are performed by incubators before starting the incubation programme. Pre-incubation activities include providing induction programmes, providing a coworking space, providing training for entrepreneurial skill development, conducting feasibility analysis for different ideas, conducting technical need analysis for different teams, providing labs and research facilities for experimenting and providing assistance in business plan development and team building. Whether these activities are performed by different types of incubators in coordination with other incubators can be understood from the below table.

Table 7.11

Pre-Incubation Activities – Activity Links with Other Incubators

Pre-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing induction programmes	Central Government supported	8	1.75	.46291	1.00	2.00
	State Government supported	11	2.09	1.37510	1.00	4.00
	University/Educational Institution supported	13	1.61	.50637	1.00	2.00
	Private/Corporate Business Incubator	6	1.33	.51640	1.00	2.00
	Total/Average	**38**	**1.73**	**.86005**	**1.00**	**4.00**
Providing a coworking space	Central Government supported	8	1.75	.46291	1.00	2.00
	State Government supported	11	1.54	.68755	1.00	3.00
	University/Educational Institution supported	13	1.53	.51887	1.00	2.00
	Private/Corporate Business Incubator	6	1.16	.40825	1.00	2.00
	Total/Average	**38**	**1.52**	**.55687**	**1.00**	**3.00**
Providing training for entrepreneurial skill development	Central Government supported	8	2.12	.83452	1.00	4.00
	State Government supported	11	2.27	.64667	1.00	3.00
	University/Educational Institution supported	13	3.00	1.15470	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	1.32916	1.00	4.00
	Total/Average	**38**	**2.42**	**1.05604**	**1.00**	**4.00**
Conducting feasibility analysis for different ideas	Central Government supported	8	2.00	.00000	2.00	2.00
	State Government supported	11	1.54	.68755	1.00	3.00
	University/Educational Institution supported	13	2.00	.40825	1.00	3.00
	Private/Corporate Business Incubator	6	1.33	.51640	1.00	2.00
	Total/Average	**38**	**1.76**	**.54198**	**1.00**	**3.00**

Pre-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Conducting technical need analysis for different teams	Central Government supported	8	1.87	.35355	1.00	2.00
	State Government supported	11	2.36	1.43337	1.00	4.00
	University/Educational Institution supported	13	2.07	.27735	2.00	3.00
	Private/Corporate Business Incubator	6	1.67	.81650	1.00	3.00
	Total/Average	**38**	**2.05**	**.86828**	**1.00**	**4.00**
Providing labs and research facilities for experimenting	Central Government supported	8	2.00	.00000	2.00	2.00
	State Government supported	11	2.27	1.34840	1.00	4.00
	University/Educational Institution supported	13	2.46	.96742	1.00	4.00
	Private/Corporate Business Incubator	6	1.50	.54772	1.00	2.00
	Total/Average	**38**	**2.15**	**.97333**	**1.00**	**4.00**
Providing assistance in business plan development and team building	Central Government supported	8	2.00	.00000	2.00	2.00
	State Government supported	11	1.63	.67420	1.00	3.00
	University/Educational Institution supported	13	2.00	.40825	1.00	3.00
	Private/Corporate Business Incubator	6	1.50	.54772	1.00	2.00
	Total/Average	**38**	**1.81**	**.51230**	**1.00**	**3.00**

Source: Field Survey

From the above table, it can be seen that there is a low level of coordination among incubators while performing pre-incubation activities. The average of total responses to activities such as providing induction programmes, providing a coworking space, conducting feasibility analysis for different ideas and providing assistance in business plan development and team building is below 2. With regard to providing training for entrepreneurial skill development to startups, universities/educational institutions supported incubators (mean = 3.00) have comparatively better coordination with other incubators.

- **Incubation Activities - Activity Links with Other Incubators**

Incubation activities are performed by incubators while providing an incubation programme. Incubation activities include screening and selection of startups for incubation, proving physical infrastructural facilities to startups, providing accommodation facilities to startup teams, assisting startups in prototype development, organising workshops, seminars and events, providing financial incentives and seed capital to startups, help startups in recruiting skill full and talented human resource, providing technical support to startups, providing facilities for advanced research and development, assisting startups in applying for intellectual properties like patent, trademark etc., arranging assistance of professionals like accountants, lawyers etc, providing opportunity to meet investors and pitch for funding, assisting in product marketing and customer generation and conducting periodical reviews of startup performance. If needed, incubators can perform these activities with the support of other incubators. The level of coordination that incubators have with other incubators in the performance of various incubation related activities can be understood from the below table.

Table 7.12

Incubation Activities - Activity Links with Other Incubators

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Screening and selection of startups for incubation	Central Government supported	8	1.87	.35355	1.00	2.00
	State Government supported	11	1.45	.52223	1.00	2.00
	University/Educational Institution supported	13	1.76	.43853	1.00	2.00
	Private/Corporate Business Incubator	6	1.50	.54772	1.00	2.00
	Total/Average	**38**	**1.65**	**.48078**	**1.00**	**2.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Proving physical infrastructural facilities to startups	Central Government supported	8	2.12	.83452	1.00	4.00
	State Government supported	11	1.63	.67420	1.00	3.00
	University/Educational Institution supported	13	2.23	.83205	1.00	4.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**2.00**	**.73521**	**1.00**	**4.00**
Providing accommodation facilities to startup teams	Central Government supported	8	1.12	.35355	1.00	2.00
	State Government supported	11	1.45	.52223	1.00	2.00
	University/Educational Institution supported	13	1.61	.50637	1.00	2.00
	Private/Corporate Business Incubator	6	1.50	.54772	1.00	2.00
	Total/Average	**38**	**1.44**	**.50390**	**1.00**	**2.00**
Assisting startups in prototype development	Central Government supported	8	1.75	1.03510	1.00	4.00
	State Government supported	11	2.09	1.37510	1.00	4.00
	University/Educational Institution supported	13	2.00	.70711	1.00	4.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**1.97**	**.94402**	**1.00**	**4.00**
Organising workshops, seminars and events	Central Government supported	8	3.75	.70711	2.00	4.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.53	.96742	1.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.63**	**.75053**	**1.00**	**4.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Providing financial incentives and seed capital to startups	Central Government supported	8	3.00	.53452	2.00	4.00
	State Government supported	11	3.63	.50452	3.00	4.00
	University/Educational Institution supported	13	2.84	.89872	1.00	4.00
	Private/Corporate Business Incubator	6	2.83	.40825	2.00	3.00
	Total/Average	**38**	**3.10**	**.72743**	**1.00**	**4.00**
Help startups in recruiting skilled and talented human resource	Central Government supported	8	2.37	.51755	2.00	3.00
	State Government supported	11	2.72	.64667	2.00	4.00
	University/Educational Institution supported	13	2.61	.76795	1.00	4.00
	Private/Corporate Business Incubator	6	1.50	.54772	1.00	2.00
	Total/Average	**38**	**2.42**	**.75808**	**1.00**	**4.00**
Arranging mentors to provide mentoring support to startups	Central Government supported	8	2.75	1.03510	2.00	4.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	3.07	1.11516	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	.98319	1.00	3.00
	Total/Average	**38**	**3.05**	**1.11373**	**1.00**	**4.00**
Providing technical support to startups	Central Government supported	8	2.62	.91613	2.00	4.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	3.07	1.11516	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	.98319	1.00	3.00
	Total/Average	**38**	**3.02**	**1.10250**	**1.00**	**4.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Providing facilities for advanced research and development	Central Government supported	8	2.75	1.03510	2.00	4.00
	State Government supported	11	3.81	.40452	3.00	4.00
	University/Educational Institution supported	13	3.07	1.11516	1.00	4.00
	Private/Corporate Business Incubator	6	1.67	.81650	1.00	3.00
	Total/Average	**38**	**3.00**	**1.11501**	**1.00**	**4.00**
Assisting startups in applying for intellectual properties like patents, trademarks etc.	Central Government supported	8	2.12	.35355	2.00	3.00
	State Government supported	11	2.72	.90453	2.00	4.00
	University/Educational Institution supported	13	2.53	.87706	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	.98319	1.00	3.00
	Total/Average	**38**	**2.39**	**.85549**	**1.00**	**4.00**
Arranging assistance of professionals like accountants, lawyers etc	Central Government supported	8	2.12	.35355	2.00	3.00
	State Government supported	11	2.72	.90453	2.00	4.00
	University/Educational Institution supported	13	2.53	.87706	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	.98319	1.00	3.00
	Total/Average	**38**	**2.39**	**.85549**	**1.00**	**4.00**
Providing opportunities to meet investors and pitch for funding	Central Government supported	8	3.12	.64087	2.00	4.00
	State Government supported	11	3.72	.46710	3.00	4.00
	University/Educational Institution supported	13	2.84	.98710	1.00	4.00
	Private/Corporate Business Incubator	6	2.33	.51640	2.00	3.00
	Total/Average	**38**	**3.07**	**.85049**	**1.00**	**4.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Assisting in product marketing and customer generation	Central Government supported	8	1.62	.74402	1.00	3.00
	State Government supported	11	2.09	.30151	2.00	3.00
	University/Educational Institution supported	13	2.07	.64051	1.00	3.00
	Private/Corporate Business Incubator	6	2.16	.40825	2.00	3.00
	Total/Average	**38**	**2.00**	**.56949**	**1.00**	**3.00**
Conducting periodical reviews of startup performance	Central Government supported	8	1.50	.53452	1.00	2.00
	State Government supported	11	2.00	.00000	2.00	2.00
	University/Educational Institution supported	13	1.92	.27735	1.00	2.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**1.86**	**.34257**	**1.00**	**2.00**

Source: Field Survey

Organising workshops, seminars and events is the incubation activity in which incubators mostly coordinate with each other. Central government supported incubators (mean = 3.75) and state government supported incubators (mean = 4.00) actively coordinate with other incubators while organising workshops and seminars. With regard to activities such as providing financial incentives and seed capital to startups (mean = 3.63), arranging mentors for providing mentoring support to startups (mean = 3.90), providing technical support to startups (mean = 3.90), providing facilities for advanced research and development (mean = 3.81) and providing opportunities to meet investors and pitch for funding (mean = 3.72), state government supported incubators well coordinate with other incubators. There is a low level of coordination among incubators while performing other incubation activities. Private business incubators mostly do not coordinate with other incubators while performing incubation activities.

- **Post-Incubation Activities - Activity Links with Other Incubators**

Incubators may continue providing services to startups even after the completion of the incubation programme. Such activities include developing a proper exit plan for incubatees, providing business advice and support for business development, providing extension to the graduated startups to continue using the incubation facilities if they need them, allowing the startups to continue using the lab and other research facilities, providing support in technology commercialisation, providing assistance in portfolio management and IPOs and providing support in business expansion and internationalisation. The level of coordination that different types of incubators have with each other while performing these activities can be understood from the below table.

Table 7.13

Post-Incubation Activities - Activity Links with Other Incubators

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Developing a proper exit plan for incubatees	Central Government supported	8	1.50	.53452	1.00	2.00
	State Government supported	11	1.90	.53936	1.00	3.00
	University/Educational Institution supported	13	2.00	.70711	1.00	3.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**1.86**	**.57756**	**1.00**	**3.00**
Providing business advice and support for business development	Central Government supported	8	1.37	.51755	1.00	2.00
	State Government supported	11	1.90	.53936	1.00	3.00
	University/Educational Institution supported	13	1.92	.75955	1.00	3.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**1.81**	**.60873**	**1.00**	**3.00**

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing extension to the graduated startups to continue using the incubation facilities if they need	Central Government supported	8	1.37	.51755	1.00	2.00
	State Government supported	11	1.45	.68755	1.00	3.00
	University/Educational Institution supported	13	1.61	.65044	1.00	3.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**1.57**	**.59872**	**1.00**	**3.00**
Allowing the startups to continue using the Lab and other research facilities	Central Government supported	8	1.50	.75593	1.00	3.00
	State Government supported	11	2.81	1.25045	1.00	4.00
	University/Educational Institution supported	13	1.61	.65044	1.00	3.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**2.00**	**.98639**	**1.00**	**4.00**
Providing support in technology commercialisation	Central Government supported	8	1.37	.74402	1.00	3.00
	State Government supported	11	1.90	.53936	1.00	3.00
	University/Educational Institution supported	13	1.61	.65044	1.00	3.00
	Private/Corporate Business Incubator	6	2.16	.40825	2.00	3.00
	Total/Average	**38**	**1.73**	**.64449**	**1.00**	**3.00**
Providing assistance in portfolio management and IPO	Central Government supported	8	1.37	.74402	1.00	3.00
	State Government supported	11	1.45	.68755	1.00	3.00
	University/Educational Institution supported	13	1.61	.65044	1.00	3.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**1.57**	**.64228**	**1.00**	**3.00**

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Support in business expansion and internationalisation	Central Government supported	8	1.25	.46291	1.00	2.00
	State Government supported	11	1.45	.68755	1.00	3.00
	University/Educational Institution supported	13	1.61	.65044	1.00	3.00
	Private/Corporate Business Incubator	6	1.50	.83666	1.00	3.00
	Total/Average	**38**	**1.47**	**.64669**	**1.00**	**3.00**

Source: Field Survey

From the aforesaid table, it can be found that there is a very low level of coordination among different types of incubators while performing various post-incubation activities. The average of responses for different activities is 2 and below.

7.4.2 Actor Bonds with Other Incubators

"The key to understanding the nature and function of what we came to call actors' bonds is that no actor (company) is an island but is always an arbitrary part of a mainland. Every company is not only dependent on its environment; it is integrated into a context. This applies to the activities it performs, to the resources it controls and also to the individuals who represent the company." (Hakansson & Snehota, 1995). As per the ARA model, actors are the business units that perform various activities by using different resources. Incubators are important actors in a startup ecosystem. They function with the support of other actors such as startups, investors, mentors, government etc. When an actor interacts with other actors, three dimensions of relationship bonds develop between them, such as structural bond, economic bond and social bond (Holmlund & Tornroos, 1997). Such bonds form an integral part of developing business relationships. This section of the study focuses on the strength of the structural, economic and social bonds that different types of incubators share with other incubators. Incubators were provided with statements that measured the various actor bonds with other incubators and they were asked to rate the strength of actor bonds from "very strong" to "very weak" using a five-point Likert scale. The analyses of various actor bonds are given below:

- **Structural Bond with Other Incubators**

Structural bonds are developed through alliances and business collaborations between actors while they perform various functions. "Structural dimension of relationships include activity links, resource ties, connections and institutional bonds. By links, we mean which activities the partners perform and how these activities are interlinked. Ties, on the other hand, refer to how the partners are resource wise tied together. Connections refer to how relationships are connected to other relationships in the business network" (Holmlund & Tornroos, 1997). Statements for measuring the structural bond of various types of incubators with other incubators include performing business activities with mutual support and coordination, sharing facilities, information, equipments and other resources, formulating policies and programmes that enhance business relationships and developing value added partnerships and connections. The analysis of structural bond with other incubators is explained in the table below

Table 7.14

Structural Bond with Other Incubators

Structural Bond	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Performing business activities with mutual support and coordination	Central Government supported	8	2.87	1.12599	1.00	4.00
	State Government supported	11	3.63	.50452	3.00	4.00
	University/Educational Institution supported	13	2.92	.95407	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	1.32916	1.00	4.00
	Total/Average	**38**	**2.94**	**1.08919**	**1.00**	**4.00**
Sharing of facilities, information, equipments and other resources	Central Government supported	8	3.00	1.19523	1.00	4.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.15	.98710	1.00	4.00
	Private/Corporate Business Incubator	6	1.67	1.21106	1.00	4.00
	Total/Average	**38**	**3.13**	**1.16645**	**1.00**	**4.00**

Structural Bond	Types of Incubators	N	Mean	Standard Deviation	Mini mum	Maximum
Formulating policies and programs that enhance business relationships	Central Government supported	8	2.87	1.12599	1.00	4.00
	State Government supported	11	3.45	.68755	2.00	4.00
	University/Educational Institution supported	13	2.76	.83205	1.00	4.00
	Private/Corporate Business Incubator	6	1.50	.83666	1.00	3.00
	Total/Average	**38**	**2.78**	**1.04385**	**1.00**	**4.00**
Developing value added partnerships and Connections	Central Government supported	8	1.19	.42258	1.00	4.00
	State Government supported	11	1.00	.30424	2.00	4.00
	University/Educational Institution supported	13	1.09	.30285	1.00	4.00
	Private/Corporate Business Incubator	6	.83	.34157	1.00	3.00
	Total/Average	**38**	**2.76**	**1.17253**	**1.00**	**4.00**

Source: Field Survey

State government supported incubators have a good structural bond with other incubators. With respect to performing business activities with mutual support and coordination (mean = 3.63), sharing of facilities, information, equipments and other resources (mean = 4.00) and formulating policies and programs that enhance business relationships (mean = 3.45), state government supported incubators have a comparatively stronger bond with other incubators. With regard to performing activities with mutual support and coordination and formulating policies and programs that enhance business relationships, centrally supported and universities/educational institutions supported incubators have a moderately strong bond with other incubators.

- **Economic Bond with Other Incubators**

“Economic dimension of relationships, contain investments and financial adjustments that the business partners make” (Holmlund & Tornroos, 1997). When actors function together in a business, it is common to have financial relationships with one another.

Actors help each other with financial matters in different ways. Financial relationships lead to economic bond between the actors. The economic bond various types of incubators have with other incubators is measured by using financial activities such as fund for managing incubation expenses, equity investment in startups, providing grants and loans to startups, providing facilities/goods/services at a lower rate and other financial incentives and joint investment in innovation projects. An analysis of the economic bond with other incubators is given in the table below.

Table 7.15

Economic Bond with Other Incubators

Economic Bond	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Fund for managing incubation expenses	Central Government supported	8	1.25	.70711	1.00	3.00
	State Government supported	11	1.18	.40452	1.00	2.00
	University/Educational Institution supported	13	1.53	.51887	1.00	2.00
	Private/Corporate Business Incubator	6	1.00	.00000	1.00	1.00
	Total/Average	**38**	**1.28**	**.51506**	**1.00**	**3.00**
Equity investment in startups	Central Government supported	8	1.12	.35355	1.00	2.00
	State Government supported	11	1.63	.50452	1.00	2.00
	University/Educational Institution supported	13	1.46	.51887	1.00	2.00
	Private/Corporate Business Incubator	6	1.00	.00000	1.00	1.00
	Total/Average	**38**	**1.36**	**.48885**	**1.00**	**2.00**
Providing grants and loans to startups	Central Government supported	8	2.25	1.48805	1.00	4.00
	State Government supported	11	2.27	1.19087	1.00	4.00
	University/Educational Institution supported	13	3.07	1.11516	1.00	4.00
	Private/Corporate Business Incubator	6	1.50	.83666	1.00	3.00
	Total/Average	**38**	**2.42**	**1.26559**	**1.00**	**4.00**

Economic Bond	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing facilities/goods/services at lower rate and other financial incentives	Central Government supported	8	2.62	1.40789	1.00	4.00
	State Government supported	11	2.54	1.12815	1.00	4.00
	University/Educational Institution supported	13	2.92	1.11516	1.00	4.00
	Private/Corporate Business Incubator	6	1.50	.83666	1.00	3.00
	Total/Average	**38**	**2.52**	**1.20218**	**1.00**	**4.00**
Joint investment in innovation projects	Central Government supported	8	2.00	1.06904	1.00	4.00
	State Government supported	11	1.81	.60302	1.00	3.00
	University/Educational Institution supported	13	1.92	.49355	1.00	3.00
	Private/Corporate Business Incubator	6	1.16	.40825	1.00	2.00
	Total/Average	**38**	**1.78**	**.70358**	**1.00**	**4.00**

Source: Field Survey

The above table indicates that the economic bond among incubators is weak. With regard to providing grants and loans to startups, incubators supported by universities and educational institutions have a mean value greater than the average of total responses. Therefore, universities/educational institutions supported incubators have economic bond with other incubators for providing loans and grants to startups. In every other aspect, the economic bond is weak among the various categories of incubators.

- **Social Bond with Other Incubators**

Social bonds are formed through the communication and interaction of people in different firms. The extent to which actors socialise with one another shows the strength of the social bond shared between them. The social bond is measured through personal attachment and friendship, mutual interaction and communication, mutual trust and belief and commitment. The strength of social bond that different categories of incubators have with other incubators is analysed and details are given in the following table:

Table 7.16

Social Bond with Other Incubators

Social Bond	Type of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Personal attachment and friendship	Central Government supported	8	3.50	1.19523	2.00	5.00
	State Government supported	11	3.63	1.12006	2.00	5.00
	University/Educational Institution supported	13	3.46	1.26592	1.00	5.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.36**	**1.17222**	**1.00**	**5.00**
Mutual interaction and communication	Central Government supported	8	3.50	1.19523	2.00	5.00
	State Government supported	11	3.63	1.12006	2.00	5.00
	University/Educational Institution supported	13	3.38	1.19293	1.00	5.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.34**	**1.14553**	**1.00**	**5.00**
Mutual trust and belief	Central Government supported	8	3.50	1.19523	2.00	5.00
	State Government supported	11	3.54	1.03573	2.00	5.00
	University/Educational Institution supported	13	3.30	1.18213	1.00	5.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.28**	**1.11277**	**1.00**	**5.00**
Commitment	Central Government supported	8	3.50	1.19523	2.00	5.00
	State Government supported	11	3.63	1.12006	2.00	5.00
	University/Educational Institution supported	13	3.23	1.16575	1.00	5.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.28**	**1.13680**	**1.00**	**5.00**

Source: Field Survey

It can be understood from the above table that there is a moderately strong social bond among the incubators. Central and state government funded incubators have a stronger social bond with other incubators since the mean values are above the average of total responses. The social bond of private business incubators with other incubators is comparatively weak.

7.4.3 Resource Ties with Other Incubators

Tangible as well as intangible resources are needed for the running of the business. "Companies make use of resources; a combination of technical, personal, financial and other resources is always needed in a business enterprise. No company has all the resources needed; some have to be acquired from others. At the same time, the products and services of a company become resources for other companies. For these reasons, the resource dimension of business relationships is an important one" (Hakansson & Snehota, 1995). Resource ties are developed between actors when they start sharing resources among themselves. Resource ties can be developed between incubators when they share resources with one another. Financial resources, physical infrastructure resources, human resources, business knowledge, business networks, business reputation and intellectual properties are the various resources based on which the strength of resource ties among incubators is measured. The analysis of resource ties with other incubators is given below.

Table 7.17

Resource Ties with Other Incubators

Resources	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Financial Resources	Central Government supported	8	1.87	.64087	1.00	3.00
	State Government supported	11	3.27	.90453	2.00	4.00
	University/Educational Institution supported	13	2.69	.85485	1.00	4.00
	Private/Corporate Business Incubator	6	2.00	.63246	1.00	3.00
	Total/Average	**38**	**2.57**	**.94816**	**1.00**	**4.00**

Resources	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Physical Infrastructure resources	Central Government supported	8	2.87	1.24642	1.00	4.00
	State Government supported	11	3.45	.68755	2.00	4.00
	University/Educational Institution supported	13	2.76	.92681	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	.40825	1.00	2.00
	Total/Average	**38**	**2.84**	**1.00071**	**1.00**	**4.00**
Human Resources	Central Government supported	8	2.50	.75593	2.00	4.00
	State Government supported	11	2.45	.68755	2.00	4.00
	University/Educational Institution supported	13	2.38	.76795	1.00	4.00
	Private/Corporate Business Incubator	6	1.83	.40825	1.00	2.00
	Total/Average	**38**	**2.34**	**.70811**	**1.00**	**4.00**
Business Knowledge	Central Government supported	8	3.37	.91613	2.00	4.00
	State Government supported	11	3.63	.50452	3.00	4.00
	University/Educational Institution supported	13	3.15	.98710	1.00	4.00
	Private/Corporate Business Incubator	6	2.33	1.03280	1.00	4.00
	Total/Average	**38**	**3.21**	**.93456**	**1.00**	**4.00**
Business Networks	Central Government supported	8	3.37	.91613	2.00	4.00
	State Government supported	11	3.63	.50452	3.00	4.00
	University/Educational Institution supported	13	3.23	1.01274	1.00	4.00
	Private/Corporate Business Incubator	6	2.33	1.03280	1.00	4.00
	Total/Average	**38**	**3.23**	**.94252**	**1.00**	**4.00**

Resources	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Business Reputation	Central Government supported	8	3.25	1.03510	2.00	4.00
	State Government supported	11	2.36	.67420	2.00	4.00
	University/Educational Institution supported	13	2.84	.89872	1.00	4.00
	Private/Corporate Business Incubator	6	2.16	.75277	1.00	3.00
	Total/Average	**38**	**2.68**	**.90360**	**1.00**	**4.00**
Intellectual Properties	Central Government supported	8	2.12	.99103	1.00	4.00
	State Government supported	11	2.09	.70065	1.00	4.00
	University/Educational Institution supported	13	1.92	.27735	1.00	2.00
	Private/Corporate Business Incubator	6	2.00	.63246	1.00	3.00
	Total/Average	**38**	**2.02**	**.63616**	**1.00**	**4.00**

Source: Field Survey

Among the different resources, there are stronger ties between incubators for the sharing of business knowledge (mean = 3.21) and business networks (mean = 3.23). State funded incubators have comparatively stronger resource ties while sharing financial resources (mean = 3.27), physical infrastructure resources (mean = 3.45), business networks (mean = 3.63) and business knowledge (mean = 3.63) with other incubators. Private business incubators have weak resource ties with other incubators.

7.5 Activity Links, Actor Bonds and Resource Ties of with Startups

From the point of entering into an incubation programme or even before that business relationship is established between incubators and startups. While studying business relationships using Actor-Resources-Activity model (Hakansson & Snehota, 1995), we need to analyse the activity links, actor bonds and resource ties shared between the parties. Parties involved in a business relationship can be called actors. Activity links are created when the activities performed by the actors are connected to one another. Linkage is created between activities that are connected to one another. Bonds that are formed through the interactions between the actors are known as actor bonds. Actor bonds can be structural, economic, or social. Resource ties are created through the sharing of resources between actors while performing connected activities. This section of the thesis analyses the business relationship between incubators and startups based on the activity links, actor bonds and resource ties between them. This analysis is explained in detail in the following section:

7.5.1 Activity Links with Startups

"A relationship between two companies connects the activity structures of the two units. It consists of activities that can link, more or less tightly, various parts of the activity structures. The number and type of activity links in a relationship can vary. Activity linking is a form of coordination and is achieved by mutual adjustments of activities" (Hakansson & Snehota, 1995). There are many activities of startups and incubators that are connected to one another. For example, startups need to find mentors to help them solve the various problems they face while doing business and one of the important activities of incubators is to arrange mentoring support for incubated startups. So these two activities are connected to one another and can be performed in coordination by startups and incubators. Activity links between incubators and startups are divided into three sections, such as activity link for pre-incubation activities, activity link for incubation activities and activity link for post-incubation activities. The level of coordination incubators have with startups while performing various activities is measured using a five-point Likert scale where incubators have to rate the level of coordination with startups between "very high" and "very low." The activity link between incubators and startups is given below:

- **Pre-Incubation Activities – Activity Links with Startups**

Pre-incubation activities include the assistance provided by incubators to startups before entering the incubation programme. Only the startups that show potential for future growth and success will be carried forward to the incubation programme. All the activities performed by incubators for startups can be successful only when they are performed with the support of startups. Activities performed by incubators during the pre-incubation period include providing induction programmes, providing a coworking space, providing training for entrepreneurial skill development, conducting feasibility analysis for different ideas, conducting technical need analysis for different teams, providing labs and research facilities for experimenting and providing assistance in business plan development and team building. The coordination between incubators and startups while performing pre-incubation activities can be understood from the below table.

Table 7.18

Pre-Incubation Activities – Activity Links with Startups

Pre-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Providing induction programmes	Central Government supported	8	2.37	1.06066	1.00	4.00
	State Government supported	11	2.36	1.56670	1.00	4.00
	University/Educational Institution supported	13	3.46	.87706	1.00	4.00
	Private/Corporate Business Incubator	6	2.16	.98319	1.00	4.00
	Total/Average	**38**	**2.71**	**1.25004**	**1.00**	**4.00**
Providing a coworking space	Central Government supported	8	2.37	1.06066	1.00	4.00
	State Government supported	11	3.09	1.04447	2.00	4.00
	University/Educational Institution supported	13	2.07	.75955	1.00	4.00
	Private/Corporate Business Incubator	6	3.50	1.22474	1.00	4.00
	Total/Average	**38**	**2.65**	**1.09733**	**1.00**	**4.00**
Providing training for entrepreneurial skill development	Central Government supported	8	2.00	1.06904	1.00	4.00
	State Government supported	11	2.90	1.04447	2.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	2.50	1.22474	1.00	4.00
	Total/Average	**38**	**3.00**	**1.13899**	**1.00**	**4.00**

Pre-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Conducting feasibility analysis for different ideas	Central Government supported	8	2.25	1.28174	1.00	4.00
	State Government supported	11	2.90	1.04447	2.00	4.00
	University/Educational Institution supported	13	3.53	.87706	1.00	4.00
	Private/Corporate Business Incubator	6	2.16	.75277	1.00	3.00
	Total/Average	**38**	**2.86**	**1.11915**	**1.00**	**4.00**
Conducting technical need analysis for different teams	Central Government supported	8	2.37	1.50594	1.00	5.00
	State Government supported	11	2.81	1.16775	1.00	4.00
	University/Educational Institution supported	13	3.61	.65044	2.00	4.00
	Private/Corporate Business Incubator	6	2.33	1.03280	1.00	4.00
	Total/Average	**38**	**2.92**	**1.17131**	**1.00**	**5.00**
Providing labs and research facilities for experimenting	Central Government supported	8	2.37	1.68502	1.00	5.00
	State Government supported	11	2.72	1.10371	1.00	4.00
	University/Educational Institution supported	13	3.53	.66023	2.00	4.00
	Private/Corporate Business Incubator	6	2.16	.75277	1.00	3.00
	Total/Average	**38**	**2.84**	**1.17465**	**1.00**	**5.00**
Providing assistance in business plan development and team building	Central Government supported	8	2.25	1.58114	1.00	5.00
	State Government supported	11	2.81	1.16775	1.00	4.00
	University/Educational Institution supported	13	3.46	.77625	2.00	4.00
	Private/Corporate Business Incubator	6	2.16	.75277	1.00	3.00
	Total/Average	**38**	**2.81**	**1.18219**	**1.00**	**5.00**

Source: Field Survey

There is a moderate level of coordination between incubators and startups in the performance of pre-incubation activities, as the mean value of total responses ranges between 2.6 and 3. Incubators functioning in universities and educational institutions have better coordination with startups with regard to most of the pre-incubation activities. Private business incubators (mean = 3.50) and state government funded business incubators (mean = 3.07) coordinate well with startups in providing coworking spaces.

- **Incubation Activities - Activity Links with Startups**

While providing incubation facilities to startups, incubators perform different activities to support the incubation programme and assist the startups. Such activities can be successfully completed by the incubators only when there is proper support from the incubated startups. Activities such as screening and selection of startups for incubation, proving physical infrastructural facilities to startups, providing accommodation facilities to startup teams, assisting startups in prototype development, organising workshops, seminars and events, providing financial incentives and seed capital to startups, help startups in recruiting skill full and talented human resource, providing technical support to startups, providing facilities for advanced research and development, assisting startups in applying for intellectual properties like patent, trademark etc., arranging assistance of professionals like accountants, lawyers etc, providing opportunity to meet investors and pitch for funding, assisting in product marketing and customer generation and conducting periodical reviews of startup performance are included among the fifteen activities which are performed by incubators while during the incubation programme. The level of coordination between incubators and incubatee startups while performing these activities can be understood from the below table.

Table 7.19

Incubation Activities - Activity Links with Startups

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Screening and selection of startups for incubation	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	4.00	.00000	4.00	4.00
	Private/Corporate Business Incubator	6	3.50	1.22474	1.00	4.00
	Total/Average	**38**	**3.94**	**.51713**	**1.00**	**5.00**
Proving physical infrastructural facilities to startups	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	4.00	.00000	4.00	4.00
	Total/Average	**38**	**4.00**	**.23250**	**1.00**	**5.00**
Providing accommodation facilities to startup teams	Central Government supported	8	2.12	1.45774	1.00	5.00
	State Government supported	11	2.63	1.12006	1.00	4.00
	University/Educational Institution supported	13	3.30	.75107	2.00	4.00
	Private/Corporate Business Incubator	6	1.83	.40825	1.00	2.00
	Total/Average	**38**	**2.63**	**1.12517**	**1.00**	**5.00**
Assisting startups in prototype development	Central Government supported	8	3.87	.83452	2.00	5.00
	State Government supported	11	2.81	1.16775	1.00	4.00
	University/Educational Institution supported	13	3.76	.72501	2.00	5.00
	Private/Corporate Business Incubator	6	3.33	1.21106	1.00	4.00
	Total/Average	**38**	**3.44**	**1.03185**	**1.00**	**5.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Organising workshops, seminars and events	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	3.50	1.22474	1.00	4.00
	Total/Average	**38**	**3.92**	**.53935**	**1.00**	**5.00**
Providing financial incentives and seed capital to startups	Central Government supported	8	2.75	.88641	2.00	4.00
	State Government supported	11	3.54	.52223	3.00	4.00
	University/Educational Institution supported	13	2.92	.49355	2.00	4.00
	Private/Corporate Business Incubator	6	2.83	.98319	1.00	4.00
	Total/Average	**38**	**3.05**	**.73328**	**1.00**	**4.00**
Help startups in recruiting skilled and talented human resource	Central Government supported	8	3.62	.74402	2.00	4.00
	State Government supported	11	3.72	.90453	1.00	4.00
	University/Educational Institution supported	13	3.53	.51887	3.00	4.00
	Private/Corporate Business Incubator	6	2.83	.98319	1.00	4.00
	Total/Average	**38**	**3.50**	**.79695**	**1.00**	**4.00**
Arranging mentors to provide mentoring support to startups	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.84	.37553	3.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.78**	**.47408**	**2.00**	**4.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Providing technical support to startups	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	3.72	.90453	1.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	3.16	.75277	2.00	4.00
	Total/Average	**38**	**3.78**	**.66405**	**1.00**	**5.00**
Providing facilities for advanced research and development	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	3.63	.92442	1.00	4.00
	University/Educational Institution supported	13	3.53	.51887	3.00	4.00
	Private/Corporate Business Incubator	6	2.83	.40825	2.00	3.00
	Total/Average	**38**	**3.57**	**.72154**	**1.00**	**5.00**
Assisting startups in applying for intellectual properties like patents, trademarks etc.	Central Government supported	8	3.75	.46291	3.00	4.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	3.30	.63043	2.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.52**	**.60345**	**2.00**	**4.00**
Arranging assistance of professionals like accountants, lawyers etc	Central Government supported	8	3.75	.46291	3.00	4.00
	State Government supported	11	3.81	.40452	3.00	4.00
	University/Educational Institution supported	13	3.23	.59914	2.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.47**	**.60345**	**2.00**	**4.00**

Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Providing opportunities to meet investors and pitch for funding	Central Government supported	8	2.75	.88641	2.00	4.00
	State Government supported	11	3.63	.50452	3.00	4.00
	University/Educational Institution supported	13	3.07	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.15**	**.63783**	**2.00**	**4.00**
Assisting in product marketing and customer generation	Central Government supported	8	3.25	.46291	3.00	4.00
	State Government supported	11	3.72	.64667	2.00	4.00
	University/Educational Institution supported	13	3.61	.65044	2.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.47**	**.64669**	**2.00**	**4.00**
Conducting periodical reviews of startup performance	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	3.81	.60302	2.00	4.00
	University/Educational Institution supported	13	3.76	.43853	3.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.71**	**.56511**	**2.00**	**4.00**

Source: Field Survey

From the above table, it can be understood that there is a high level of coordination between incubators and startups in the case of most of the incubation activities. With regard to providing accommodation facilities to startups, incubators functioning in universities and educational institutions (mean = 3.30) have better coordination with startups. In case of activities like providing financial incentives and seed capital to startups (mean = 3.54), helping startups in recruiting skilled and talented human resources (mean = 3.72), assisting startups in applying for intellectual properties like patents, trademarks, etc. (mean = 3.90), providing opportunities to meet investors and pitch for funding (mean = 3.63) and assisting in product marketing and customer generation (mean = 3.72), state government supported incubators have comparatively good coordination with startups. In the case of activities like assisting startups in prototype development (mean = 3.87), providing technical support to startups (mean = 4.12) and providing facilities for advanced research and development (mean = 4.12), central government supported incubators have greater coordination with the startups.

- **Post-Incubation Activities - Activity Links with Startups**

Incubators may extend their support to incubated startups even after the completion of the incubation programme. Such support will help startups accelerate the growth of their businesses after graduating from the incubator. Activities such as developing a proper exit plan for incubatees, providing business advice and support for business development, providing extension to the graduated startups to continue using the incubation facilities if they need them, allowing the startups to continue using the lab and other research facilities, providing support in technology commercialisation, providing assistance in portfolio management and IPOs and providing support in business expansion and internationalisation are some of the assistance provided by incubators to startups during the post-incubation period. The extent to which incubators and incubatees coordinate while performing post-incubation activities can be understood from the below table.

Table 7.20

Post-Incubation Activities - Activity Links with Startups

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Developing a proper exit plan for incubatees	Central Government supported	8	2.87	.99103	2.00	4.00
	State Government supported	11	3.81	.60302	2.00	4.00
	University/Educational Institution supported	13	3.15	.98710	2.00	4.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.18**	**.95451**	**2.00**	**4.00**

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Providing business advice and support for business development	Central Government supported	8	2.75	1.03510	2.00	4.00
	State Government supported	11	3.54	1.03573	1.00	4.00
	University/Educational Institution supported	13	3.07	.95407	2.00	4.00
	Private/Corporate Business Incubator	6	3.00	.63246	2.00	4.00
	Total/Average	**38**	**3.13**	**.96341**	**1.00**	**4.00**
Providing extension to the graduated startups to continue using the incubation facilities if they need	Central Government supported	8	3.62	.74402	2.00	4.00
	State Government supported	11	3.00	1.18322	1.00	4.00
	University/Educational Institution supported	13	2.53	.77625	2.00	4.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**2.89**	**.98061**	**1.00**	**4.00**
Allowing the startups to continue using the Lab and other research facilities	Central Government supported	8	3.75	.70711	2.00	4.00
	State Government supported	11	3.00	1.18322	1.00	4.00
	University/Educational Institution supported	13	2.15	.80064	1.00	4.00
	Private/Corporate Business Incubator	6	2.16	.40825	2.00	3.00
	Total/Average	**38**	**2.73**	**1.05739**	**1.00**	**4.00**
Providing support in technology commercialisation	Central Government supported	8	3.6250	.74402	2.00	4.00
	State Government supported	11	3.0000	1.18322	1.00	4.00
	University/Educational Institution supported	13	2.1538	.68874	1.00	3.00
	Private/Corporate Business Incubator	6	2.3333	.81650	2.00	4.00
	Total/Average	**38**	**2.73**	**1.03151**	**1.00**	**4.00**

Post-Incubation Activities	Types of Incubators	N	Mean	Standard Deviation	Mini Mum	Maximum
Providing assistance in portfolio management and IPO	Central Government supported	8	2.37	.74402	2.00	4.00
	State Government supported	11	3.00	1.18322	1.00	4.00
	University/Educational Institution supported	13	2.07	.64051	1.00	3.00
	Private/Corporate Business Incubator	6	2.16	.98319	1.00	4.00
	Total/Average	**38**	**2.42**	**.94816**	**1.00**	**4.00**
Support in business expansion and internationalisation	Central Government supported	8	2.37	.74402	2.00	4.00
	State Government supported	11	2.09	.70065	1.00	4.00
	University/Educational Institution supported	13	2.15	.80064	1.00	4.00
	Private/Corporate Business Incubator	6	2.16	.98319	1.00	4.00
	Total/Average	**38**	**2.18**	**.76601**	**1.00**	**4.00**

Source: Field Survey

Incubators mostly coordinate with startups for developing a proper exit plan (mean = 3.18) and providing business advice and support for business development (mean = 3.13). Central government supported incubators have greater coordination with startups in providing extensions to the graduated startups to continue using the incubation facilities (mean = 3.62) and allowing the startups to continue using the lab and other research facilities (mean = 3.75).

7.5.2 Actor Bonds with Startups

Actors are organisations whose function is to operate in a business environment. For smoothly functioning in a competitive business environment, it is important to support and cooperate with one another. Actors perform activities by coordinating with each other and sharing resources. Mutual interaction and partnerships lead to the development of structural, economic and social bonds among the different actors (Holmlund & Tornroos, 1997). Incubators and startups are actors that function closely with each other in the startup ecosystem. Incubators set up essential resources and offer guidance and assistance to startups while they carry out various tasks. Naturally, while closely associated during the incubation period, different types of bonds will be developed between incubators and startups associated with them. This section of the thesis discusses the structural bond, economic bond and social bond between incubators and startups Incubators are asked to rate their bond with startups using a five-point Likert scale from “very strong” to “very weak." A detailed analysis of the responses of incubators is given below:

- **Structural Bond with Startups**

Structural bonds are developed through the linkage of activities; ties are developed for resource sharing, interactions and other business connections (Holmlund & Tornroos, 1997). Incubators and startups enter into a business relationship through incubation programmes, which creates a business connection between them. Through this connection and continuous interactions for performing activities as well as resource sharing, there develops a structural bond between incubators and startups. The structural bond is measured using four statements, which are: performing business activities with mutual support and coordination; sharing of facilities, information, equipment’s and other resources; formulating policies and programmes that enhance business relationships; and developing value added partnerships and connections. The analysis of the structural bond between incubators and startups is given in the following table:

Table 7.21

Structural Bond with Startups

Structural Bond	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Performing business activities with mutual support and coordination	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	4.07	.27735	4.00	5.00
	Private/Corporate Business Incubator	6	4.00	.00000	4.00	4.00
	Total/Average	**38**	**4.02**	**.28350**	**3.00**	**5.00**

Structural Bond	Types of Incubators	N	Mean	Standard Deviation	Mini mum	Maximum
Sharing of facilities, information, equipments and other resources	Central Government supported	8	4.25	.46291	4.00	5.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	4.07	.27735	4.00	5.00
	Private/Corporate Business Incubator	6	4.00	.00000	4.00	4.00
	Total/Average	**38**	**4.07**	**.27328**	**4.00**	**5.00**
Formulating policies and programs that enhance business relationships	Central Government supported	8	3.50	.92582	2.00	5.00
	State Government supported	11	2.81	.60302	2.00	4.00
	University/Educational Institution supported	13	3.38	.65044	2.00	4.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.10**	**.79829**	**2.00**	**5.00**
Developing value added partnerships and connections	Central Government supported	8	2.87	1.35620	1.00	5.00
	State Government supported	11	3.09	.94388	2.00	4.00
	University/Educational Institution supported	13	2.61	.86972	1.00	4.00
	Private/Corporate Business Incubator	6	2.33	.51640	2.00	3.00
	Total/Average	**38**	**2.76**	**.97077**	**1.00**	**5.00**

Source: Field Survey

With respect to performing business activities with mutual coordination (mean = 4.02) and sharing of facilities, information, equipment's and other resources (mean = 4.07), incubators have a strong bond with startups. About formulating policies and programs that enhance business relationships (mean = 3.50), centrally supported startups have a greater bond with startups. With regard to developing value added partnerships and connections, state government supported incubators (mean = 3.09) have a better structural bond with startups.

- **Economic Bond with Startups**

Financial adjustments and investments lead to economic bond between actors (Holmlund & Tornroos, 1997). Incubators and startups are actors connected through an incubation programme where incubators help startups arrange finance through different sources as well as provide services to startups at a concessional rate. When startups achieve revenue generation, they can also enter into partnerships with incubators, which will develop an economic bond between them. The economic bond between actors is measured by using financial activities such as fund for managing incubation expenses, equity investment in startups, providing grants and loans to startups, providing facilities/goods/services at a lower rate and other financial incentives and joint investment in innovation projects. The strength of the economic bond between incubators and startups can be understood from the below table.

Table 7.22

Economic Bond with Startups

Economic Bond	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Fund for managing incubation expenses	Central Government supported	8	1.12	.35355	1.00	2.00
	State Government supported	11	1.18	.40452	1.00	2.00
	University/Educational Institution supported	13	1.30	.48038	1.00	2.00
	Private/Corporate Business Incubator	6	1.33	.51640	1.00	2.00
	Total/Average	**38**	**1.23**	**.43085**	**1.00**	**2.00**
Equity investment in startups	Central Government supported	8	1.25	.46291	1.00	2.00
	State Government supported	11	1.36	.92442	1.00	4.00
	University/Educational Institution supported	13	1.61	.86972	1.00	4.00
	Private/Corporate Business Incubator	6	1.33	.51640	1.00	2.00
	Total/Average	**38**	**1.42**	**.75808**	**1.00**	**4.00**

Economic Bond	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Providing grants and loans to startups	Central Government supported	8	2.00	1.19523	1.00	4.00
	State Government supported	11	1.72	.78625	1.00	3.00
	University/Educational Institution supported	13	2.61	.65044	1.00	3.00
	Private/Corporate Business Incubator	6	1.66	.81650	1.00	3.00
	Total/Average	**38**	**2.07**	**.91183**	**1.00**	**4.00**
Providing facilities/goods/services at lower rate and other financial incentives	Central Government supported	8	3.50	.75593	2.00	4.00
	State Government supported	11	2.36	1.43337	1.00	4.00
	University/Educational Institution supported	13	3.53	.87706	2.00	5.00
	Private/Corporate Business Incubator	6	2.50	.83666	2.00	4.00
	Total/Average	**38**	**3.02**	**1.15048**	**1.00**	**5.00**
Joint investment in innovation projects	Central Government supported	8	2.25	1.03510	1.00	4.00
	State Government supported	11	1.36	.92442	1.00	4.00
	University/Educational Institution supported	13	2.07	.95407	1.00	4.00
	Private/Corporate Business Incubator	6	2.00	.00000	2.00	2.00
	Total/Average	**38**	**1.89**	**.92384**	**1.00**	**4.00**

Source: Field Survey

Incubators have a weak economic bond with startups. Only with regard to providing facilities/goods/services at a lower rate and other financial incentives (mean = 3.02) there is a better bond between incubators and startups. Central government supported incubators (mean = 3.50) and universities/educational institutions supported incubators (mean = 3.53) have a comparatively greater bond with startups in the case of providing facilities at a lower rate and other financial incentives.

- **Social Bond with Startups**

The social components of relationships are founded on the interactions between people in organisations. Relational concepts such as commitment, trust, environment, attractiveness and social relationships are included in this dimension (Holmlund & Tornroos, 1997). Social bonds are developed when people interact and work together. Incubators and startups are actors who function very closely with one another. The employees working in incubators and startups develop close personal associations as they start communicating and coordinating more with each other. Social bonds help to develop an intimate business relationship between the actors. Personal attachment and friendship, mutual interaction and communication, mutual trust and belief and commitment are the various aspects used to measure social bond between actors. The social bond between incubators and startups from the perspective of incubators can be understood from the below table.

Table 7.23

Social Bond with Startups

Social Bond	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Personal attachment and friendship	Central Government supported	8	3.62	1.06066	2.00	5.00
	State Government supported	11	4.09	.30151	4.00	5.00
	University/Educational Institution supported	13	3.92	.86232	3.00	5.00
	Private/Corporate Business Incubator	6	3.33	.51640	3.00	4.00
	Total/Average	**38**	**3.81**	**.76601**	**2.00**	**5.00**
Mutual interaction and communication	Central Government supported	8	3.75	1.03510	2.00	5.00
	State Government supported	11	4.09	.30151	4.00	5.00
	University/Educational Institution supported	13	3.92	.75955	3.00	5.00
	Private/Corporate Business Incubator	6	3.33	.51640	3.00	4.00
	Total/Average	**38**	**3.84**	**.71759**	**2.00**	**5.00**

Social Bond	Types of Incubators	N	Mean	Standard Deviation	Mini mum	Maximum
Mutual trust and belief	Central Government supported	8	3.62	1.06066	2.00	5.00
	State Government supported	11	4.09	.30151	4.00	5.00
	University/Educational Institution supported	13	3.92	.75955	3.00	5.00
	Private/Corporate Business Incubator	6	3.33	.51640	3.00	4.00
	Total/Average	**38**	**3.81**	**.72987**	**2.00**	**5.00**
Commitment	Central Government supported	8	3.62	1.06066	2.00	5.00
	State Government supported	11	4.09	.30151	4.00	5.00
	University/Educational Institution supported	13	3.92	.75955	3.00	5.00
	Private/Corporate Business Incubator	6	3.33	.51640	3.00	4.00
	Total/Average	**38**	**3.81**	**.72987**	**2.00**	**5.00**

Source: Field Survey

The above table indicates that incubators have a strong social bond with startups. With respect to all the different aspects of social bond the average of total responses is above 3.8. Compared to other types of incubators, state government funded incubators have a stronger social bond with startups, as the mean value of their responses is above 4.

7.5.3 Resource Ties with Startups

Resource ties are the connections between two actors numerous resource elements, including their technological, material, knowledge and other intangible resources. Resource ties are the outcome of the evolution of the relationship and serve as a resource in and of itself for an organisation. (Hakansson & Snehota, 1995). Resource ties are generated as the result of the sharing of resources among the various actors. Incubators and startups function very closely with each other and as a result, many resources are shared between them. Resource ties indicate the strength of the relationship between incubators and startups based on their resource sharing.

Resource ties are measured based on the sharing of financial resources, physical infrastructure resources, human resources, business knowledge, business networks, business reputation and intellectual properties between incubators and their incubatees. A detailed analysis of the responses of incubators regarding their resource ties with startups is given in the below table.

Table 7.24

Resource Ties with Startups

Resources	Types of Incubators	N	Mean	Standard Deviation	Minimum	Maximum
Financial Resources	Central Government supported	8	2.62	.74402	2.00	4.00
	State Government supported	11	3.63	.50452	3.00	4.00
	University/Educational Institution supported	13	2.84	.55470	2.00	4.00
	Private/Corporate Business Incubator	6	2.16	.75277	1.00	3.00
	Total/Average	**38**	**2.92**	**.78436**	**1.00**	**4.00**
Physical Infrastructure resources	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	4.07	.27735	4.00	5.00
	Private/Corporate Business Incubator	6	4.00	.00000	4.00	4.00
	Total/Average	**38**	**4.02**	**.16222**	**4.00**	**5.00**
Human Resources	Central Government supported	8	2.87	.83452	2.00	4.00
	State Government supported	11	3.36	.67420	2.00	4.00
	University/Educational Institution supported	13	3.38	.76795	2.00	4.00
	Private/Corporate Business Incubator	6	2.33	1.03280	1.00	4.00
	Total/Average	**38**	**3.10**	**.86335**	**1.00**	**4.00**

Resources	Types of Incubators	N	Mean	Standard Deviation	Mini mum	Maximum
Business Knowledge	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	4.07	.27735	4.00	5.00
	Private/Corporate Business Incubator	6	3.66	.81650	2.00	4.00
	Total/Average	**38**	**3.97**	**.36664**	**2.00**	**5.00**
Business Networks	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	4.00	.00000	4.00	4.00
	Private/Corporate Business Incubator	6	3.66	.81650	2.00	4.00
	Total/Average	**38**	**3.92**	**.35880**	**2.00**	**4.00**
Business Reputation	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	3.92	.27735	3.00	4.00
	Private/Corporate Business Incubator	6	3.66	.81650	2.00	4.00
	Total/Average	**38**	**3.89**	**.38831**	**2.00**	**4.00**
Intellectual Properties	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	3.27	1.00905	2.00	4.00
	University/Educational Institution supported	13	2.07	.64051	1.00	4.00
	Private/Corporate Business Incubator	6	2.83	.75277	2.00	4.00
	Total/Average	**38**	**2.94**	**1.01202**	**1.00**	**4.00**

Source: Field Survey

From the above table, it can be understood that there are strong resource ties between incubators and startups in terms of physical infrastructure resources (mean = 4.02), business knowledge (mean = 3.97), business networks (mean = 3.92) and business reputation (mean = 3.89). With regard to financial resources (mean = 3.63) and human resources (mean = 3.36), state government supported incubators have stronger resource ties with startups. Sharing of intellectual properties is stronger between central government supported incubators (mean = 4.00) and startups.

7.6 Chapter Summary

Incubators are the supporting organisations that function to make sure that startup ideas are well developed and become successful in the market. Incubators are those actors in the startup ecosystem who coordinate with many other actors or elements in the ecosystem to develop an environment that is friendly to startups. Incubators in Kerala are classified into incubators supported by the central government, state government, universities/educational institutions and private companies. Most of the incubators in Kerala are supported by universities or educational institutions. There are exclusive incubation opportunities for technology startups and product oriented startups in Kerala. Activities performed by incubators are divided into pre-incubation, incubation and post-incubation activities. Activity links between incubators and other incubators for performing pre-incubation activities and post-incubation activities are weak due to a low level of coordination. But with regard to organising workshops and events, there is a high level of coordination among incubators. Incubators have a moderate level of coordination with startups regarding the performance of pre-incubation activities and a high level of coordination while performing incubation activities. Incubators also have a moderate level of coordination with startups while performing post-incubation activities. The organisation structure of incubators in Kerala is formal and appropriate for achieving planned goals. Incubators have a moderately strong structural bond, a weak economic bond and a moderate social bond with other incubators. There is a moderately strong structural bond between incubators and startups, whereas the economic bond is weak and the social bond is strong. Incubators provide many tangible and intangible resources to startups. In terms of resource ties, there are moderately strong ones among incubators. Strong resource ties exist between incubators and startups. This chapter analysed incubators as individual organisation and also on the basis of their business relationships with other incubators as well as startups. Some aspects of the business relationship between incubators are weak, while others are strong.

Chapter 8

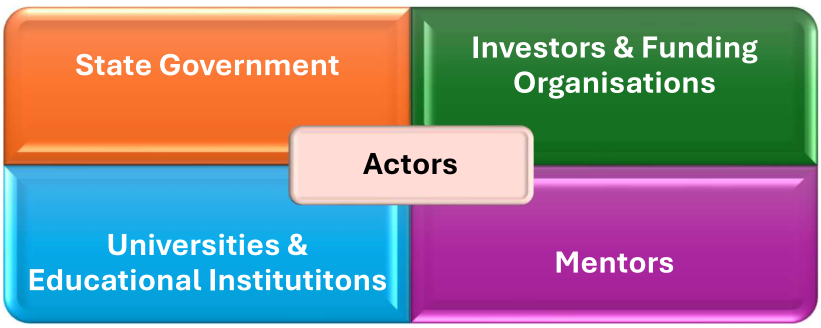
Role of Supporting Actors

8.1 Introduction

The previous chapter discussed the business relationships of incubators in the startup ecosystem. “Entrepreneurial ecosystems not only act as catalysts for economic growth but also for community revitalisation. Entrepreneurial ecosystems enable individuals, organizations and society to merge and generate economic prosperity” (Graybeal & Sindik, 2016). A startup ecosystem is an entrepreneurial ecosystem, which is the combination of various elements that function together to create an environment favourable for startups. Apart from startups and incubators, there are other actors like investors, funding organisations, startup communities, central and state governments, research and educational institutions, mentors, etc., which are also important for the growth and development of startups in an ecosystem. The role played by these actors is equally relevant and to be discussed. This chapter focuses on the role played by selected actors (based on the pilot study) in the startup ecosystem. The actors discussed in this chapter are the following:

Figure 8.1

Supporting Actors in the Startup Ecosystem



The government has the most pivotal role in developing a business environment favourable for startups by establishing a nodal agency, formulating startup policies, supporting startups through different schemes, etc. The foundation stone for a startup ecosystem in a geographical space has to be laid by a government. The government is responsible for formulating policies and plans that will aid incubators in providing assistance to startups. The state government can also fund incubators to provide incubation programmes. Investors and funding organisations provide what is considered the lifeblood of a business, i.e., funds. Money matters and arranging finance is a difficult task because startups need to convince investors and go through the tedious procedures of funding organisations. Investors and funding organisations can coordinate with incubators by providing pitching opportunities to incubated startups as well as sanctioning grants and soft loans, which will be a huge relief to startups. Universities and education institutions play an important role in moulding creative entrepreneurs for the future. Students learn the initial lessons of entrepreneurship and get the opportunity to research their initial ideas at educational institutions. Universities and educational institutions also provide incubation facilities for feasible student ideas. Mentors guide the startup entrepreneurs and help them overcome their obstacles in business one by one. The experience and resources of a mentor are the most valued assets for a startup. Mentors can associate with incubators and help them provide guidance to incubated startups. Therefore, every actor has its own relevance to the growth and survival of startups. Their role in the startup ecosystem, therefore, needs to be discussed in detail.

8.2 Analysis of the Role of Supporting Actors

Apart from startups and incubators, there are many other actors that play a significant role in startup development and growth in the state. Four such actors have been selected to analyse the perspective of startups towards the role of these actors in the ecosystem. The actors selected for the study are the state government, investors & funding organisations, research & educational institutions and mentors. The role of these actors may have a different impact on startups depending on the category of startups. Investors may be more interested in a technology startup than a non-technology startup. Mentors may be more interested in supporting a product oriented startup than a service oriented startup. Similarly, incubators also act with the support of all other actors existing in the ecosystem. The state government proposes policies and essential guidelines for the incubators to function. Investors coordinate with incubators in organising pitching events and funding startups. Universities and educational institutions provide the basic knowledge of entrepreneurship to students and provide them with an incubation facility for commercialising their ideas. Mentors also associate with incubators, providing guidance and imparting business knowledge to startups. Therefore, every other actor in the startup ecosystem has a relevant role to play in the functioning of incubators. The Kruskal-Wallis H test and Mann-Whitney U test are used to analyse whether there is a significant difference in the perspective of various categories of startups regarding the role of different supporting actors. The hypothesis formulated is:

H_0: There is no significant difference in the perspective of various startup categories about the role of different supporting actors in the startup ecosystem.

Since incubators have a population study, descriptive statistics measures are used to analyse the perspectives of various categories of incubators about the roles of different supporting actors.

❖ Exploratory Factor Analysis – Role of Supporting Actors

The role of supporting actors is to be analysed and an EFA is conducted to group the statements regarding their roles into different categories based on the responses of startups. Bartlett's test is used to confirm that there is a substantial correlation between the sample data and the Kaiser-Meyer-Olkin test is used to determine whether the sample is enough for factor analysis. The test results are displayed below.

Table 8.1

KMO and Bartlett's Test – Role of Supporting Actors

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.869
Bartlett's Test of Sphericity	Approx. Chi-Square	3441.486
	DF	120
	Sig.	<0.01

Source: Field Survey

The KMO Test value is .869, which denotes the adequacy of the sample size for EFA and the P value of Bartlett's Test of Sphericity is less than .05 indicating a significant correlation between the sample data. Since the sample adequacy and correlation between the sample data are confirmed, principal component analysis is performed.

Table 8.2

Total Variance Explained – Role of Supporting Actors

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.649	41.558	41.558	6.649	41.558	41.558
2	2.429	15.181	56.739	2.429	15.181	56.739
3	1.832	11.452	68.191	1.832	11.452	68.191
4	1.257	7.856	76.046	1.257	7.856	76.046
Extraction Method: Principal Component Analysis						

Source: Field Survey

From the result of principal component analysis it can be found that there are four factors with Eigenvalue greater than 1 and together they explain 76.046% of the total variance extracted. Therefore, the statements about the role of supporting actors can be classified into four groups based on the responses from startups. Factors and factor loadings are given below.

Table 8.3

Factors and Factor Loadings – Role of Supporting Actors

Factors	Statements	Factor Loadings
Factor-1 (State Government)	Adequate policies are formulated and implemented by the state government for the growth and development of startups in Kerala	.843
	Startup policies adopted by the government are favourable for the functioning of startups in the state	.886
	It is less time-consuming and involves only limited procedures for availing various benefits for startups through the government.	.826
	The startup activities in the state are effectively coordinated through the nodal agency, KSUM	.808

Factors	Statements	Factor Loadings
Factor-2 (Investor & Funding Organisations)	There are angel investors who are interested in investing in your sector of business	.659
	The state financial institutions are ready to provide loans for startups and the procedures to be followed are simple	.640
	The loan amount is sanctioned and provided to the startups within an appropriate time period by the funding organisations	.665
	There is no difficulty in arranging funds through investors and funding organisations in the state	.812
Factor-3 (Universities & Educational Institutions)	Basic education regarding entrepreneurship and startups is provided to students at educational institutions	.831
	Students are trained and encouraged to develop their own business ideas	.887
	Organising startup camps/workshops in coordination with other actors in the ecosystem	.895
	Provides research and incubation facilities for students with the help of the government or institution itself	.875
Factor-4 (Mentors)	It is easy and affordable for startups to get the help of mentors to support the management of their businesses	.817
	Mentors are ready to share their knowledge, time and resources with startups	.872
	Mentors help solve the technical, financial, marketing and other problems faced by startups	.890
	Mentors help in the revenue generation and performance evaluation of startups	.889

Source: Field Survey

8.2.1 Role of State Government – Startups

"The primary goals for governments need to be removing obstacles for funding startups and their growth, especially in areas such as: developing a workable policy, competitive regulation on the market, unfair taxation on small companies, attracting investment capital and help them in the sensitive stages of their development" (Vekić & Borocki, 2017). All the activities of the startup ecosystem are regulated and controlled by the state government. The state government issues policies and schemes that support startups and enhance the development of a startup ecosystem in the state.

The policies and schemes of the government are implemented through their nodal agency, KSUM. The state government has a significant role in the development of both incubators and startups in an ecosystem. Four statements are identified about the adequacy of government policies, favourability of government policies, the ease of availing startup benefits from the government and the effective coordination of startup activities by KSUM. The results of the Kruskal-Wallis H test and Mann-Whitney U test conducted to identify whether there is a substantial difference among various startup categories about the role of state government in the ecosystem are given below.

Table 8.4

Role of State Government - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.25	133.36	4.495	.343
	Validation	41	3.25	123.80		
	Early Traction	141	3.50	150.46		
	Scale-up	85	3.50	143.00		
	Maturity	10	3.75	170.30		
Nature of Business	Technology	244	3.50	149.01	9.082	.011*
	Non-Technology	31	3.00	102.66		
	Both technology & non-technology	13	3.50	159.62		
Type of Technology	IT	142	3.50	138.98	15.444	.001**
	Non-IT	76	3.50	157.45		
	Both IT & non-IT	38	3.87	174.21		
	None	32	3.00	102.98		
Nature of Output	Product oriented	148	3.50	155.60	38.178	<0.01**
	Service oriented	38	2.75	67.24		
	Both product & service oriented	102	3.50	157.17		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

The responses from various categories of startups regarding the role of state government in the startup ecosystem are moderately favourable. The Kruskal-Wallis H test indicates that based on the nature of business (P = .011), type of technology (P = .001) and nature of output (P = <0.01) of startups, there is substantial difference among various startup categories regarding the role of state government. Non-technology startups and service oriented startups have given a comparatively less favourable response about the role of state government. But both IT & non-IT startups have given a more favourable response about the role of state government compared to other startup categories. However, based on the stages of the startup life cycle (P = .343), there is no valid difference in the perspective of different startup categories about the role of state government. Therefore, startups of all the various stages have the same perspective about the role of state government in the startup ecosystem. In order to identify the pairs with substantial differences, a pair wise comparison is done for groups with a P value less than .05. The results are as follows:

Table 8.5

Pairwise Comparison - Role of State Government

Categories of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Nature of Business	Non-technology and Technology	46.349	.010
Type of Technology	None and Non-IT	-54.463	.011
	None and Both IT & non-IT	-71.226	.002
Nature of Output	Service oriented and Product oriented	88.368	<0.01
	Service oriented and Both product & service oriented	-89.935	<0.01

Source: Field Survey

Results of Mann-Whitney U tests are provided in the below table.

Table 8.6

Role of State Government – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.75	161.71	6102.000	<0.01**
	No	99	3.00	111.64		
KSUM Registration	Yes	143	3.75	170.04	6715.500	<0.01**
	No	145	3.25	119.31		
Status in Incubators	Incubatee	234	3.50	156.76	3448.500	<0.01**
	Coworking	54	3.00	91.36		

Source: Field Survey
**Significant at 1% level of significance

The median value of responses from startups of different types about the role of state government in the startup ecosystem is 3 and above, indicating a moderately favourable response. From the above table, it can be found that with regard to the DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P = <0.01) of startups, there is a notable difference among various startup categories about the role of state government. This is because those startups registered in DPIIT, KSUM and incubated startups have given a comparatively more favourable response about the role of state government in the startup ecosystem.

8.2.2 Role of State Government – Incubators

State government coordinates the functioning of incubators within a startup ecosystem. The nodal agency for startup development in Kerala, KSUM, takes all the necessary measures to make sure that incubators function effectively in the state. There are incubators funded by the state government. There are also incubators that receive infrastructural support from state government. The state government forms policies and regulations that can support incubators in providing incubation programme to startups. Statements that measure the perspective of incubators regarding the role of state government and corresponding analysis are given in the below table:

Table 8.7

Role of State Government – Incubators

Statements/Categories of Incubators		N	Mean	Standard Deviation	Minimum	Maximum
Government has introduced policies which support the functioning of incubators in the state	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	4.45	.52223	4.00	5.00
	University/Educational Institution supported	13	4.15	.80064	3.00	5.00
	Private/Corporate Business Incubator	6	2.67	.81650	2.00	4.00
	Total/Average	**38**	**4.00**	**.86992**	**2.00**	**5.00**
Government provides infrastructural support to incubators	Central Government supported	8	3.75	1.28174	2.00	5.00
	State Government supported	11	4.00	.00000	4.00	4.00
	University/Educational Institution supported	13	3.61	1.12090	2.00	5.00
	Private/Corporate Business Incubator	6	2.17	.40825	2.00	3.00
	Total/Average	**38**	**3.52**	**1.05873**	**2.00**	**5.00**
Government provides financial assistance to incubators for their development and supporting the startups	Central Government supported	8	3.12	.99103	2.00	5.00
	State Government supported	11	4.27	.46710	4.00	5.00
	University/Educational Institution supported	13	4.00	.91287	2.00	5.00
	Private/Corporate Business Incubator	6	2.83	.40825	2.00	3.00
	Total/Average	**38**	**3.71**	**.92730**	**2.00**	**5.00**
Government effectively coordinates the functioning of various incubators in the state through KSUM	Central Government supported	8	4.12	.83452	3.00	5.00
	State Government supported	11	4.45	.93420	3.00	5.00
	University/Educational Institution supported	13	4.23	.72501	3.00	5.00
	Private/Corporate Business Incubator	6	4.50	.83666	3.00	5.00
	Total/Average	**38**	**4.31**	**.80891**	**3.00**	**5.00**

Source: Field Survey

From the table above, it can be seen that central government supported incubators (mean = 4.12), state government supported incubators (mean = 4.45) and universities/educational institutions supported incubators (mean = 4.15) have favourably responded to the statement that the government has introduced policies that support the functioning of incubators in the state, but private incubators (mean = 2.67) have given less favourable response to the same. State government funded incubators (mean = 4.00) have strongly supported the statement that the government provides infrastructural support to incubators. With regard to providing financial assistance to incubators for their development and supporting startups, central government funded incubators (mean = 4.00) and state funded incubators (mean = 4.27) have supported this statement. All the various categories of incubators have agreed to the statement that the government effectively coordinates the functioning of various incubators in the state through KSUM. But state government supported incubators have given the most supportive responses about the role of state government in the startup ecosystem, as the mean values of their responses are above the average of all responses.

8.2.3 Role of Investors & Funding Organisations - Startups

“Angel investors - are high net-worth, non-institutional, private equity investors who have the desire and sufficiently high net worth to enable them to invest part of their assets in high risk, high-return entrepreneurial ventures in return for a share of voting, income and ultimately, capital gain.” (McKaskill, 2009). Funding organisations include commercial banks and other financial institutions that grant loans to business concerns. Therefore, angel investors and funding organisations are actors that provide financial assistance to startups. Startups approach them when they need funds for further expansion and development of their business. But getting funding through angel investors as well as funding organisations can be difficult. Angel investors should be interested in your idea and funding organisations may have complex procedures and conditions to be fulfilled. Four statements regarding funding through angel investors and funding organisations are formed. These statements are related to the availability of interested angel investors, the readiness of financial institutions to provide loans, sanctioning loans within the appropriate time and the ease of arranging funds through investors and financial institutions. The agreement of startups with these statements is measured on a five-point Likert scale. The Kruskal-Wallis H test and Mann-Whitney U test are employed to understand if there is a significant difference among various startup categories about the role of supporting investors & funding organisations in the ecosystem. The results of the tests are given below.

Table 8.8

Role of Investors & Funding Organisations - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	2.75	108.09	11.670	.050
	Validation	41	2.75	116.00		
	Early Traction	141	3.00	144.15		
	Scale-up	85	3.00	159.25		
	Maturity	10	3.00	180.95		
Nature of Business	Technology	244	3.00	149.89	12.192	.002**
	Non-Technology	31	2.25	95.87		
	Both technology & non-technology	13	3.00	159.31		
Type of Technology	IT	142	2.75	134.63	28.711	<0.01**
	Non-IT	76	3.00	161.50		
	Both IT & non-IT	38	3.00	189.95		
	None	32	2.25	93.95		
Nature of Output	Product oriented	148	3.00	151.39	28.523	<0.01**
	Service oriented	38	2.00	78.42		
	Both product & service oriented	102	3.00	159.12		

Source: Field Survey
**Significant at 1% level of significance

The aforementioned table shows that the responses from different categories of startups about the role of investors & funding organisations range between neutral and less favourable. With regard to the nature of business (P = .011), type of technology

(P = .001) and nature of output (P = <0.01) of startups, there is a significant difference in the responses of different startup categories about the role of investors & funding organisations. Non-technology startups and service oriented startups have given non-supportive responses about the role of investors & funding organisations. But based on the stages of the startup life cycle (P = .050), there is no valid difference in the perspective of different categories of startups about the role of investors & funding organisations. A pairwise comparison is done for groups with a P value less than .05 to identify the pairs with substantial differences in their perspectives about the role of investors & funding organisations. Results of the comparison are given in the following table.

Table 8.9

Pairwise Comparison - Role of Investors & Funding Organisations

Categories of Startups	Pairwise comparison	Test Statistics	Adj.Sig.
Nature of Business	Non-technology and Technology	54.018	.002
Type of Technology	None and Non-IT	-67.547	.001
	None and Both IT & non-IT	-95.994	<0.01
Nature of Output	Service oriented and Product oriented	72.967	<0.01
	Service oriented and Both product & service oriented	-80.701	<0.01

Source: Field Survey

Mann-Whitney U test results are given below.

Table 8.10

Role of Investors & Funding Organisations – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.00	163.17	5826.000	<0.01**
	No	99	2.50	108.85		
KSUM Registration	Yes	143	3.00	169.08	6852.500	<0.01**
	No	145	2.50	120.26		
Status in Incubators	Incubatee	234	3.00	150.99	4799.000	.006**
	Coworking	54	2.50	116.37		

Source: Field Survey
**Significant at 1% level of significance

According to the results of the Mann-Whitney U test, based on the DPIIT registration (P = <0.01), KSUM registration (P = <0.01) and status in incubators (P = <0.01) of startups, there is a significant difference among various categories of startups about the role of investors & funding organisations in the startup ecosystem. Responses from various categories of startups indicate that startups not registered in DPIIT, KSUM and coworking startups have given a less favourable response about the role of investors & funding organisations.

8.2.4 Role of Investors & Funding Organisations - Incubators

Funds are essential for every startup and one of the important functions of incubators is to assist startups in arranging funds. Incubators can associate with investors and provide opportunities for startups to pitch for funding. There are financial institutions that provide soft loans to startups after proper assessment and incubators can collaborate with such institutions. Funds are one of the most difficult resources for startups to arrange and that increases the importance of investors and other financial institutions functioning in the ecosystem. Perspective of different types of incubators regarding the role of investors & funding organisations in the startup ecosystem and analysis with regard to the same are given in the table below:

Table 8.11

Role of Investors & Funding Organisations - Incubators

Statements/Categories of Incubators		N	Mean	Standard Deviation	Minimum	Maximum
State financial institutions helps in proving loans to the incubated startups	Central Government supported	8	2.87	1.35620	1.00	5.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	3.69	.63043	3.00	5.00
	Private/Corporate Business Incubator	6	2.00	1.26491	1.00	4.00
	Total/Average	**38**	**3.31**	**1.09311**	**1.00**	**5.00**
Angel networks and venture capital firms are ready to coordinate with incubators and provide funds to startups	Central Government supported	8	3.00	1.06904	2.00	4.00
	State Government supported	11	2.81	.75076	2.00	4.00
	University/Educational Institution supported	13	2.84	.89872	2.00	5.00
	Private/Corporate Business Incubator	6	2.00	1.26491	1.00	4.00
	Total/Average	**38**	**2.73**	**.97770**	**1.00**	**5.00**
Investors/funding organisations coordinate with incubators in arranging seminars/ workshops/pitching sessions for the startups	Central Government supported	8	3.37	1.06066	2.00	5.00
	State Government supported	11	3.90	.30151	3.00	4.00
	University/Educational Institution supported	13	3.30	.94733	2.00	5.00
	Private/Corporate Business Incubator	6	3.33	.81650	3.00	5.00
	Total/Average	**38**	**3.50**	**.83017**	**2.00**	**5.00**
Investors/funding organisations provide timely fund to startups and evaluate their performance	Central Government supported	8	3.25	.70711	2.00	4.00
	State Government supported	11	3.18	.40452	3.00	4.00
	University/Educational Institution supported	13	3.23	.59914	2.00	4.00
	Private/Corporate Business Incubator	6	2.50	.54772	2.00	3.00
	Total/Average	**38**	**3.10**	**.60580**	**2.00**	**4.00**

Source: Field Survey

The table above indicates that state government funded incubators have given a favourable response to the statement (mean = 3.90) that state financial institutions help in proving loans to the incubated startups. University/educational institutions supported incubators (mean = 3.69) have also given a moderately favourable response to the same. Central government supported incubators (mean = 3.00), state government supported incubators (mean = 2.81) and universities/educational institutions supported incubators (mean = 2.84) have neutrally responded to the statement that angel networks and venture capital firms are ready to coordinate with incubators and provide funds to startups. With regard to coordinating with investors/funding organisations in arranging seminars/workshops/pitching sessions for the startups, state government supported incubators (mean = 3.90) have given a response supporting this statement, whereas other categories of incubators have given a neutral response to the same. Private incubators (mean = 2.50) have less favourably responded to the statement that investors/funding organisations provide timely funding to startups and evaluate their performance. Other categories of incubators have neutrally responded to the same.

8.2.5 Role of Universities & Educational Institutions – Startups

"Research and educational organizations have a huge impact on startups, especially in the early stages of development. Experts from different institutions such as: universities, faculties, institutes could provide a functioning and efficient platforms for startups operating" (Vekić & Borocki, 2017). The role played by universities and educational institutions in the startup ecosystem is high because they nurture and train the youth to become successful entrepreneurs in the future. Today, educational institutions make an effort to improve the skills and knowledge of students through different measures, like forming an ED cell, conducting workshops, providing incubation facilities to student startups, etc. Four statements regarding the role of universities and educational institutions in the startup ecosystem are formed. These statements are regarding the basic education about entrepreneurship provided by educational institutions, training and encouragement for developing business ideas, organising startup camps/workshops in coordination with other actors and providing research and incubation facilities to students. To determine if there are significant differences between different startup categories regarding the role of universities and educational institutions in the startup ecosystem, the Mann-Whitney and Kruskal-Wallis H tests are employed. The test results are shown below.

Table 8.12

Role of Universities & Educational Institutions - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	4.00	144.05	1.513	.824
	Validation	41	4.00	142.41		
	Early Traction	141	4.00	140.82		
	Scale-up	85	4.00	148.61		
	Maturity	10	4.25	170.50		
Nature of Business	Technology	244	4.00	147.75	4.672	.097
	Non-Technology	31	4.00	114.56		
	Both technology & non-technology	13	4.00	154.92		
Type of Technology	IT	142	4.00	146.96	5.197	.158
	Non-IT	76	4.00	150.99		
	Both IT & non-IT	38	4.00	148.39		
	None	32	4.00	113.53		
Nature of Output	Product oriented	148	4.00	148.40	3.488	.175
	Service oriented	38	4.00	121.25		
	Both product & service oriented	102	4.00	147.50		

Source: Field Survey

Different categories of startups have given very favourable responses about the role of universities and educational institutions in the startup ecosystem. Results of the Kruskal-Wallis H test show that, with regard to the stages of life cycle (P = .824), nature of business (P = .097), type of technology (P = .158) and nature of output (P = .175) of startups, there is no significant difference among various startup categories about the role of universities and educational institutions as the P values are above .05. This indicates that all the different categories of startups have a favourable perception about the role of universities and educational institutions in the startup ecosystem.

Results of Mann-Whitney U are given below.

Table 8.13

Role of Universities & Educational Institutions – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	4.00	151.86	7965.000	.036*
	No	99	3.50	130.45		
KSUM Registration	Yes	143	4.00	155.87	8741.000	.020*
	No	145	3.50	133.28		
Status in Incubators	Incubatee	234	4.00	154.78	3913.500	<0.01**
	Coworking	54	3.50	99.97		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

Startups registered in DPIIT and KSUM, as well as incubatee startups, have responded about the role of universities and educational institutions with a median value of 4, which shows the favourable attitude of these startup categories. Hence, it has been found from the results of the Mann-Whitney U test that there is a significant difference among various startup categories based on their registration in DPIIT (P = .036), registration in KSUM (P = .020) and status in incubators (P = <0.01) about the role of universities and educational institutions in the startup ecosystem.

8.2.6 Role of Universities & Educational Institutions – Incubators

Universities and educational institutions play a crucial role in entrepreneurship development. Students develop the basic knowledge of entrepreneurship from educational institutions. Today, more than just educating the young minds, educational institutions also provide research and incubation facilities to students. Educational institutions can associate with other incubators to provide facilities and resources to students that cannot be provided by them. In many ways, the role of universities and educational institutions is critical in a startup ecosystem. The perception of various categories of incubators about the role of universities and educational institutions can be understood from the below table:

Table 8.14

Role of Universities & Educational Institutions – Incubators

Statements/Categories of Incubators		N	Mean	Standard Deviation	Minimum	Maximum
Basic education regarding entrepreneurship and startups is provided to students at educational institutions	Central Government supported	8	3.75	.46291	3.00	4.00
	State Government supported	11	4.18	.40452	4.00	5.00
	University/Educational Institution supported	13	4.23	.43853	4.00	5.00
	Private/Corporate Business Incubator	6	3.17	.75277	2.00	4.00
	Total/Average	**38**	**3.94**	**.61281**	**2.00**	**5.00**
Students are trained and encouraged to develop their own business ideas	Central Government supported	8	3.87	.35355	3.00	4.00
	State Government supported	11	4.36	.50452	4.00	5.00
	University/Educational Institution supported	13	4.76	.43853	4.00	5.00
	Private/Corporate Business Incubator	6	4.00	1.26491	2.00	5.00
	Total/Average	**38**	**4.34**	**.70811**	**2.00**	**5.00**
Organising startup camps/workshops in coordination with other actors of the ecosystem	Central Government supported	8	4.12	.35355	4.00	5.00
	State Government supported	11	4.18	.40452	4.00	5.00
	University/Educational Institution supported	13	4.76	.43853	4.00	5.00
	Private/Corporate Business Incubator	6	4.50	1.22474	2.00	5.00
	Total/Average	**38**	**4.42**	**.64228**	**2.00**	**5.00**
Provides incubation and research facilities students for supporting their startup ideas with the help of government or institution by itself	Central Government supported	8	4.12	.64087	3.00	5.00
	State Government supported	11	4.36	.50452	4.00	5.00
	University/Educational Institution supported	13	4.76	.43853	4.00	5.00
	Private/Corporate Business Incubator	6	4.33	1.21106	2.00	5.00
	Total/Average	**38**	**4.44**	**.68566**	**2.00**	**5.00**

Source: Field Survey

State government (mean = 4.18) and universities/educational institutions (mean = 4.23) supported incubators have favourably responded to the statement that basic education regarding entrepreneurship and startups is provided to students at educational institutions. Central government (mean = 3.75) supported incubators have given a favourable response and private incubators (mean = 3.17) have given a neutral response to the same. University/educational institution (mean = 4.76) funded incubators have strongly supported the statement that students are trained and encouraged to develop their own business ideas in educational institutions. Other categories of incubators have also supportively responded to the statement. With regard to universities/educational institutions organising startup camps/workshops in coordination with other actors of the ecosystem as well as providing incubation and research facilities for students for supporting their startup ideas, all the various categories of incubators have favourably responded to these statements.

8.2.7 Role of Mentors - Startups

The role of mentors in startup growth is such that the absence of proper mentoring support can lead to the failure of startup businesses. Mentors are industry experts who function closely with the startup ecosystem and have experience in the startup business. They can provide many valuable advices to the startups and help the startups to move forward on the right path. The role of mentors becomes more important when the founders of startups do not have adequate business knowledge. The researcher has identified four statements regarding the role of mentors in the ecosystem and the agreement of startups to these statements was measured by using a five-point Likert scale. The statements about the role of mentors, regarding easy and affordable mentorship, readiness of mentors to share their knowledge, time and resources, mentors help in solving technical, financial, marketing and other problems and mentors help in revenue generation and performance evaluation. To know if there is a significant difference in the perspective of various categories of startups regarding the role of mentors in the startup ecosystem, the Kruskal-Wallis H test and Mann-Whitney U test are performed. The test results are provided below.

Table 8.15

Role of Mentors - Kruskal-Wallis H Test

Categories of Startups		N	Median	Mean Rank	χ^2	Sig.
Stages of Startup Life Cycle	Ideation	11	3.25	118.86	4.364	.359
	Validation	41	3.50	133.98		
	Early Traction	141	3.50	141.89		
	Scale-up	85	3.75	153.41		
	Maturity	10	4.12	176.90		
Nature of Business	Technology	244	3.75	148.67	5.429	.066
	Non-Technology	31	3.00	111.85		
	Both technology & non-technology	13	3.50	144.12		
Type of Technology	IT	142	3.75	144.70	6.583	.086
	Non-IT	76	3.75	150.03		
	Both IT & non-IT	38	3.75	160.04		
	None	32	3.00	112.05		
Nature of Output	Product oriented	148	3.75	151.02	18.628	<0.01**
	Service oriented	38	2.87	90.66		
	Both product & service oriented	102	3.75	155.10		

Source: Field Survey
**Significant at 1% level of significance

Based on the stages of the life cycle (P = .359), nature of business (P = .066) and type of technology (P = .086) of startups, there is no significant difference among various startup categories about the role of mentors. Startups within these categories have similar perceptions about the role of mentors in the startup ecosystem and their perceptions are moderately supportive. With respect to the nature of the output (P = <0.01) of startups, there is a significant difference among different startup categories about the role of mentors. Service oriented startups have a less favourable perception about mentors compared to product oriented and both product & service oriented startups. A pair wise comparison is done for different types of startups based on their nature of output to identify the pairs with significant differences. The results of the comparison are provided below.

Table 8.16

Pairwise Comparison – Role of Mentors

Category of Startups	Pairwise Comparison	Test Statistics	Adj.Sig.
Nature of Output	Service oriented and Product oriented	60.359	<0.01
	Service oriented and Both product & service oriented	-64.445	<0.01

Source: Field Survey

The results after conducting the Mann-Whitney U test are given in the table below.

Table 8.17

Role of Mentors – Mann-Whitney U Test

Categories of Startups		N	Median	Mean Rank	Mann Whitney χ^2	Sig.
DPIIT Registration	Yes	189	3.75	150.27	8265.000	.103
	No	99	3.50	133.48		
KSUM Registration	Yes	143	3.75	154.78	8898.000	.037*
	No	145	2.75	134.37		
Status in Incubators	Incubatee	234	3.75	152.39	4471.500	.001**
	Coworking	54	3.00	110.31		

Source: Field Survey
*Significant at 5% level of significance, **Significant at 1% level of significance

Mann-Whitney U test results show that based on the registration of startups in DPIIT (P = .103), there is no notable difference among different types of startups about the role of mentors. Therefore, startups registered as well as those not in DPIIT have similar perceptions about the role of mentors in the startup ecosystem. However, in respect of the registration of startups in KSUM (P = .037) and their status in incubators (P = .001) there is a significant difference among startup categories about the role of mentors in the startup ecosystem. This is because startups registered in KSUM and incubated startups have a more favourable attitude towards the functioning of mentors in the startup ecosystem.

8.2.8 Role of Mentors - Incubators

Mentors are the industrial experts who can help to a great extent in coaching as well as training startup founders to be great entrepreneurs. It is difficult for startups to directly arrange for mentoring support. Incubators can associate with industry experts and form a panel of mentors that can assist startups in solving the problems in their business. Mentors are a huge source of business knowledge and their business experience and expertise should be well utilised for the benefit of startups by incubators. The perspective of incubators about the role of mentors in the startup ecosystem can be better understood from the table below:

Table 8.18

Role of Mentors – Incubators

Statements/Categories of Incubators		N	Mean	Standard Deviation	Minimum	Maximum
Mentors are available for coordinating with incubators and helping startups to manage their business	Central Government supported	8	4.00	.00000	4.00	4.00
	State Government supported	11	4.09	.30151	4.00	5.00
	University/Educational Institution supported	13	4.23	.59914	3.00	5.00
	Private/Corporate Business Incubator	6	3.17	.75277	2.00	4.00
	Total/Average	**38**	**3.97**	**.59215**	**2.00**	**5.00**
Mentors are ready to share their knowledge, time and resources with incubated startups	Central Government supported	8	4.25	.70711	3.00	5.00
	State Government supported	11	4.09	.30151	4.00	5.00
	University/Educational Institution supported	13	4.53	.66023	3.00	5.00
	Private/Corporate Business Incubator	6	3.83	.98319	2.00	5.00
	Total/Average	**38**	**4.23**	**.67521**	**2.00**	**5.00**

Statements/Categories of Incubators		N	Mean	Standard Deviation	Minimum	Maximum
Mentors support incubators in arranging seminars/workshops/pitching sessions for startups	Central Government supported	8	4.00	.75593	3.00	5.00
	State Government supported	11	4.36	.67420	3.00	5.00
	University/Educational Institution supported	13	4.07	.86232	3.00	5.00
	Private/Corporate Business Incubator	6	4.33	1.21106	2.00	5.00
	Total/Average	**38**	**4.18**	**.83359**	**2.00**	**5.00**
Mentors help the incubators in evaluating and improving the performance of startups	Central Government supported	8	3.50	.92582	2.00	5.00
	State Government supported	11	3.09	.30151	3.00	4.00
	University/Educational Institution supported	13	3.61	.96077	2.00	5.00
	Private/Corporate Business Incubator	6	3.17	.98319	2.00	5.00
	Total/Average	**38**	**3.36**	**.81940**	**2.00**	**5.00**

Source: Field Survey

The table above indicates that private incubators (mean = 3.17) have neutrally responded about the availability of mentors for coordinating with incubators and helping startups manage their businesses. All the other categories of incubators have given a favourable response about the availability of mentors. As regards to the readiness of mentors to share their knowledge, time and resources with incubated startups, all the various categories of incubators have given a supportive response. About receiving support from mentors for arranging seminars/workshops/pitching sessions for startups also, all the various categories of incubators have given a favourable response. Incubators supported by universities/educational institutions have given a moderately favourable response about support from mentors in evaluating and improving the performance of startups.

The summary of the results of hypothesis testing for the role of supporting actors is presented in the below table.

Table 8.19

Hypothesis Testing – Role of Supporting Actors

Hypothesis	Supporting Actors	Groups for which H_0 is rejected
There is no significant difference in the perspective of various startup categories about the role of different supporting actors in the startup ecosystem.	State Government	Nature of business, type of technology, nature of output, registration in DPIIT, registration in KSUM and status in incubator
	Investors & Funding Organisations	Nature of business, type of technology, nature of output, registration in DPIIT, registration in KSUM and status in incubator
	Universities & Educational Institutions	Registration in DPIIT, registration in KSUM and status in incubator
	Mentors	Nature of output, registration in KSUM and status in incubator

Source: Field Survey

8.3 Chapter Summary

This chapter discussed the perspective of startups and incubators regarding the role of supporting actors in the startup ecosystem of Kerala. Non-technology startups (also startups not using any type of technology), service oriented startups, startups not registered in DPIIT, startups not registered in KSUM and coworking startups have significant differences in their perspectives regarding the role of supporting actors in the startup ecosystem from others in their respective groups. This may be because the services of supporting actors in the startup ecosystem are not effectively available to these categories of startups. Various categories of incubators, except private business incubators, have a positive attitude regarding the role of the state government in the startup ecosystem. About investors & funding organisations, incubators have a neutral perspective and about the role of universities and educational institutions as well as mentors, the responses of all the different categories of incubators were supportive. To a certain extent, incubators are receiving support from various supporting actors in the ecosystem.

Chapter 9

Summary, Findings and Conclusions

9.1 Introduction

A startup ecosystem is an entrepreneurial ecosystem where different types of startups grow and prosper with the help of various supporting actors. Survival and growth of startups in an ecosystem is dependent on how well the startups are supported by the different actors functioning in the startup ecosystem. In a startup ecosystem, startups themselves are the most important actors. Among the various actors that support the existence of startups, incubators function closest to them. Startups and incubators in the startup ecosystem are of different categories. While studying about how the different categories of startups are functioning within the startup ecosystem, it is important to analyse their business relationships within the ecosystem.

Among the different business relationships of startups in the ecosystem, most important ones are the relationship with other startups and incubators. Similarly, among the various business relationships of incubators in the startup ecosystem, the important ones are with other incubators and startups associated with them. Actor-Resource-Activity (ARA) model developed by Industrial Marketing and Purchase Group (IMP Group) and later modified by Hakan Hakansson and Ivan Snehota (1995) in their book 'Developing Relationships in Business Networks' is one of the models used for analysing relationships in a business network. According to the ARA model, individual actors are analysed on the basis of their activity structure, organisation structure and resource collection. The relationships between two actors (dyadic relationships) are analysed based on the activity links, actor bonds and resource ties between two actors.

In this study, the ARA model is used to analyse the business relationships of startups and incubators. Both startups and incubators are analysed as individual actors; also, their dyadic relationships are examined in detail. Apart from startups and incubators, there are many other actors, like state government, investors, mentors, educational institutions, research institutions etc., that support startups in an ecosystem. It is also important to understand the perspective of startups and incubators about the role of the important supporting actors functioning in the ecosystem. These analyses will give us an overview of business relationships of different types of startups in the ecosystem, thereby providing us information about the categories of startups that require more attention and support from the startup ecosystem.

The analysis part showed the business relationships of startups and incubators, including their perspective on the role of other supporting actors in the startup ecosystem. The findings of the study are arrived at after completing the analysis. A summary of the research work conducted, findings and conclusions of the study are included in this chapter.

9.2 Methodology at a Glance

The business relationships of startups and incubators in the Kerala startup ecosystem are analysed in the research work. Actor-Resource-Activity model is used as the basis for analysing the business relationships. The perspectives of startups and incubators about the role of supporting actors in the ecosystem are also evaluated. The research work follows an exploratory and descriptive research design. The study of incubators is a population study and data are collected from 38 active incubators functioning in Kerala. Startups associated with these 38 incubators, either as incubatees or as coworking startups, are included in the study. The survey method through sampling is used for collecting data from startups. The sampling technique used is stratified random sampling and the sample size is determined to be 288 startups. Pre-tested interview schedules are used for collecting data from startups and incubators. The Chi-square test, Fisher's Exact test, Kruskal-Wallis H test, Mann-Whitney U test, Spearman's Rank Correlation and multiple regression analysis using PLS-SEM models are the various statistical tests used for analysing the data. The softwares used for data analysis are IBM-SPSS 21.0, Smart PLS 4 and MS Excel (2010).

9.3 Summary of the Chapters

A summary of the chapters included in the thesis is given below.

Chapter 1: Introduction

An introduction to the research work is given in this chapter. It includes description regarding the various aspects of the study, such as significance of the study, scope of the study, research problem, research questions and objectives of the study. Along with that, details about hypotheses formulated, methodology, definitions of operational terms used and descriptions of the chapters included in the thesis are also included in this chapter.

Chapter 2: Review of Literature

A review of the literatures relevant to the study taken from different sources, such as journals, periodicals, books, reports, conference proceedings, research theses, etc., is included in this chapter. The research gap of the study identified through the literature review is also explained in it.

Chapter 3: Theoretical Framework

Different theories and concepts associated with the topic of research work are narrated in this chapter. Detailed explanations of various concepts such as startups, entrepreneurial ecosystems, the startup ecosystem and its elements, Actor-Resource-Activity model and different variables discussed in the study are given in the chapter.

Chapter 4: Research Methodology

The methodology followed while carrying out the research work is presented in this chapter. Details regarding research design, sample design, sources of data, variables of the study, conceptual framework, method of data collection, instrument used for data collection, designing of interview schedules, pilot study, validity and reliability of data, normality of data, softwares and tools used for data analysis are given in the chapter.

Chapter 5: Components of Individual Actors - Startups

This chapter shows an analysis of startups as an individual actor. Throughout the chapter, activity structure, organisation structure and resource collection of different startup categories are analysed to find out whether there is a significant difference among various categories of startups as an individual actor.

Chapter 6: Components of Business Relationships - Startups

This chapter analyses the dyadic business relationship of startups with other startups and incubators. Analysis of activity links, actor bonds and resource ties of various categories of startups with other startups and incubators is presented in the chapter. Detailed analysis of the interrelationship between activity links, actor bonds and resource ties of startups is also included in the chapter.

Chapter 7: Components of Individual Actors and Business Relationships – Incubators

This chapter exhibited the analysis of incubators as individual actors through a detailed examination of their activity structure, organisation structure and resource collection. This chapter also explores the dyadic relationship of various categories of incubators with other incubators and startups by analysing their activity links, actor bonds and resource ties.

Chapter 8: Role of Supporting Actors

This chapter analyses the perspective of startups and incubators about the role of supporting actors like the state government, investors, universities/educational institutions and mentors in the startup ecosystem.

Chapter 9: Summary, Findings and Conclusions

A brief summary about the research work carried out, along with the important findings of the statistical tests conducted, implications of the study, contributions of the study and conclusions derived from the study, are presented in this chapter.

Chapter 10: Recommendations

Recommendations derived from the findings, limitations of the research work and scope for future research are discussed in this chapter.

9.4 Findings of the Study

The findings of the study after analysis are classified and presented in various headings as below.

9.4.1 Different Categories of Startups and Cross-Tabulations

- ✓ In terms of registration in DPIIT, 65.6% of startups are registered in it. This means that most of the startups are aware of the benefits available to them through Startup India. Out of the startups registered in DPIIT, 50.8% are startups at the early traction stage and 33.3% are in the growth stage. Ninety percentage of startups registered in DPIIT are technology startups and based on the type of technology, 52.9% of DPIIT registered startups are IT based. This means that the startups included in the study are mostly IT startups. Among startups registered in DPIIT, 54% are product oriented startups and 41.8% are both product & service oriented startups. Out of 38 service oriented startups, only 8 have registered with DPIIT. Service oriented startups need to be made aware and also encouraged to register with DPIIT. Incubated startups account for 89.4% of DPIIT registrations, with only 10.6 % coming from coworking startups.

- ✓ With respect to registration in KSUM, 49.7% of startups are registered in it. Only technology based, product oriented startups are registered in KSUM. All the startups that are registered in KSUM also have registration in DPIIT. Among the startups registered in KSUM, 51.7% and 34.3% of startups are at early traction and growth stages respectively. Most of startups registered in KSUM (95.8%) are technology based and the rest are both technology & non-technology startups. Non-technology startups are not registered in KSUM. KSUM allows registration only for technology startups. Based on different types of technology, 54.5% of startups registered at KSUM are IT startups. Only product oriented startups and both product & service oriented startups are registered in KSUM. Ninety five percentage of KSUM registered startups are incubatees; only 5.6% are coworking startups. Out of 54 coworking startups, only 8 have registered with KSUM.

Coworking startups may not be aware of the benefits available to startups through registration at KSUM.

- ✓ The study consists of 84.4% of technology startups. This indicates that the startup ecosystem in Kerala is highly supportive of technology startups. This also means that more support needs to be extended to non-technology startups. Among technology startups, 49% and 30.5% are at the early traction and scale-up stages respectively, which indicates that technology startups have more chances to succeed and grow in the startup ecosystem. Ideas related to technology mostly succeed and move on to the next stage.

- ✓ Based on the stages of startup life cycle, 53.8% and 38.5% of both technology & non-technology startups are at an early traction and scale-up stage, showing a good possibility of success for both technology & non-technology startups. In the case of non-technology startups, 46.9% are in the early traction stage and only 18.8% are in the scale-up stage. Non-technology startups are not scaling up like technology or both technology & non-technology startups.

- ✓ Majority of the technology startups are IT based (56.6%) and only 29.9% are non-IT based. So, in Kerala, among the incubated technology startups, most of them are IT based. Fifty two percentage of technology startups and 59% of non-technology startups are product oriented. Only 9.8% of technology and 38.7% of non-technology startups are service oriented. It may be because service oriented startups are not getting the same level of support as product oriented startups from the ecosystem. Among technology startups, only 15.6% are coworking, but among non-technology startups, 40.6% are coworking startups. It seems like non-technology startups don't have many incubation opportunities in the Kerala startup ecosystem. The study found that 49.3% of startups are focused on information technology. Non-IT startups are only 26.4%, which is half the number of IT startups.

- ✓ Among the startups included in the study, 51.4% are product oriented and only 13.2% are service oriented. Service oriented startups need to be given more attention so that we can have as many service oriented startups as product oriented startups. Sixty one percentage of service oriented startups and sixty five percentage of both product & service oriented startups are IT technology based, whereas 35.8% of product oriented startups are non-IT technology based, which is the majority of product oriented startups. Only 10.1% of product oriented startups are coworking, whereas 55.3% of service oriented startups are coworking. It can be because enough incubation support is not there for service oriented startups in the ecosystem.

- ✓ While considering the sector of business, 18% of technology startups belong to the health/life science sector and 18% to the software sector. These two sectors together contribute to 36% of startups in technology, followed by the electronics/robotics sector with 13.9%. This indicates the growth of health/ life science sector in Kerala. Thirty three percentage of non-technology startups belong to the retail sector. Thirty nine percentage of both technology & non-technology startups belongs to other business sectors and 15.4% to the food sector. The software sector contributes 30.3% to IT startups. Thirty eight percentage of non-IT startups belong to the health and life science sector and 23.7% belong to electronics/robotics. Together, they contribute to 61.9% of non-IT technology startups. Among product oriented startups, 17.6% and 16.2% of are from the health/life science and the electronic/robotics sectors respectively. Together, they contribute to 33.8% of product oriented startups. Software contributes to 39.5% of service oriented startups and the health/life science sector contributes to 17.6% of both product & service oriented startups.

- ✓ Cross-tabulation of various categories of startups has shown that there is significant association between startups based on their stages of startup life cycle, registration of startups in DPIIT, registration of startups in KSUM, stages of startup life cycle, nature of business, type of technology, nature of output and status of startups in incubators, except between stages of startup life cycle and their nature of business.

9.4.2 Activity Structure, Organisation Structure and Resource Collection of Startups

- ✓ Market research & business formation activities consist of five activities, such as conducting a market survey, conducting a feasibility study, developing a business idea, arranging seed capital to start a business and formally registering a startup. Most categories of startups perform market research & business formation activities. Startups at the ideation stage have a neutral attitude about the performance of market research & business formation activities. It may be because most of them are yet to perform some of these activities. Non-technology startups and service oriented startups have a significant difference in their responses compared to other categories of startups in their groups regarding the performance of market research & business formation activities, but still have a positive attitude towards it.

- ✓ Revenue generation & performance evaluation activities consist of activities such as customer generation and care, sales and revenue generation, marketing of products and evaluating the performance of startups. All the startup categories except startups at the ideation stage and validation stage perform revenue generation & performance evaluation activities; therefore, startups in their early stages do not perform these activities.

- ✓ Planning & team building activities include activities such as preparing a business plan, hiring and training employees, devoting full time to business development and organising a startup team. Most startup categories perform planning & team building activities. Startups at the ideation stage have a favourable attitude towards the performance of planning & team building activities, but it is significantly different from startups at later stages of their life cycle. This can be because, at the ideation stage, many startups don't have a full-fledged business plan or a proper team with hired talents. Startups not registered in DPIIT and KSUM also have significant differences in their responses about the performance of planning & team building activities compared to startups registered in DPIIT and KSUM.

- ✓ Research and modeling of prototype/sample, arranging mentoring support, arranging technical assistance needed for business and attending workshops and seminars are the activities included in product modeling & networking activities. In every group of startups analysed, there are significant differences between various categories of startups about the performance of product modeling & networking activities. But the responses are mostly positive in nature. This indicates that product modeling & networking activities are performed by most categories of startups.

- ✓ Approaching financial institutions for credit, meeting investors and pitching for funds and applying for intellectual properties like patents, trademarks etc. are the activities included in funding & IP registration activities. Most categories of startups have a neutral attitude about the performance of funding & IP registration activities. There is a significant difference in every group analysed between the various startup categories regarding the performance of funding & IP registration activities. But startups at the scale-up stage, non-IT startups and both IT & non-IT startups perform funding & IP registration activities. Startups at the ideation stage, validation stage, non-technology startups and service oriented startups do not perform funding & IP registration activities. This is because of the difficulties faced by these categories of startups in funding or because they don't need IP registration.

- ✓ Physical resource & expertise seeking activities include arranging office infrastructure facilities, purchasing raw materials and arranging machinery or equipment and arranging the assistance of professionals like accountants, lawyers, etc. Attitude towards the performance of physical resource & expertise seeking activities by most categories of startups is neutral. But non-IT startups, both IT & non-IT startups and product oriented startups perform physical resource & expertise seeking activities.

- ✓ The organisation structure of startups was analysed based on the seven statements relating to the formality, hierarchy, communication, flexibility, adaptability and ability (to achieve goals and maintain business relationships) of the organisation structure. Startups in various categories, except those at the ideation stage, have a proper organisation structure that is formal, flexible and adaptable.

- ✓ Bootstrapping is a major source of funding for all the different types of startups. Apart from startups in the ideation and validation stages, for every other category of startup, earnings of startups are a major source of funding. With regard to grants through incubators as a source of finance, apart from both technology & non technology and startups registered in KSUM, every other category has given an unfavourable response. It means that, compared to startups not registered in KSUM, startups registered in KSUM are getting grants through incubators. Similarly, both technology & non-technology startups are getting more grants from incubators than purely technology and non-technology startups.

- ✓ Bootstrapping is the only source of funding to which all the categories of startups have favourably responded, showing that bootstrapping is the major source of funding for all the categories of startups. Apart from bootstrapping, the earnings of startups are their major source of funding. Grants through incubators, grants from state financial institutions, loans from commercial banks and other financial institutions, angel investors and other sources do not serve as major sources of funding for most startup categories.

- ✓ Most of the physical infrastructure needed by startups is provided by incubators. Office space, office equipment, furniture and fittings, conference rooms, internet/Wi-Fi facilities, lab facilities with equipment, electricity for the office and security arrangements for the office are mostly provided by incubator to startups. Sixty eight percentage of startups use their own computer systems in incubation centres. Sixty one percentage of startups arrange refreshment facilities by themselves and 43.8% of startups arrange their own library facilities. It shows means that computer systems, libraries and refreshment facilities are mostly arranged by the startups themselves. Thirty five percentage of startups that need plant & machinery arrange it themselves and 37.5% of startups that need raw materials/ stock also arrange it themselves. No assistance is obtained by startups from incubators in arranging these resources.

- ✓ From the analysis of the number of members in the startup team, it could be found that an average of 12 to 15 members is present in most categories of startups. Depending on the stages of the startup life cycle, we can see there are differences in the number of members in the team. When the average number of members for a startup in the ideation stage is 6, the average number of members in the team of a startup at the maturity stage is 24. Both IT and non-IT startups have an average of 20 members in their teams. Regarding the availability of skilled and qualified personnel in Kerala, most startup categories have given a neutral response. Startups at the ideation stage have responded unfavourably to this statement, which indicates the difficulty for startups at the early stage to get talented personnel compared to later stage startups.
- ✓ Both technology & non-technology startups and startups at maturity stage have positively responded to the statement regarding the availability of skilled and qualified personnel in Kerala, indicating skilled personnel are available to them in Kerala. Human resources seem like a problem, depending on the stage of startups. Startups at the ideation and validation stages have the fewest team members compared to startups at other stages and their responses to statements regarding human resources are mostly negative or neutral compared to startups at later stages of their life cycle. This is an indication of the human resource problems faced by startups in the early stages of their life cycle.
- ✓ As regards to the acquisition of business knowledge through coaching from incubators, most categories of startups have a neutral attitude, indicating that even though there is coaching from incubators, it may not be sufficient and needs to be focused more. Both technology & non technology startups have responded positively to acquiring business knowledge through coaching from the incubator. Which means this category of startups is getting sufficient coaching through the incubator. But service oriented startups and coworking startups are not receiving coaching from incubators.
- ✓ Regarding the acquisition of business knowledge through training from incubators, there are both neutral and positive responses from various categories

of startups. Startups at the ideation stage, startups at the scale-up stage, both technology & non-technology, both IT & non-IT, product oriented, both product & service oriented, startups registered in DPIIT and incubated startups acquire business knowledge through training from incubators. Both startups registered and not registered in KSUM have a neutral attitude regarding acquiring business knowledge through training from incubators. Service oriented startups and coworking startups do not acquire business knowledge through training from incubators. This can mean that both service oriented startups and coworking startups are not getting training through incubators.

- ✓ As regards to the acquisition of business knowledge through experience, most startup categories have agreed that they have acquired business knowledge through their experiences, other than startups at the ideation stage and validation stage. Startups at the ideation stage and validation stage lack business experience compared to startups at later stages of their life cycle.

- ✓ In terms of technological resources, 54.2% of startups have already developed their own software/ application, 24% of startups have their own patented technology/design but only 4.2% of startups have acquired license agreements to use a technology. Eighty percentage of startups have a logo and 85.8% have a brand name. It shows that the majority of startups in the study have their own logo and brand name.

9.4.3 Activity Links, Actor Bonds and Resource Ties of Startups with Other Startups and Incubators

- ✓ Activity link for marketing & expertise assistance includes activities such as customer generation and care, sales and revenue generation, marketing of products, arranging the assistance of professionals like accountants, lawyers etc. and arranging the technical assistance needed for business. There is a low level of coordination among startups for marketing & expertise assistance. Therefore, startups do not have a strong activity link with other startups in the performance of marketing & expertise assistance activities.

- ✓ The activity link for idea feasibility & registration includes four activities, such as developing a business idea, conducting a market survey, conducting a feasibility study and formally registering a startup. All startup categories have a low level of coordination with other startups while performing activities included in idea feasibility & registration.
- ✓ The activity link for product modeling & team building includes three activities such as hiring and training employees, conducting research and modeling of prototype/sample and organising a startup team. Startups at the scale-up stage, both IT & non-IT startups and both product & service oriented startups are the categories that have a neutral attitude about coordinating the performance of product modeling & team building activities with other startups. It has been found that none of the startup categories analysed have a high level of coordination with other startups for performing activities included in product modeling & team building.
- ✓ The activity link for business development & evaluation includes three activities, such as evaluating the performance of startups, arranging office infrastructure facilities and devoting full time to business development. All startup categories have weak activity link for business development & evaluation with other startups, indicating that the coordination of startups in various categories with other startups for performing activities included in business development & evaluation is low.
- ✓ The activity link for mentoring & resource collection includes three activities such as purchasing raw materials & arranging machinery/equipments, applying for intellectual properties like patents, trademarks, etc and arranging mentoring support. Non-IT and both IT & non-IT startups have a neutral attitude towards activity link for mentoring & resource collection activities with other startups. Every other startup category has a low level of coordination with other startups in the performance of activities included in mentoring & resource collection. It can be found that startups in various categories have a low level of coordination with other startups in the performance of activities because the responses of startups towards different activity links are mostly negative and neutral.

- ✓ While analysing the actor bonds of startups with other startups, it was found that most startup categories have strong social bond with other startups. Non-technology startups, IT startups, service oriented startups, startups not registered in DPIIT and startups not registered in KSUM have given a positively inclined response regarding the strength of their social bond with other startups. Startups at the ideation stage have a weak social bond with other startups and startups at the validation stage have a moderately strong social bond with other startups. Every other startup category has a strong social bond with other startups.

- ✓ Startups mostly have a moderately strong structural bond with other startups. But startups at the ideation stage, validation stage, non-technology startups and coworking startups have a weak structural bond with other startups. Various categories of startups have a weak economic bond with other startups. It can be inferred that startups have a strong social bond, a moderately strong structural bond and a weak economic bond with other startups. Both technology & non-technology startups, IT startups and startups at the scale-up stage have moderately strong resource ties with other startups. Other startup categories have weak resource ties with other startups.

- ✓ Activity link for business development & team building include activities such as devoting full time to business development, preparing a business plan, formally registering a startup, organising a startup team, arranging seed capital to start a business and hiring and training employees. Regarding activity link for business development & team building with incubators, various categories of startups have a low level of coordination with incubators in performing activities included in business development & team building.

- ✓ The activity link for marketing & performance evaluation includes four activities such as marketing of products, customer generation and care, sales and revenue generation and evaluating the performance of startups. Different categories of startups have a low level of coordination with incubators in the performance of activities included in marketing & performance evaluation.

- ✓ Activity link for idea generation & feasibility study has three activities such as developing a business idea, conducting a market survey and conducting feasibility study. Maturity startups, product & service oriented, both IT & non- IT, startups registered in DPIIT, startups registered in KSUM and incubated startups have a moderate level of coordination with incubators while performing activities included in idea generation & feasibility study, whereas others have a low level of coordination.

- ✓ The activity link for funding & professional assistance with incubators includes three activities, such as meeting investors and pitching for funds, approaching financial institutions for credit and arranging the assistance of professionals like accountants, lawyers etc. Service oriented startups have a moderate level of coordination with incubators for performing activities included in funding & professional assistance. Startups not registered in DPIIT and not registered in KSUM also have a moderate level of coordination with incubators in case of activity link for funding & professional assistance. Coworking startups have a low level of coordination with incubators in performing activities included in funding & professional assistance whereas incubated startups have a high level of coordination with incubators regarding the same. Every other category of startups has a high level of coordination with incubators in performing funding & professional assistance activities.

- ✓ The activity link for product modeling & resource collection includes four activities such as arranging technical assistance needed for business, conducting research and modeling of prototype or sample, purchasing stock or raw materials & arranging machinery or equipment and applying for intellectual properties like patents, trademarks, etc. Both technology & non-technology startups have a moderate level of coordination with incubators in performing activities included in product modeling & resource collection. Other startup categories have a low level of coordination with incubators regarding the same.

- ✓ Service oriented startups, non-technology startups and coworking startups have weak social bond with incubators. Both technology & non technology have a strong social bond with incubators. Other categories of startups have a moderately strong social bond with incubators. Service oriented startups and coworking startups have a weak structural bond with incubators, whereas other categories of startups have a moderately strong structural bond with incubators. Startups have a weak economic bond with incubators. Most startup categories have a moderately strong social and structural bond but a weak economic bond with incubators. Both technology & non technology startups have moderately strong resource ties with incubators. Startups registered in DPIIT and KSUM have moderately weak resource ties with incubators. The resource ties of other categories of startups with incubators are weak.

9.4.4 Interrelationship Analysis of Activity Links, Actor bonds and Resource Ties

- ✓ Correlation analysis between activity links, actor bonds and resource ties has shown that there is a positive and significant correlation between above components of startups with other startups. There is a strong positive correlation between actor bonds and resource ties with other startups. Structural bond, social bond and economic bond have strong positive correlations with resource ties.

- ✓ Activity link for marketing & expertise assistance and structural bond have a strong positive correlation with each other. The correlation of the economic bond with the activity link for marketing & expertise assistance is weak but positive. The correlation of social bond and resource ties with the activity link for marketing & expertise assistance is moderately strong and positive. Activity link for idea feasibility & registration have a weak positive correlation with structural bond, social bond, economic bond and resource ties.

- ✓ There is a strong positive correlation between activity link for product modelling & team buildingand resource ties. The correlation between the activity link for product modelling & team buildingand the structural bond with other startups is moderately strong and positive. Activity link for product modelling & team buildinghave a moderately weak positive correlation with social bond and economic bond with other startups.

- ✓ Structural bond, social bond, economic bond and resource ties with other startups have a weak but positive correlation with activity link for business development & evaluation. Activity link for mentoring & resource collection have a moderately positive correlation with structural bond, economic bond and resource ties with other startups. But the correlation between activity link for mentoring & resource collection and social bond with other startups is moderately weak but positive.

- ✓ Multiple regression analysis of activity links, actor bonds and resource ties with other startups were done to find the dependency between the variables. From regression model-1, it can be found that activity link for marketing & expertise assistance, mentoring & resource collection and product modelling & team building are dependent on structural bond with other startups. Activity link for product modelling & team building is dependent on resource ties with other startups. Activity link for business development & evaluation and idea feasibility & registration are dependent on economic bond with other startups. Activity links are not dependent on social bond.

- ✓ From Regression model-2, it can be found that the structural bond with other startups is influenced by activity links for business development & evaluation, mentoring & resource collection, marketing & expertise assistance and resource ties. The economic bond with other startups is influenced by activity link for business development & evaluation, mentoring & resource collection and resource ties. Social bond is influenced by activity link for marketing & expertise assistance and resource ties. Activity link for product modelling & team building and idea feasibility & registration have no impact on actor bonds. Resource ties with other startups have a complete influence on actor bonds with other startups since all three structural bond, social bond and economic bond are impacted by resource ties.

- ✓ From regression model-3 it can be found that resource ties with other startups is significantly impacted by structural bond, economic bond, social bond and activity link for product modeling & team building. The resource ties with other startups are completely dependent on actor bonds with other startups since all three structural bond, social bond and economic bond have an influence on resource ties.

- ✓ The correlation between activity links, actor bonds and resource ties of startups with incubators shows that there is a positive correlation between all three. Resource ties with incubators and actor bonds with incubators have a strong positive correlation with each other. Activity link with incubators for business development & team building have a weak but positive correlation with structural bond, social bond, economic bond and resource ties with incubators. Activity link for marketing & performance evaluation have a moderately strong positive correlation with structural bond, social bond and resource ties but a moderately weak correlation with economic bond with incubators.

- ✓ Activity link for idea generation & feasibility study have a moderately strong and positive correlation with structural bond, social bond, economic bond and resource ties with incubators. There is a moderately strong positive correlation between activity link for funding & professional assistance and structural bond, economic bond, social bond and resource ties with incubators. The correlation of activity link for product modelling & resource collection with structural bond, economic bond, social bond and resource ties is positive and found to be moderately weak.

- ✓ Regression model-4 shows that activity links with incubators are significantly impacted by structural bond with incubators. Only activity link for business development & team building and funding & professional assistance are impacted by the economic bond with incubators. The social bond with incubators has an impact only on activity link for business development & team building. Resource ties have an impact on all types of activity links, except activity link for idea generation & feasibility study. This model indicates that the activity link for business development & team building is the only activity link with incubators, which is impacted by structural bond, economic bond, social bond and resource ties with incubators all together.

- ✓ Based on regression model-5 it is understood that activity link with incubators for business development & team building has a significant impact on structural bond, economic bond and social bond with incubators. Activity link for marketing & performance evaluation have an impact on structural bond and social bond but activity link for product modeling & resource collection have an impact only on structural bond. Activity link for idea generation & feasibility with incubators have no effect on actor bond with incubators. Resource ties with incubators have an impact on structural, economic and social bond with incubators. This model shows that actor bonds with incubators are not fully dependent on activity links. But actor bonds are fully dependent on resource ties with incubators.

- ✓ Regression model-6 indicates that resource ties with incubators are dependent on activity link for business development & team building, activity link for funding & professional assistance, activity link for product modeling & resource collection, structural bond with incubators, social bond with incubators and economic bond with incubators. Resource ties with incubators are not fully dependent on activity links with incubators; they are fully dependent on actor bonds with incubators.

- ✓ Regression analysis conducted to determine the dependency between activity links, actor bonds and resource ties with incubators shows that activity links are not fully dependent on resource ties and actor bonds. Actor bonds and resource ties are also not fully dependent on activity links. But resource ties and actor bonds with incubators are fully dependent on each other.

9.4.5 Components of Individual Actors and Business Relationships - Incubators

- ✓ Most of the incubators in Kerala are based in universities and educational institutions (34.2%). There are 28.9% state government supported and 21.1% central government supported incubators in Kerala. Only 15.8% of incubators in Kerala are private/corporate incubators. Among the incubators in Kerala, 60.5 % of incubators take startups at their ideation stage for incubation. Most of the central government supported incubators (87.5%), universities/educational institutions supported incubators (53.8%) and private business incubators (66.7%) take startups at their ideation stage for incubation. Fifty five percentage of state supported incubators take startups at their validation stage for incubation.

- ✓ Majority of the incubators (68.4%) take only technology startups for incubation. Thirty two percentage of incubators provide incubation facilities to any category of startup, irrespective of their nature of business. Most of incubators provide incubation to any category of startup despite their nature of output, but 31.6% incubators provide incubation facilities exclusively to product oriented startups. Majority of central government, state government and universities/educational institutions supported incubators provide incubation facilities only to technology startups, whereas 66.7% of private business incubators provide incubation facilities to any category of startups based on their nature of business. Half of the central government supported incubators, 45.5% of the state government supported incubators and 23.1% of universities/educational institutions supported incubators provide incubation only to product oriented startups.

- ✓ Opportunities for incubation are very limited for non-technology startups compared to technology startups. Startups that are solely service oriented don't have as many incubation opportunities as product oriented or both product & service oriented startups. Technology startups and product oriented startups have exclusive incubation facilities in Kerala, while other categories of startups do not have the incubation facility.

- ✓ Central government supported incubators and private business incubators generally do not provide induction programmes to startups. State government supported incubators and private business incubators have positive attitude with regard to providing coworking facilities for startups during the pre-incubation stage. Universities/educational institutions provide training for entrepreneurial skill development to their incubatees. Pre-incubation activities performed by university/educational institutions supported incubators are better than other types of incubators.

- ✓ Other than providing accommodation facilities to startup teams, most of the other incubation activities are performed by different categories of incubators. Screening and selection of startups for incubation, providing physical infrastructural facilities to startups and organising workshops and seminars are done by all the different types of incubators. The central government supported incubators and universities/educational institutions supported incubators assist startups in prototype development. State government funded incubators provide financial incentives and seed capital to startups and also provide the opportunity to meet investors. Greater technical support and facilities for advanced research and development for startups are provided by central government funded incubators.

- ✓ The central government, state government and universities/educational institutions supported incubators have a neutral attitude towards developing a proper exit plan for incubatees after their graduation. State government supported incubators provide business advice and support for business development to startups during the post incubation period.

- ✓ Central government supported incubators provide extensions to the graduated startups to continue using the incubation facilities, allow the startups to continue using the lab as well as other research facilities and also support them in technology commercialisation. The central government, universities/educational Institutions and private business supported incubators do not provide assistance in portfolio management and IPOs to startups after incubation. Incubators generally do not support startups in business expansion and internationalisation during the post-incubation period.

- ✓ Incubators in Kerala have a formal organisation structure, with the individual positions of the members and the hierarchy of positions in the incubator being well defined. Communications within the incubators are also formally structured. State government supported incubators are flexible and adaptable to changing environment. The organisation structure of different types of incubators is appropriate for achieving the planned goals and building business relationships. Incubators under the study mostly have a well-defined formal organisation structure but comparatively private business incubators have a better organisation structure than others.

- ✓ Only central government supported incubators receive funds from the central government. The state government supported incubators receive funding from the state government. Universities/educational institutions supported incubators get funding from universities/educational institutions and private/corporate business incubators receive funding from corporate/private investors. Incubators generally don't take loans from banks and other financial institutions. Incubators earn their own income and they are not receiving funds from other sources.

- ✓ Incubators provide office space as well as office equipments, furniture and fittings to startups on a payment basis. Central government, state government and private business supported incubators mostly provide conference halls on a payment basis to incubatees. Half of the central government supported incubators and private business incubators do not provide incubatees with access to computer systems. State government supported incubators mostly provide incubatees with paid access to computer systems. Incubators mostly provide paid access to internet/WIFI facilities to startups.

- ✓ While half of the government supported incubators provide paid access to kitchen/refreshment facilities, the other half does not provide any access. Fifty five percentage of state government supported incubators do not provide any access to kitchen/refreshment facilities. Most universities/educational institutions supported incubators and all private business incubators provide incubatees with paid access to kitchen/refreshment facilities.

- ✓ Most of the state government supported incubators and none of the private business incubators provide access to library facilities. Most of the universities/educational institutions supported incubators provide free access to library and lab facilities with equipments. None of the private business incubators provide access to lab facilities with equipments. State government supported incubators, private business incubators and most of the universities/educational institutions supported incubators do not provide incubatees with access to plant & machinery. Whereas 62.5% of central government supported incubators provide incubatees with paid access to plant & machinery.

- ✓ State supported incubators and private business incubators do not provide access to raw materials to incubatees. But 62.5% of central government supported incubators provide incubatees with paid access to raw materials. Central government supported incubators and private business incubators provide startups with paid access to electricity. Private business incubators provide security arrangements to incubatees only on a payment basis.

- ✓ Central government, state government and private business supported incubators have staff members working at various positions in the organisation. Incubators funded by the central government and private companies appoint staff through formal procedures. However, universities/educational institutions and state government supported incubators have a neutral attitude towards following formal procedures for appointing staff. State government-supported incubators don't have enough workers in the incubation centre. Incubators supported by the central government and private businesses claim that their employees are skilled and qualified for their positions.

- ✓ In terms of providing coaching and training to startups, 75% of the central government, 81.8% of state government and 61.5% of universities and educational institutions supported incubators provide both to their incubatees. But half of the private business incubators offer their incubatees only training. State government funded incubators have strong internal and external business networks. Most incubators funded by the central government, universities/educational institutions and private businesses also have strong internal and external networks.

- ✓ Most of the of the central government (62.5%) and state government supported (63.6%) incubators claim to have a good track record. While 38.5% of universities/educational institutions supported incubators and 66.6% of private business incubators have an average track record. Half of the central government supported incubators own patents and the other half doesn't. Most of the state government and universities/educational institutions supported incubators do not own any patents. Private business incubators also don't own any patents. All of the central government supported incubators have own trademark. Most state government supported incubators and private business incubators also have their own trademarks.

- ✓ There is a low level of coordination among incubators with regard to providing incubation programmes as well as coworking space for incubatees. Universities/educational institutions supported incubators have a moderate level of coordination with other incubators while providing training for entrepreneurial skill development to startups, but other categories of incubators have a low level of coordination for the same. In terms of providing labs and research facilities for experimenting and providing assistance in business plan development and team building to incubatees, there is also a low level of coordination among incubators. Incubators have a low level of coordination while performing pre-incubation activities.

- ✓ The level of coordination amongst incubators is low while carrying out tasks like screening and selection of startups for incubation, providing physical infrastructural facilities to startups, providing accommodation facilities to startup teams and assisting startups in prototype development. While organising workshops, seminars and events, incubators funded by the central government and state government coordinate highly with other incubators, but incubators funded by universities/educational institutions and private businesses coordinate moderately with other incubators to organise workshops, seminars and events.

- ✓ In terms of providing financial incentives and seed capital to startups, both central government and state government supported incubators have a moderate level of coordination with other incubators. In terms of arranging mentors and facilities for advanced research and development for startups, the state government supported incubators have a high level of coordination with other incubators. The state government supported incubators moderately coordinate with other incubators to help startups apply for intellectual property such as patents and trademarks and arrange professional assistance from accountants, lawyers other professionals. Other categories of incubators coordinate at a low level while performing these activities. State government supported incubators coordinate highly with other incubators with regard to providing startups with the opportunity to meet investors and pitch for funding.

- ✓ With regard to developing a proper exit plan for incubatees, incubators coordinate at a very low level with each other. There is a low level of coordination among incubators about providing business advice and support for business development as well as providing extensions to the graduated startups to continue using the incubation facilities. While performing post-incubation activities such as providing support to startups in technology commercialisation, providing assistance in portfolio management and IPOs and supporting startups in business expansion as well as internationalisation, different types of incubators have a low level of coordination with other incubators.
- ✓ Central government, state government and universities/educational institutions supported incubators have a moderately strong structural bond with other incubators with regard to performing business activities with mutual support and coordination. State government supported incubators have a strong bond with other incubators in the sharing of facilities, information, equipments and other resources. But central government supported incubators and universities/educational institutions supported incubators have a moderately strong bond with other incubators for the same.
- ✓ In the formulation of policies and programs that enhance business relationships, incubators funded by central government, state government and universities/educational institutions have a moderately strong bond with other incubators. When it comes to developing value added partnerships and connections, incubators have a weak bond among themselves. Private business incubators generally have a weak structural bond with other incubators.
- ✓ Incubators funded by universities/educational institutions have a moderately strong economic bond with other incubators with regard to providing grants and loans to startups. The central government, state government and private businesses supported incubators have a weak bond with other incubators while providing grants and loans to startups. Universities/educational institutions supported

incubators have a moderately strong economic bond with other incubators about providing facilities/goods/services at a lower rate and other financial incentives to incubatees.

- ✓ Central government, state government and university/educational institutions supported incubators have moderately strong personal attachments and friendships with other incubators. Incubators supported by the central government, state government and universities/educational institutions have moderately strong mutual interaction and communication with other incubators. Central government, state government and universities/educational institutions supported incubators have moderately strong mutual belief and trust as well as commitment with other incubators. Private business incubators have a weak social bond with other incubators.

- ✓ There are stronger resource ties among incubators while sharing business knowledge and business networks. State government supported incubators have a moderately strong resource tie with other incubators with regard to financial resources. Central government, state government and universities/educational institutions supported incubators have moderately strong resource ties with other incubators while sharing physical infrastructural resources. The resource tie is weak among incubators regarding the sharing of intellectual properties. Private business incubators have weak resource ties with other incubators.

- ✓ There is a moderate level of coordination between incubators and startups in the performance of pre-incubation activities. Incubators supported by universities and educational institutions have better coordination with startups with regard to most of the pre-incubation activities. There is a high level of coordination between incubators supported by universities/educational institutions and startups in providing training for entrepreneurial skill development. There is a high level of coordination between incubators and startups in the case of most of the incubation activities. Activities like providing financial incentives and seed capital to startups, helping startups in recruiting skilled and talented human resources, assisting startups in applying for intellectual properties like patents, trademarks, etc., providing opportunities to meet investors and pitch for funding and assisting in product marketing and customer generation are better coordinated by state government supported incubators with startups.

- ✓ In the case of post-incubation activities, incubators mostly coordinate with startups for developing a proper exit plan and providing business advice and support for business development. Centrally supported incubators have greater coordination with startups in providing extensions to the graduated startups to continue using the incubation facilities and allowing the startups to continue using the lab and other research facilities.

- ✓ There is a strong structural bond between incubators and startups about performing business activities with mutual support, coordination and sharing of facilities, information, equipment's and other resources. With regard to formulating policies and programs that enhance business relationships, universities/educational institutions supported startups have a greater bond than other incubators with startups. Central government and state government funded incubators have a moderately strong structural bond with their incubatees about developing value added partnerships and connections.

- ✓ Incubators have a weak economic bond with startups. Only with regard to providing facilities/goods/services at a lower rate and other financial incentives, there is a better bond between incubators and startups. Centrally funded incubators and universities/educational institutions supported incubators have a moderately strong economic bond with incubatees about providing facilities/goods/services at a lower rate and other financial incentives.

- ✓ In terms of personal attachment and friendship, mutual interaction and communication, mutual trust and belief and commitment, state government supported incubators and universities/educational institutions supported incubators have a strong social bond with their incubatees. Central government supported incubators have a moderately strong social bond with incubatees and private business incubators also have a moderate level of social bond with incubatees.

- ✓ Resource ties are strong between incubators and startups in case of physical infrastructure resources, business knowledge, business networks and business reputation. With regard to financial resources and human resources, state government supported incubators have stronger resource ties with startups. Sharing of intellectual properties is stronger between central government supported incubators and incubatees.

9.4.6 Role of Supporting Actors

- ✓ Most startup categories have a positive attitude about the role of state government in the startup ecosystem. But non-technology startups, service oriented startups, startups not registered in DPIIT, startups not registered in KSUM and coworking startups have responded neutrally about the role of state government in the startup ecosystem. The central government, state government and universities/ educational institutions supported incubators agree that the government has introduced policies that support the functioning of incubators in the state. State government funded incubators have strongly agreed that the government provides infrastructural support to incubators. Central government funded incubators and state funded incubators say that the government provides financial assistance for their development and for supporting startups. All the different categories of incubators have agreed that the government effectively coordinates the functioning of incubators in the state through KSUM.

- ✓ There are negative to neutral responses from various startup categories about the role of investors/funding organisations in the ecosystem. Startups at the ideation stage, validation stage, non-technology startups, service oriented startups, startups not registered in DPIIT, startups not registered in KSUM and coworking startups have responded with a negative attitude about the role of investors/funding organisations indicating that funding is still one of the crucial problems faced by startups. State government funded incubators agree that state financial institutions help in providing loans to the incubated startups. Central government, state government and universities/educational institutions supported incubators have a neutral attitude about the readiness of angel networks and venture capital firms to coordinate with incubators and provide funds to startups. State government supported incubators coordinate with investors/funding organisations in arranging seminars/ workshops/pitching sessions for the startups. Private incubators have stated that investors/funding organisations neither provide timely funding to startups nor evaluate their performance.

- ✓ All the categories of startups have a positive attitude regarding the role of universities & educational institutions in the startup ecosystem through training and incubating startups. The state government and universities/educational institutions funded incubators support the statement that basic education regarding entrepreneurship and startups is provided to students at educational institutions. Various categories of incubators agree that students are trained and encouraged to develop their own business ideas in educational institutions. Incubators in general agree that universities/educational institutions organise startup camps/workshops in coordination with other actors in the ecosystem, as well as provide incubation and research facilities for students to support their startup ideas.

- ✓ Startups in the ideation stage, non-technology startups, service oriented startups, startups not registered in KSUM and coworking startups have a neutral view about the role of mentors in the startup ecosystem. But other categories of startups have responded positively to the same. Various categories of incubators, except private business incubators, agree about the availability of mentors for coordinating with them and helping startups manage their businesses. Incubators in general agree about the readiness of mentors to share their knowledge, time and resources with incubated startups, as well as supporting incubators in arranging seminars/ workshops/pitching sessions. Universities/educational institutions supported incubators have a positive view about receiving support from mentors for evaluating and improving the performance of startups.

- ✓ Compared to technology and both technology & non-technology startups, non-technology startups seem to get less support from the ecosystem. The same goes for service oriented startups compared to product oriented startups and both product & service oriented startups. That is why their responses are either neutral or negative in nature about the role of supporting actors in the ecosystem. Non-technology startups, startups not registered in DPIIT, startups not registered in KSUM and coworking startups also have mostly neutral or negative responses about the role of supporting actors in the ecosystem. This can be because either the supporting actors are not providing assistance to these categories of startups or support from the actors is not effectively reaching these startups.

9.5 Contributions of the Study

There are different elements in a startup ecosystem that work together to create an environment favourable for startups to grow and succeed. All these elements are interconnected with one another. Analysing these interconnections will help to understand the strength of business relationships between the different elements of a startup ecosystem. The research work focuses on exploring the business relationships of startups and incubators in Kerala. This will help us understand the strength of business relationships created by startups and incubators in the ecosystem. While exploring business relationships, the interconnections that startups and incubators have among themselves are often left out. By analysing the relationship that startups have with other startups and incubators have with other incubators, the level of support among the startups and incubators in Kerala can be understood. There are different types of startups functioning in Kerala. The business relationships of startups can vary from one another depending on the nature of their business and many other factors. Through the study, we can understand how the business relationships of various categories of startups differ from one another. Business relationships can be studied using different methods and one of the most established models for studying business relationships is Actor-Resource-Activity model, which has been very rarely used in studies related to startup ecosystems. By analysing the business relationships of startups and incubators using Actor-Resource-Activity model, the activity links, actor bonds and resource ties developed by them could be understood.

9.6 Implications of the Study

Startups are business concerns that bring a lot of scope for employment and development in an economy. From the study, we can understand the different activities performed by startups and what resources they need to perform these activities. The resource requirements differ among startups based on the type of business they are engaged in. Therefore, the resource requirements of different categories of startups can be brought forward through the study. By exploring the business relationships of startups, it could be understood whether the activity links, actor bonds and resource ties of startups are weak with other startups and incubators. Incubators can understand the areas where they need to improve in providing incubation facilities to startups. Business relationship analysis of incubators will help them evaluate the shortcomings in their existing relationships with other incubators and startups. Supporting actors can understand the perspective of startups and incubators about them and they can take actions to make needed changes in the way they function. The government and other authorities concerned can understand the requirements of different startup categories in Kerala. They can take steps to solve the issues faced by different types of startups and formulate policies that can make the startup ecosystem in Kerala favourable for all startups.

9.7 Conclusions

Startups are business concerns that intend to provide innovative solutions to the problems faced by their customers. But the risks and uncertainties associated with these business concerns make their existence and survival difficult. Startups survive through the network of relationships built by them in the ecosystem. Their association with fellow startups, incubators, mentors, investors, the government and other supporting actors allows them to grow and succeed in business. Therefore, a startup ecosystem ought to be set up in a way that gives each startup an equal chance to thrive. The startup ecosystem in Kerala is one of the best performing among the various states in India and the study intended to know if the ecosystem is suitable for startups belonging to different categories. The startup ecosystem in Kerala is favourable for startups that use technology and are product oriented. It is easy for these startups to find incubation facilities in the state. Most technology startups in the state are IT/software based. Startups that use other types of technologies are smaller in number compared to IT startups. Service oriented startups and non-technology startups have few opportunities in the state. Startups at their early stages definitely have more struggles than startups at the latter stages. Registration in DPIIT and KSUM provides startups access to more opportunities and can also help build their internal strength through networking. As incubatee startups are a part of the incubation programme, they have a closer bond with incubators and other supporting actors than coworking startups. Startups continue to struggle with funding and bootstrapping is still their main source of capital. Bonds and relationships that startups develop along the way of their journey are needed for their existence. Actor bonds (structural, economic and social bonds) and resource ties of startups with other startups and incubators are dependent on each other. Some of the activity links of startups are also dependent on actor bonds and resource ties. These dependencies indicate how important it is for startups to maintain strong business relationships with different actors in the ecosystem.

Incubators directly provide guidance and support to startups and are closely associated with them. Incubators in Kerala are mostly based in universities and educational institutions. They play a crucial role in developing future entrepreneurs in the state. This has been agreed upon by startups and incubators. Incubators in Kerala are formal and well-structured organisations. But incubators that are willing to provide incubation to all categories of startups are few and that is a concerning matter. Incubators are actively involved in the performance of incubation activities, but pre and post-incubation activities are not given the same importance. State government supported incubators provide better access to different funding prospects for startups, but they do not have adequate staff for working. Incubators arrange all needed resources for startups, but most of them cannot assist startups in arranging raw materials as well as plant and machinery needed. Incubators have a low level of coordination with each other while performing different activities, except in the case of arranging workshops and other events. The bond between incubators is moderately strong, but private incubators have weaker bonds with other incubators. Anyhow

Incubators coordinate well with startups while performing incubation activities and this ensures that incubation programmes will be effective for startups. The startup ecosystem of Kerala is astonishing and a great place for startups because of many good elements, but it also has many flaws that need to be fixed in order to make the ecosystem ideal and acceptable for all kinds of startups.

Chapter 10

Recommendations

The recommendations that follow are based on the findings presented in the previous chapter.

10.1 Recommendations

After analysing the different variables related to business relationships of startups and incubators, the findings of the study have been presented and conclusions are arrived at. Based on the findings of the study, it is important that necessary recommendations are provided to the parties concerned about how the problems identified through the study can be solved. Such recommendations will help the authorities to frame necessary policies and other related parties to take necessary steps to face the situation. The recommendations to startups, incubators, state government and investors/funding organisations are given below:

Recommendations to Startups

- All the various categories of startups should register in DPIIT and product oriented technology startups should register in KSUM. These registrations are important for getting access to different funding programmes, competitions and networking events organised by the central and state governments for startups.

- Activity links between startups are weak. The strong social bond that startups have with other startups is not resulting in a strong structural and economic bond between them. Resource ties are also not strong between various startup categories. Startups should consider developing stronger connections with fellow startups. This can be achieved by building personal and friendly relationships with other startups. Developing a value added partnership with them and performing various activities through mutual help and coordination. Business partnerships will help in building mutual trust and commitment among the parties involved, which will lead to the sharing of various resources between them. This can make the performance of different activities much easier and provide access to different resources, which are otherwise difficult to achieve.

- Startups have a moderately strong structural and social bond with incubators. Most categories of startups have weak economic bond and resource ties with incubators. Activity links of startups with incubators are also weak in many cases. Efforts should be taken by different categories of startups to make their activity links, actor bonds and resource ties with incubators stronger. This can be ensured by establishing friendly relationships with incubators that result in mutual understanding and trust. Startups can discuss the various business problems with incubators and seek their help in solving them. Startups should not consider incubators as just a work space provider. The advices and mentoring from the part of incubators should be considered by startups and they should try to show a steady progress in the startup growth which can help in securing grants through incubators. In case of any dissatisfaction, that should be directly communicated to the incubation centre manager. Strong relationships with incubators will allow startups to easily network and connect with the different facilities that they require for the business.

Recommendations to Incubators

- Incubators should come forward to provide incubation facilities to all different types of startups. Most incubators are focused on technology startups and product oriented startups. Non-technology startups and service oriented startups have limited opportunities for getting incubation support. Importance should be given to the innovativeness of the idea while considering startups for incubation rather than their nature of business or output.

- Incubators should attempt to improve their bonds with startups associated with them. Activity links, actor bonds and resource ties that incubators have with startups are not strong enough to ensure that startups can completely rely on incubators to fulfill all their business requirements. Incubators can coordinate with startups in the performance of various startup activities and make startups feel like they are a part of the system. Accurate mentoring and connecting startups with investors and other professionals can ensure solutions to the problems faced by startups. Similarly, even though incubators are not obliged to assist coworking startups, incubators can informally associate with them. This will help incubators get access to the various business connections of these startups. Incubators should strengthen the business network among themselves.

- Incubators should put more effort into pre and post incubation activities. Most incubators do not focus on proving support to startups before and after their incubation. Many startups die at the ideation stage itself and many don't succeed after graduation. During these stages also, there are many functions where startups require the guidance of incubators.

- Incubators should focus more on the coaching and training of startups. Every category of incubator should try to provide both coaching and training to startups incubated by them. It should also be ensured that the benefit of coaching and training is reached to every type of startup in the incubator.

- Incubators need to improve their track record by providing startups with the necessary facilities that they need to succeed. Apart from office facilities and furniture, computer systems, refreshment facilities, research and lab facilities can also be extended by incubators to startups. The track record of existing private incubators in the state is not very good and incubation facilities provided by universities/educational institutions also need to improve their track record. This can be done by identifying the areas where they are lacking and taking corrective measures.

- Most of the technology startups in the state are IT based. Steps should be taken to make the startup ecosystem more attractive for non-IT startups as well. Robotics, electronics, biotechnology etc. are some of the blooming sectors that can be focused on. Incubators should help non-IT startups to arrange all the required resources such as raw materials, plants, machinery and equipments needed for producing physical products so that they can focus more on the core business activities.

- Bootstrapping is the main source of funding for every category of startup. Funding from other sources like angel investors and grants from incubators is not a major source of funding for startups. Therefore, it is suggested that effective steps should be taken by incubators to connect startups with more investors and grant funds to deserving startups without any bias. Workshops and pitching events by the angel investors can be arranged and startups should be given ample opportunities to participate in such events. Startups should be groomed well by investors as to how a good presentation can be made in front of investors and help them revise and come up with a good business plan.

Recommendations to State Government

- The number of non-technology and service oriented startups is few when compared to technology startups in the state. This is because they are not getting enough support from the startup ecosystem of Kerala. The government should come forward with exclusive policies and plans to support the different categories of startups in the state and focus on their development.

- More private companies should come forward to support startups through incubation. There are only a few private incubators in the state and the corporate sector can contribute largely in assisting startups to success. The government should take the necessary steps to bring more private companies into incubation. This may call for policy changes on the part of the government.

- The number of workers at incubators funded by the state government is insufficient. This will cause current employees to multitask and work longer hours, which may have an impact on their performance and ultimately on the performance of startups. The state government must ensure that there are enough employees to handle the many activities that need to be completed within the incubator.

Recommendations to Investors/Funding Organisations

- Grants from state financial institutions, loans from commercial banks and other financial institutions are not a major source of funds for the startups in the state. Therefore, authorities concerned should liberalise the procedures for acquiring loans through commercial and financial institutions.

- Most categories of startups in the state are not getting needed support from investors in the ecosystem. Startup categories like, non-technology startups, service oriented startups and coworking startups are not getting enough attention from investors. Angel investors should broaden their horizons and consider all the various categories of startups for investment.

10.2 Limitations of the Study

The various limitations of the study are the following:

- Startups that are associated with incubators, either as incubatees or coworking startups, are only considered in this study. Startups that are not associated with incubators are excluded from the study.

- Incubators considered for the study are active incubators. Those incubators who have previously contributed to the ecosystem but currently don't have any startups under incubation are not taken into consideration.

- There are many actors in the startup ecosystem that support the functioning of startups, but the study focuses only on startups and incubators. The study could be elaborated by focusing on the other elements in the startup ecosystem as well.

10.3 Scope for Future Research

The results of the study led to the identification of the following research areas for the future.

- Apart from startups and incubators, state government, mentors, investors, communities, educational institutions etc. are also elements functioning in the ecosystem. Therefore, the startup ecosystem of Kerala can also be studied by focusing on these elements using the ARA model.

- A third actor can be added along with startups and incubators and business network analysis can be done using the ARA model. The same can be done with any three or more elements of the startup ecosystem.
- Actor-Resource-Activity model is one among the many models available for understanding business relationships and networks. Other models can also be used for analysing business relationships among the different elements of the startup ecosystem.
- Each category of incubator and startup can be studied in detail while giving focus to the opportunities and challenges faced by them in the startup ecosystem.

Bibliography

Acharya, S. R., & Dixit, T. (2019, June 1). *Technology Entrepreneurship: Role of Government in Enabling Startup Support Ecosystem*. ResearchGate.

Aggarwal, B. (2005). *Elementary Statistics*. Sultan Chand Educational Publishers.

Agnihotri, D. (2016). *Startup Ecosystem*. Dr. V.N. Bedekar Research Institute of Management Studies.

Ahmady, G. A., Mehrpour, M., & Nikooravesh, A. (2016, September). Organizational Structure. *Procedia - Social and Behavioral Sciences,* 230, 455–462.

Al-Mubaraki, H., & Busler, M. (2011, January 1). *Critical Activity of Successful Business Incubation*. ResearchGate.

Alvarez Salazar, J. (2020, October 28). *Organizational Resources and Survival of Startups Firms – A Qualitative Analysis in the Peruvian Context*. Academia Revista Latinoamericana De Administración, 34(1), 59–87.

Audretsch, D. B., Cunningham, J. A., Kuratko, D. F., Lehmann, E. E., & Menter, M. (2018). Entrepreneurial Ecosystems: Economic, Technological, and Societal Impacts. *The Journal of Technology Transfer*, 313–325.

Balachandran, A. (2015). *A Study of Business Incubation Environment Influencers Impacting Performance of Incubatee Ventures*. (Doctoral Thesis, Anna University)

Bannerjee, M. K., Bannerjee, S., & Sastry, P. R. (2014, January 1). *Start-up City*.

Bagozzi, R. P., & Yi, Y. (1988). On the Evaluation of Structural Equation Models. *Journal of the Academy of Marketing Science*, 16(1), 74-94.

Bajpai, N. (2017). *Business Research Methods*. Pearson India Education Services Pvt.Ltd.

Boothem, S.M. (2019, March). *Investing in Future*. Business India - The Magazine of the Corporate World, p. 23.

Bryman, A., & Bell, E. (2011). *Business Research Methods*. Oxford University Press.

Buckley, J. W., Buckley, M. H., Chiang, H. F., Accountants, N. A. O., & Canada, S. O. I. A. O. (1976, January 1). *Research Methodology & Business Decisions*. New York : NAA.

Business Incubation Models. (2014, February 17). Entrepreneurship, Business Incubation, Business Models & Strategy Blog.

Cater, Barbara. (2008). *The Importance of Social Bonds for Communication and Trust in Marketing Relationships in Professional Services*. Management. 13.

Chandiok, S. (2016). India the World's Fastest Growing Startup Ecosystem: A Study. *Amity Research Journal of Tourism, Aviation and Hospitality*, 84-93.

Choudary, P. (2020). *Performance Evaluation of Incubator 'Startup Oasis' in Capacity Building of Entrepreneurial Ventures in Rajasthan*. (Doctoral Thesis, Manipal University)

Cronbach, L. J., & Meehl, P. E. (1955, July). *Construct Validity in Psychological Tests*. Psychological Bulletin, 52(4), 281–302.

Dangi, H., & Dewen, S. (2016). *Business Research Methods*. Cengage Learning India Private Limited.

Dalal, M. (2019, October 6). *Big Billion Startup: The Untold Flipkart Story*. Pan Macmillan.

Darooka, M., & Kumar, V. (2016). *Startups Finding Funding: Innovative Ways to Fund Your Startup*. Vishwakarma Publications.

Department for Promotion of Industry and Internal Trade. (2019, February 19). Notification by Ministry of Commerce and Industry. India.

Department for Promotion of Industry and Internal Trade. (2018). *States Startup Ranking*. Startup India.

Department for Promotion of Industry and Internal Trade. (2022). *Compendium of Best Practices of States and Union Territories.*

Dessler, G., & Varkkey, B. (2020, January 1). *Human Resource Management*.

Durda, L., & Kljucnikov, A. (2019). *Social Networks in Entrepreneurial Startups Development*. Economics and Sociology, 12(3), 192-208.

Dutta, A. (2016). Start-up Initiative. *IOSR Journal of Business and Management*, 93-97.

Edward.J.Malecki. (2018). *Entrepreneurship and Entrepreneurial Ecosystems*. Geography Compass, 1 to 21.

Ford, David & Gadde, Lars-Erik & Hakansson, Hakan & Snehota, Ivan & Waluszewski, Alexandra. (2010). *Analysing Business Interaction*. IMP Journal. 4. 82-103.

G, Geetangali. (2020). *Startups in India- A Study on Challenges and Prospects of Selected Units in Bengaluru.* (Doctoral Thesis, University of Mysore)

Gartner, W. B., Carter, N. M., & Reynolds, P. D. (2004). Business Start-up Activities. Handbook of Entrepreneurial Dynamics: *The Process of Business Creation*, 285–298.

Garvey, R., Garvey, B., Stokes, P., & Megginson, D. (2017, October 23). *Coaching and Mentoring*. SAGE.

Gassmann, O., & Becker, B. (2006, March). Towards A Resource-Based View of Corporate Incubators. *International Journal of Innovation Management*, 10(01), 19–45.

George, D. & Mallery, P. (2003). *SPSS for Windows Step By Step: A Simple Guide and Reference*. 11.0 update (4th ed.). Allyn & Bacon.

GIZ. (2018). *Guide for Mapping the Entrepreneurial Ecosystem*. Frankfurt: Deutsche Gesellschaft für and Internationale Zusammenarbeit (GIZ).

Gnyawali, R. D., & Fogel, S. D. (1994). Environments for Entrepreneurship Development: Key Dimensions and Research Implications. *Entrepreneurship Theory and Practice*, 43-62.

Government of Kerala. (2014). *Kerala Technology Startup Policy 2014*. Government of Kerala.

Graybeal, G., & Sindik, A. (2016). *University Partnerships With Area Entrepreneurial Efforts Produce Shared Benefits*. Newspaper Research Journal.

Gstraunthaler, T. (2010). The Business Of Business Incubators An Institutional Analysis – Evidence From Lithuania. *Baltic Journal of Management*, 5, 397-421.

Ghuman, K., & Aswathappa, K. (2015) *Management Concept and Cases*, Mc Graw Hill Education, page 244.

Hair Jr., J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010) *Multivariate Data Analysis: A Global Perspective*. 7th Edition, Pearson Education, Upper Saddle River.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021, November 3). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011, April). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–152.

Hair Jr, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). *Advanced Issues In Partial Least Squares Structural Equation Modeling*. Sage publications.

Hakkanson, H., & Snehota, I. (1995, January 1). *Developing Relationships in Business Network*. ResearchGate.

Holaday, B. M. G. (2019). *Government Intervention and Entrepreneurship Development in Kerala: An Empirical Study of Startup Village at Firm Level*. (Doctoral Thesis, Mahatma Gandhi University)

Holmen, E. (2009). *Activity Links Versus Resource Ties and Efficiency Versus Effectiveness In The Industrial Network Approach*.

Holmlund, M., & Törnroos, J. (1997, May 1). What Are Relationships In Business Networks? *Management Decision*, 35(4), 304–309.

Hsieh, T. (2010, June 7). *Delivering Happiness*. Hachette UK.

Hulland, J. (1999, February). Use of Partial Least Squares (PLS) In Strategic Management Research: A Review of Four Recent Studies. *Strategic Management Journal*, 20(2), 195–204.

H.V, H., Mehra, P., Gandhi, K., Gupta, A., Kumar, D., Bhansali, S., et al. (2016). *Startups India - An Overview*. Grant Thornton in India, ASSOCHAM.

IBM. (2017). *Innovation Key to Startup Success in India.*

Isenberg, D. (2011). *The Entrepreneurship Ecosystem Strategy as a New Paradigm for Economic Policy: Principles for Cultivating Entrepreneurship*. Ireland: Babson Global.

Iyer, R. (2019, December 31). *Innovation Ecosystem in India*. Notion Press.

Jain, G., & Jain, N. (2013, September 16). *The Startup Diaries*. Orient Publishing.

Jain, S. (2016). Growth of Startup Ecosystems in India. *International Journal of Applied Research*, 152-154.

James, Gareth, Daniela Witten, Trevor Hastie, and Robert Tibshirani (2014). *An Introduction to Statistical Learning: With Applications in R*. Springer Publishing Company, Incorporated.

J.D., H., & Gorman, S. (2017). *Innovation That Matters*. U.S Chamber of Commerce Foundation.

Jones, O., Macpherson, A., & Jayawarna, D. (2022, October 31). *Resourcing the Start-up Business*. Taylor & Francis.

Kalyanasundaram, G. (2018). Why Do Startups Fail? A Case Study Based Empirical Analysis in Bangalore. *Asian Journal of Innovation and Policy*, 79-102.

Kamaldeep Kaur, A. (2017). Start up India: Challenges & Opportunities. *Journal of Social Science Research*, 2318-2321.

Kapoor, D., & Sharma, S. (2016). *The India State Innovation Report. Institute for Competitiveness*.

Kerala Startup Mission. (2017). *Kerala's Vibrant Startup Ecosystem*. Kerala Startup Mission.

Kerala Startup Mission. (2018*). Kerala Startup Ecosystem Report*. Kerala Startup Mission.

Kerala Startup Mission. (2019). *The State of Kerala Startup Ecosystem*. Kerala Startup Mission.

Kerala Startup Mission. (2023). *The Kerala Startup Ecosystem Report 2022*. Kerala Startup Mission

Khattab, I. (2017). Towards an Integrated Model of Entrepreneurship Ecosystem. *Journal of Business & Economic Policy*, 4, 80-92.

Korreck, S. (2019). *The Indian Startup Ecosystem: Drivers, Challenges and Pillars of Support*. Observer Research Foundation.

Kothari, C., & Garg, G. (2019). *Research Methodology: Methods and Techniques*. New Age International Publishers.

Krejcie, R.V., & Morgan, D.W., (1970). *Determining Sample Size for Research Activities*. Educational and Psychological Measurement.

Kumar, A. S. (2017). *Management Challenges in Information Technology Services Startups: An Exploratory Study.* (Doctoral Thesis, Jain University)

Kumar, G. P. (2018). *Indian Startups- Issues, Challenges and Opportunities*.

Kumar, M. (2022). *A Study on Startups in India, Issues Challenges and Opportunities by Government Policies*. (Doctoral Thesis, Jayothi Vidyapeeth Women's University)

Lenney, P., & Easton, G. (2009, July). *Actors, Resources, Activities and Commitments*. Industrial Marketing Management, 38(5), 553–561.

Lewis, A. (2016). *Kansas City Startup Village: A Case Study*. Kansas State University.

Lockett, A., Vohora, A., & Wright, M. (2002). Universities as Incubators without Walls. *Entrepreneurship and Innovation*, 245-256.

Malagihal, S. S., & Hazarika, D. (2018). *Challenges in Startup Ecosystem.*

Mason, C., & Brown, R. (2014). *Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship*. Hague: Organisation for Economic Co-operation and Development.

McKaskill, T. (2009, January 1) *Introduction to Angel Investing.*

Mehrothra, N., Patrao, C., Marshall, A., Banda, M., & Singh, R. R. (2016). *Entrepreneurial India: How Startups Redefine India's Economic Growth*. IBM Institute for Business Value.

Menon, K. S. V., & Malik, G. (2016, May 7). *Funding Options for Startups: A Conceptual Framework and Practice Guide*. Chennai: Notion Press.

Ministry of Human Resource Development. (2019). *National Innovation and Startup Policy 2019*. Ministry of Human Resource Development, Government of India.

Monsson, C. K., & Jorgensen, S. B. (2016). How Do Entrepreneurs Characteristics Influence The Benefits From The Various Elements Of A Business Incubator? *Journal of Small Business and Enterprise Development,* 23, 224-239.

Moody, P., Gruen, D., Muller, M. J., Tang, J., & Moran, T. P. (2006). Business Activity Patterns: A New Model for Collaborative Business Applications. *IBM Systems Journal*, 45(4), 683–694.

Motoyama, Y., & Watkins, K. K. (2014). Examining the Connections within the Startup Ecosystem: A Case Study of St. Louis. *SSRN Electronic Journal*.

Mumtaz, S., Shafi, F., & Zafa, F. (2017). Role of Technology Business Incubators to Nurture Entrepreneurship: A Study on Pakistani Universities. *Journal of Accounting & Marketing*.

Nambiar, R. S. (2020). *Impact of Start-Up Policy Initiatives of Kerala Government on Start-ups in Kerala*. (Doctoral Thesis, Amritha School of Arts and Science, Kochi, India)

N.K.Nikhil, Joy, V., & S, S. (2015). Problems and Prospects of Start-ups in Kerala - A Study with Special Reference to Cochin Startup Village. *International Journal of Physical and Social Sciences*, 5(9), 276-289.

NASSCOM, Zinnov. (2014). *Tech-Startups in India - A Bright Future*. NASSCOM.

NASSCOM, Zinnov. (2015). *Start-up India - Momentous Rise of the Indian Startup Ecosystem*. NASSCOM.

NASSCOM, Zinnov. (2017). *Incubators/Accelerators Driving Growth of Indian Startup Ecosystem*. NASSCOM.

NASSCOM, Zinnov. (2017). *Indian Startup Ecosystem - Transversing the Maturity Cycle*. NASSCOM.

Ojaghi, H., Mohammadi, M., & Yazdani, H. R. (2019). A Synthesized Framework for the Formation of Startups Innovation Ecosystem: A Systematic Literature

Review. *Journal of Science and Technology Policy Management,* 10, 1063-1097.

Ozdemir, O. C., & Sehitoglu, Y. (2013). Assessing the Impacts of Technology Business Incubators: A Framework for Technology Development Centres in Turkey. *Procedia - Social and Behavioral Sciences,* 282-291.

Noufal, P. & Ramachandran, K.V. (2017). Entrepreneurship Development and the Prospects of Startups in Kerala's Industrial Economy: An Overview. *International Journal of Research in Management & Business Studies*, 4(2), 13-15.

Pandey, N. K. (2018). An Analysis of Startup Ecosystem in Metropolitan City in India. *International Journal of Engineering and Management Research*, 237-244.

Pandey, T. (2017). Challenges and Opportunities of Startup India. *International Journal of Scientific and Innovative Research*, 120-125.

Goyal, P. (2017, November 1). *Before You Start Up*. Fingerprint! Publishing.

Persson, S. G., Mattsson, L. G., & Oberg, C. (2014). *The Network Approach - A Theoretical Discussion*. IMP Conference 2014.

R.Cooper, D., S.Schindler, P., & Sharma, J. (2014). *Business Research Methods*. Chennai: Mcgraw Hill Education (India) Private Limited.

Rafi, P. M. (2023). *Problems and Prospects of Information Technology Services Start-Ups in Kerala*. (Doctoral Thesis, University of Calicut)

Ramadani, V. (2009). Business Angels: Who They Really Are. *Strategic Change*, 18, 249-258.

Rao, S., & Kumar, L. (2016, March). *Role of Angel Investor in Indian Startup Ecosystem*. FIIB Business Review, 5(1), 3–14.

Rezayian, A. (2005). *The Basics of Organization and Management*. Tehran. SAMT publications.

Ries, E. (2011). *The Lean Startup*. Newyork: Crown Business.

Roundy, P. T. (2017). “Small Town” Entrepreneurial Ecosystems Implications for Developed and Emerging Economies. *Journal of Entrepreneurship in Emerging Economies*, 9, 238-262.

Roy, S., & Salwan, S. (2023). *Emerging Technology Hubs of India*.

Sa, C., & Lee, H. (2012). Science, Business, and Innovation: Understanding Networks in Technology-Based Incubators. *R&D Management*, 243-253.

S, A. T. (2017). Commercialising Technological Innovation: Role of Business Incubators in Kerala. *Journal of Entrepreneurship and Organizational Management*.

S, D. N. (2023, March 31). Startup Mission in Kerala: Insights and Implications. *International Journal for Research in Applied Science and Engineering Technology*, 11(3), 1309–1312.

Salamzadeh, A., & Kesim, H. K. (2017). The Enterprising Communities and Startup Ecosystem in Iran. *Journal of Enterprising Communities: People and Places in the Global Economy*, 11, 456-479.

Sarkar, A. (2016). *Startup India- A New Paradigm for Young Entrepreneurs*.

Sartorelli, D. (2018*). Startup Smart: A Handbook for Entrepreneurs*.

Schober, P., Boer, C., & Schwarte, L. A. (2018, May). Correlation Coefficients: Appropriate Use and Interpretation. *Anesthesia & Analgesia*, 126(5), 1763–1768.

Schwartz, M. (2011). Incubating an Illusion? Long-Term Incubator Firm Performance After Graduation. *Growth and Change*, 42, 491-516.

Sedita, S. R., Apa, R., Bassetti, T., & Grandinetti, R. (2019). Incubation Matters: Measuring the Effect of Business Incubators on the Innovation Performance of Start-Ups. *R&D Management*, 439-454.

Senor, D., & Singer, S. (2011, September 7). *Start-up Nation*. Twelve.

Shammout, A., Polonsky, M., & Edwardson, M. (2012, January 1). *Relational Bonds and Loyalty: The Bonds that Tie*. ResearchGate.

Sharma, S. (2021). *Problems and Prospects of Financing Start-up Entrepreneurial Ventures: A Study of First Generation Entrepreneurs.* (Doctoral Thesis, University School of Applied Management)

Sharma, S., Raj, M., & Gandhi, T. (2018). *Challenges and Issues Faced by Startup Companies in India*. Sixteenth AIMS International Conference on Management. Symbiosis International Deemed University.

Shaw, E., Grant, I., & Wilson, J. (2010). *The Role and Impact of Business Networks on Marketing in the Creative Industries: Evidence from Case Study Research*.

Sheriff, M., & Muffatto, M. (2015). The Present State of Entrepreneurship Ecosystems in Selected Countries in Africa. *African Journal of Economic and Management Studies*, 6, 17-54.

Singh, H., & Kaur, M. (2016). *Startups in India- Retrospect and Prospects*. Jagannath University.

Singh, S., Chauhan, A., & Dhir, S. (2019). Analysing the Startup Ecosystem of India: A Twitter Analytics Perspective. *Journal Of Advances In Management Research*.

Sinha, P. K. (2022). *Assessment of Startups Performance in India*. (Doctoral Thesis, GLA University, Mathura)

Smith, M., & Dawson, J. (2016). *Startup From Idea to Launch: Navigating the Four Stages of a Startup Business*. Maven Publishing USA.

Soma, S. (2016, December 10). *Startup Story*. Notion Press.

Sorheim, R. (2005). Business Angels as Facilitators for Further Finance: An Exploratory Study. *Journal of Small Business and Enterprise Development*, 12, 178-191.

Spigel, B. (2017). The Relational Organization of Entrepreneurial Ecosystems. *Entrepreneurship Theory and Practice*, 49-72.

Stam , E., & Ven, v. A. (2019). *Entrepreneurial Ecosystem Elements*. Springer.

Stam, E., & Spigel, B. (2016). *Entrepreneurial Ecosystems*. Tjalling C. Koopmans Research Institute, Utrecht University.

Startup Genome. (2018). *Global Startup Ecosystem Report 2018*: Succeeding in the New Era of Technology. Startup Genome.

Startup Genome. (2019). *Global Startup Ecosystem Report 2019*. Startup Genome.

Startup Genome. (2023). *The Global Startup Ecosystem Report 2023*. Startup Genome.

Stokan, E., Thompson, L., & Mahu, R. J. (2015). Testing the Differential Effect of Business Incubators on Firm Growth. *Economic Development Quarterly*, 29, 317–327.

Tamasy, C. (2007). Rethinking Technology-Oriented Business Incubators: Developing a Robust Policy Instrument for Entrepreneurship, Innovation, and Regional Development? *Growth and Change*, 38, 460-473.

Tengeh, R. K., & Choto, P. (2015). The Relevance and Challenges Of Business Incubators That Support Survivalist Entrepreneurs. *Investment Management and Financial Innovations*, 12(2), 150-161.

Thiel, P. (2014). *Zero To One: Notes On Startups And, Or How To Build The Future*. Newyork: Crown Business.

Todericiu, R., Lucia, F., & Staniţ, A. (2014). Reflections on Human Resources – Vital Intangible Assets of Organizations. *Procedia Economics and Finance*, 16, 575–579.

Tripathi, N., Seppanen, P., Boominathan, G., Oivo, M., & Liukkunen, K. (2018). *Insights into Startup Ecosystems through Exploration of Multi-vocal Literature*. Information and Software Technology.

Upadhyay, S., & Rawal, P. (2017). Start Ups; Let's Start Them Up - An Inside View in the Indian Start Up Scenario. *International Journal for Research in Applied Science & Engineering Technology*, 1531-1544.

Van.Weele, M., Steinz, H., & Van Rinjsoever, F. (2017). Start-Up Communities as Communities of Practice: Shining a Light on Geographical Scale and Membership. *Tijdschrift voor Economische en Sociale Geografie*, 173-188.

Van Weele, M. A., Van Rijnsoever, F. J., Groen, M., & Moors, E. H. M. (2019, March 18). Gimme Shelter? Heterogeneous Preferences For Tangible And Intangible Resources When Choosing An Incubator. *The Journal of Technology Transfer*, 45(4), 984–1015.

Vekic, A., & Borocki, J. (2017). *The Role of Institutions in Supporting Startup*. XVII International Scientific Conference on Industrial Systems (IS'17), 486-491.

Vinod, A. (2011). *Entrepreneurial Development & Project Management*. University of Calicut.

Volkmann, C., Wilson, E. K., Mariotti , S., Rabuzzi, D., Vyakarnam, S., & Sepulveda, A.(2009). *Educating the Next Wave of Entrepreneurs: Unlocking Entrepreneurial Capabilities to Meet the Global Challenges of the 21st Century*. Switzerland: World Economic Forum.

Wilson, J., Grant, I., & Shaw, E. (2010). *The Role and Impact of Business Networks on Marketing in the Creative Industries: Evidence from Case Study Research*. Paper presented at Industrial Marketing and Purchasing, Hungary.

World Bank Group. (2020). *Doing Business 2020: Comparing Business Regulations of 190 Economies*. World Bank Group.

World Economic Forum. (2009). *Educating the Next Wave of Entrepreneurs*. Switzerland: World Economic Forum.

World Economic Forum. (2013). Entrepreneurial Ecosystems around the Globe and Company Growth Dynamics. Geneva: World Economic Forum.

Appendices

Appendix 1

Interview Schedule - Startups

Business Relationship Analysis of Startup Ecosystem in Kerala

Startup Profile

Name of the Startup (Optional) :

No. of years the startup has been active :

No. of Members in the Startup Team :

Registration	:	DPIIT : Yes ☐	No ☐	
		KSUM : Yes ☐	No ☐	
Stage of Startup	:	Ideation ☐	Validation ☐	Early Traction ☐
		Scale up ☐	Maturity ☐	
Nature of Business	:	Technology ☐		
		Non-Technology ☐		
		Both Technology & Non-Technology ☐		
If Technology Startup	:	Type of Technology:	IT ☐	
			Non IT ☐	
			Both IT & Non IT ☐	
Nature of Output	:	Product Oriented ☐	Service Oriented ☐	
		Both product & service oriented ☐		
Status in Incubator	:	Incubatee ☐	Coworking ☐	
Legal Status	:	Sole Proprietor ☐	Partnership ☐	
		LLP ☐	PVT Company ☐	
Sector of Business	:	Food ☐	Communication ☐	
		Software ☐	Health/Life science ☐	
		Electronics/Robotics ☐	E-Commerce ☐	
		Agriculture ☐	Advertisement ☐	
		Others ☐	Finance ☐	
		Game ☐	Education ☐	
		Retail ☐		
Business Model	:	B2C ☐	B2B ☐	
		B2G ☐	B2C, B2B ☐	

Does the startup have another office space other than in the Incubator: Yes ☐ No ☐

1. **Activity Structure (put a tick mark to indicate your agreement with regard to performing the following activities: SDA-Strongly Disagree, DA-Disagree, N-Neutral, A-Agree and SA-Strongly Agree)**

No.	Activity Structure	SDA	DA	N	A	SA
1	Developing a business idea					
2	Conducting a market survey					
3	Conducting a feasibility study					
4	Arranging seed capital to start a business					
5	Formally registering a startup					
6	Organising a startup team					
7	Devoting full time to business development					
8	Preparing a business plan					
9	Hiring and training employees					
10	Research and modeling of a prototype or sample					
11	Meeting investors and pitching for funds					
12	Approaching financial institutions for credit					
13	Arranging the technical assistance needed for business					
14	Arranging mentoring support					
15	Arranging office infrastructure facilities					
16	Applying for intellectual properties like patents, trademarks, etc.					
17	Attending workshops and seminars					
18	Arranging the assistance of professionals like accountants, lawyers, etc.					
19	Purchasing stock or raw materials & arranging machinery/equipment					
20	Marketing of the product					
21	Customer generation and care					
22	Sales and revenue generation					
23	Evaluating the performance of startups					

2. Activity Links – Extend of cooperation in the performance of activities

Indicate the extent of cooperation with other startups and incubators in performing the following activities: (VH-Very High, H-High, M-Moderate, L-Low and VL-Very Low)

No.	Activity Link	With Other Startups					With Incubators				
		VH	H	M	L	VL	VH	H	M	L	VL
1	Developing a business idea										
2	Conducting a market survey										
3	Conducting a feasibility study										
4	Arranging seed capital to start a business										
5	Formally registering a startup										
6	Organising a startup team										
7	Devoting full time to business development										
8	Preparing a business plan										
9	Hiring and training employees										
10	Research and modeling of a prototype or sample										
11	Meeting investors and pitching for funds										
12	Approaching financial institutions for credit										
13	Arranging the technical assistance needed for business										
14	Arranging mentoring support										
15	Arranging office infrastructure facilities										
16	Applying for intellectual properties like patents, trademarks, etc.										
17	Attending workshops and seminars										
18	Arranging the assistance of professionals like accountants, lawyers, etc.										

No.	Activity Link	With Other Startups					With Incubators				
		VH	H	M	L	VL	VH	H	M	L	VL
19	Purchasing stock or raw materials & arranging machinery/equipment										
20	Marketing of the product										
21	Customer generation and care										
22	Sales and revenue generation										
23	Evaluating the performance of startups										

3. Organisation Structure (put a tick mark to the statements regarding the organisation structure of the startup: SDA-Strongly Disagree, DA-Disagree, N-Neutral, A-Agree and SA-Strongly Agree)

No.	Organisation Structure	SDA	DA	N	A	SA
1	There is a formal organisation structure for the startup					
2	The individual positions of the members and the hierarchy of positions are well defined					
3	The communication within the startup is formal and structured					
4	The structure of the startup is simple and flexible					
5	The structure of the startup is adaptable to changing environments					
6	The structure of the startup is appropriate for achieving the planned goals					
7	The structure of the startup is appropriate for building business relationships					

4. Actor Bonds (put a tick mark to indicate the structural, financial and social bond with other startups and incubators: VS-Very Strong, S-Strong, MS-Moderately Strong, W-Weak and VW-Very Weak)

No.	Actor Bond	With Other Startups					With Incubators				
		VS	S	MS	W	VW	VS	S	MS	W	VW
	Structural Bond										
1	Performing business activities with mutual support and coordination										
2	Sharing of facilities, equipments and other resources										
3	Formulating policies and programs that enhance business relationships										
4	Developing value added partnerships and collaborations										
	Economic Bond										
5	Capital investment in startup										
6	Providing business credit/grant to startup										
7	Providing facilities/goods/services at lower rate and other financial incentives										
8	Joint investment in innovation projects										
	Social Bond										
9	Personal attachment and friendship										
10	Mutual interaction and communication										
11	Mutual trust and belief										
12	Commitment										

5.1 Resource Collection: Tangible Resources (put a tick mark next to the options indicating the agreement regarding the source of finance of the startup: SDA-Strongly Disagree, DA-Disagree, N- Neutral, A-Agree and SA-Strongly Agree)

No.	**1. Financial Resources – Sources of Funding**					
	State your level of agreement that finance is arranged for the startup through following sources:	**SD**	**D**	**N**	**A**	**SA**
1	Bootstrapping					
2	Earnings of Startup					
3	Grants through Incubators					
4	Grants from State Financial Institutions					
5	Loans from Commercial Banks and Other Financial Institutions					
6	Angel Investors					
7	Other Sources					

5.2 Resource Collection: Tangible Resources (put a tick mark to indicate how the following physical resources are available to startups)

No.	2. Physical Infrastructure Resources	Provided by Incubator	Arranged by Startup Team	Not Required by Startups
1	Office space			
2	Office equipments, furniture and fittings			
3	Conference rooms			
4	Computer systems			
5	Internet/WIFI			
6	Kitchen/Refreshment facilities			
7	Library			
8	Lab facility with equipments			
9	Plant & Machinery/ Equipments			
10	Stock/Raw materials			
11	Electricity for office			
12	Security arrangements of office			

5.3 Resource Collection: Intangible Resources (put a tick mark to the statements regarding human resources and business knowledge of the startup: SDA-Strongly Disagree, DA-Disagree, N- Neutral, A-Agree and SA-Strongly Agree)

No.	3. Human Resources	SDA	DA	N	A	SA
1	There is a team of members working in different positions for the startup					
2	Startup team members are qualified and skilled for their positions					
3	Skilled and qualified personnel are easily available in Kerala					
	4. Business Knowledge					
1	Business knowledge is acquired through coaching from incubation centre					
2	Business knowledge is acquired through training from incubation centre					
3	Business knowledge is acquired through various business activities					

5.4 Resource Collection: Intangible Resources (put a tick mark to indicate the status of technological resources and other intangible assets of the startup)

No.	5. Technological Resources	Developed/Acquired by Startups	Under the Process of Developing/ Acquiring	Not Developed/ Acquired
1	Softwares/Applications			
2	License Agreements			
3	Patented Technology/Design			

No.	6. Other intangible resources	Yes	No
1	Logo		
2	Brand name		

6. **Resource Ties (put a tick mark to indicate the strength of the relationship with other startups and incubators for resource sharing: VS-Very Strong, S-Strong, MS-Moderately Strong, W-Weak and VW-Very Weak)**

No.	Resource Ties	With Other Startups					With Incubators				
		VS	S	M	W	VW	VS	S	M	W	VW
1	Financial Resources										
2	Physical Infrastructure Resources										
3	Human Resources										
4	Business Knowledge										
5	Technological Resources										
6	Other Intangible Resources										

7. **Put a tick mark on the following statements regarding the role of supporting actors in the startup ecosystem (SDA-Strongly Disagree, DA-Disagree, N-Neutral, A-Agree and SA-Strongly Agree)**

No.	Role of Supporting Actors	SDA	DA	N	A	SA
	State Government					
1	Adequate policies are formulated and implemented by the state government for the growth and development of startups in Kerala					
2	Startup policies adopted by the government are favourable for the functioning of startups in the state					
3	It is less time-consuming and involves only limited procedures for availing various benefits for startups through the government					
4	The startup activities in the state are effectively coordinated through the nodal agency, KSUM					
	Investors & Funding Organisations					
5	There are angel investors who are interested in investing in your sector of business					
6	The state financial institutions are ready to provide loans for startups, and the procedures to be followed are simple					

No.	Role of Supporting Actors	SDA	DA	N	A	SA
7	The loan amount is sanctioned and provided to the startups within an appropriate time period by the funding organisations					
8	There is no difficulty in arranging funds through investors and funding organisations in the state					
	Universities & Educational Institutions					
9	Basic education regarding entrepreneurship and startups is provided to students at educational institutions					
10	Students are trained and encouraged to develop their own business ideas.					
11	Organising startup camps/workshops in coordination with other actors in the ecosystem					
12	Provides research and incubation facilities for students with the help of the government or institution itself					
	Mentors					
13	It is easy and affordable for startups to get the help of mentors to support the management of their businesses					
14	Mentors are ready to share their knowledge, time and resources with startups					
15	Mentors help solve the technical, financial, marketing and other problems faced by startups					
16	Mentors help in the revenue generation and performance evaluation of startups					

Thank You

Appendix 2

Interview Schedule – Incubators

Business Relationship Analysis of Startup Ecosystem in Kerala

Name of the Incubation Centre :

Place/Location :

Year of Establishment :

No of Startups :

Period of Incubation :

Supporting Authority/Organisation : Central Government supported ☐

State Government supported ☐

University/Educational Institution supported ☐

Private/Corporate Business Incubator ☐

Details of Startups under incubation

Stage of Startup (Stage from which startups are taken for incubation) :

Ideation ☐ Validation ☐

Early Traction ☐ Scale up ☐

Maturity ☐

Nature of Business : Technology ☐ Non Technology ☐

Both Technology & Non-Technology ☐ Any category ☐

Nature of Output : Product Oriented ☐ Service Oriented ☐

Both Product & Service Oriented ☐ Any category ☐

1. **Activity Structure (put a tick mark to indicate your agreement with regard to performing the following activities: SDA-Strongly Disagree, DA-Disagree, N-Neutral, A-Agree and SA-Strongly Agree)**

No.	Activity Structure					
	Pre-Incubation	**SDA**	**DA**	**N**	**A**	**SA**
1	Providing induction programmes					
2	Providing a coworking space					
3	Providing training for entrepreneurial skill development					

No.	Activity Structure					
	Pre-Incubation	**SDA**	**DA**	**N**	**A**	**SA**
4	Conducting feasibility analyses for different ideas					
5	Conducting technical need analysis for different teams					
6	Providing labs and research facilities for experimenting					
7	Providing assistance in business plan development and team building					
	Incubation					
8	Screening and selection of startups for incubation					
9	Proving physical infrastructure facilities to startups					
10	Providing accommodation facilities to startup teams					
11	Assisting startups in prototype development					
12	Organising workshops, seminars and events					
13	Providing financial incentives and seed capital to startups					
14	Help startups recruit skilled and talented human resources.					
15	Arranging mentors to provide mentoring support to startups					
16	Providing technical support to startups					
17	Providing facilities for advanced research and development					
18	Assisting startups in applying for intellectual properties like patents, trademarks etc.					
19	Arranging assistance of professionals like accountants, lawyers etc.					
20	Providing opportunities to meet investors and pitch for funding					
21	Assisting in product marketing and customer generation					
22	Conducting periodical reviews of startup performance					

No.	Activity Structure					
	Pre-Incubation	**SDA**	**DA**	**N**	**A**	**SA**
	Graduation/Post-Incubation					
23	Developing a proper exit plan for incubatees					
24	Providing business advice and support for business development					
25	Providing an extension to the graduated startups to continue using the incubation facilities if they need them.					
26	Allowing the startups to continue using the lab and other research facilities					
27	Providing support for technology commercialisation					
28	Providing assistance in portfolio management and IPOs					
29	Support for business expansion and internationalisation					

2. Activity Links – Extend of cooperation in the performance of activities

Indicate the extent of cooperation with other incubators and startups in performing the following activities: (VH-Very High, H-High, M-Moderate, L-Low and VL-Very Low)

No.	Activity Structure										
	Pre-Incubation	**With Other Incubators**					**With Startups**				
		VH	**H**	**M**	**L**	**VL**	**VH**	**H**	**M**	**L**	**VL**
1	Providing induction programmes										
2	Providing a coworking space										
3	Providing training for entrepreneurial skill development										
4	Conducting feasibility analyses for different ideas										
5	Conducting technical need analysis for different teams										

No.	Activity Structure										
	Pre-Incubation	**With Other Incubators**					**With Startups**				
		VH	**H**	**M**	**L**	**VL**	**VH**	**H**	**M**	**L**	**VL**
6	Providing labs and research facilities for experimenting										
7	Providing assistance in business plan development and team building										
	Incubation										
8	Screening and selection of startups for incubation										
9	Proving physical infrastructure facilities to startups										
10	Providing accommodation facilities to startup teams										
11	Assisting startups in prototype development										
12	Organising workshops, seminars and events										
13	Providing financial incentives and seed capital to startups										
14	Help startups recruit skilled and talented human resources										
15	Arranging mentors to provide mentoring support to startups										
16	Providing technical support to startups										
17	Providing facilities for advanced research and development										
18	Assisting startups in applying for intellectual properties like patents, trademarks etc.										

No.	Activity Structure										
	Pre-Incubation	**With Other Incubators**					**With Startups**				
		VH	**H**	**M**	**L**	**VL**	**VH**	**H**	**M**	**L**	**VL**
19	Arranging assistance of professionals like accountants, lawyers etc.										
20	Providing an opportunities to meet investors and pitch for funding										
21	Assisting in product marketing and customer generation										
22	Conducting periodical reviews of startup performance										
Graduation/Post-Incubation											
23	Developing a proper exit plan for incubatees										
24	Providing business advice and support for business development										
25	Providing an extension to the graduated startups to continue using the incubation facilities if they need them										
26	Allowing the startups to continue using the lab and other research facilities										
27	Providing support for technology commercialisation										
28	Providing assistance in portfolio management and IPOs										
29	Support for business expansion and internationalisation										

3. Organisation Structure (put a tick mark to the statements regarding the organisation structure of the incubation centre: SDA-Strongly Disagree, DA-Disagree, N-Neutral, A-Agree and SA-Strongly Agree)

No.	Organisation Structure	SDA	DA	N	A	SA
1	There is a formal organisation structure for the incubator					
2	The individual positions of the members and the hierarchy of positions are well defined					
3	The communication within the incubator is formal and structured					
4	The structure of the incubator is simple and flexible					
5	The structure of the incubator is adaptable to changing environments					
6	The structure of the incubator is appropriate for achieving the planned goals					
7	The structure of the incubator is appropriate for building business relationships					

4. Actor bonds (put a tick mark to indicate the structural, financial and social bond with other incubators and startups: VS-Very Strong, S-Strong, MS-Moderately Strong, W-Weak and VW-Very Weak)

No.	Actor Bond	With Other Incubators					With Startups				
		VS	S	MS	W	VW	VS	S	MS	W	VW
	Structural Bond										
1	Performing business activities with mutual support and coordination										
2	Sharing of facilities, information, equipments and other resources										
3	Formulating policies and programs that enhance business relationships										
4	Developing value added partnerships and Connections										

No.	Actor Bond	With Other Incubators					With Startups				
		VS	S	MS	W	VW	VS	S	MS	W	VW
	Economic Bond										
5	Fund for managing incubation expenses										
6	Equity investment in startups										
7	Providing grants and loans to startups										
8	Providing facilities/goods/services at lower rate and other financial incentives										
9	Joint investment in innovation projects										
	Social Bond										
10	Personal attachment and friendship										
11	Mutual interaction and communication										
12	Mutual trust and belief										
13	Commitment										

5.1 Resource Collection: Tangible Resources (put a tick mark on the options indicating the agreement regarding the source of finance for incubation centres: SDA-Strongly Disagree, DA-Disagree, N- Neutral, A-Agree and SA-Strongly Agree)

No.	Financial Resources	SDA	DA	N	A	SA
	The financial resources are acquired from the following sources:					
1	Central Government					
2	State Government					
3	University/Educational Institution					
4	Fund from Corporate/Private Investors					
5	Loans from Banks and Other Financial Institutions					
6	Own Income					
7	Other Sources					

5.2 Resource Collection: Tangible Resources (put tick on the following options to indicate whether startups have paid, free or no access to following physical infrastructure resources)

No.	Physical Infrastructure Resources	Paid Access	Free Access	No Access
1	Office space			
2	Office equipments, furniture and fittings			
3	Conference rooms			
4	Computer systems			
5	Internet/WIFI			
6	Kitchen/Refreshment facilities			
7	Library			
8	Lab facility with equipments			
9	Plant & Machinery			
10	Raw materials			
11	Electricity			
12	Security arrangements			

5.3 Resource Collection: Intangible Resources (put a tick mark to the statements regarding human resources of incubation centres: SDA-Strongly Disagree, DA-Disagree, N-Neutral, A-Agree and SA-Strongly Agree)

No.	Human Resources	SDA	DA	N	A	SA
1	There are staff members in various positions working within the incubator					
2	The staff members are appointed through a formal appointment process					
3	There are sufficient numbers of workers in the incubator					
4	The staff members are skilled and qualified for their positions					

5.4 Resource Collection: Other Intangible Resources (Tick the appropriate option for the various intangible assets of the incubator)

1. Business Knowledge	Coaching only	Training only	Coaching and Training	None
Training and Coaching				

2. Business Network	Strong internal network only	Strong external network only	Strong internal and external network	No strong network
Internal and External network				

3. Business Reputation	Good	Average	Neutral	Bad
Track Record				

4. Intellectual properties	Owned	Not owned
Patent		
Trademark		

6. Resource Ties (put a tick mark to indicate the level of resource sharing of incubators with other incubators and startups: VS-Very Strong, S-Strong, MS-Moderately Strong, W-Weak and VW-Very Weak)

No.	Resource Ties	With Other Incubators						With Startups			
		VS	S	M	W	VW	VS	S	M	W	VW
1	Financial Resource										
2	Physical Infrastructure resources										
3	Human Resource										
4	Business Knowledge										
5	Business Networks										
6	Business Reputation										
7	Intellectual Properties										

7. **Put a tick mark on the following statements regarding the role of supporting actors in the startup ecosystem: (SDA-Strongly Disagree, DA-Disagree, N-Neutral, A-Agree and SA-Strongly Agree)**

No.	Role of Supporting Actors	SDA	DA	N	A	SA
	State Government					
1	The government has introduced policies that support the functioning of incubators in the state					
2	The government provides infrastructural support to incubators					
3	The government provides financial assistance to incubators for their development and supports the startups					
4	The government effectively coordinates the functioning of various incubators in the state through KSUM					
	Investors & Funding organisations					
5	State financial institutions help provide loans to incubated startups					
6	Angel networks and venture capital firms are ready to coordinate with incubators and provide funds to startups					
7	Investors/funding organisations coordinate with incubators in arranging seminars/ workshops/pitching sessions for the startups					
8	Investors/funding organisations provide timely funding to startups and evaluate their performance					
	Universities & Educational Institutions					
9	Basic education regarding entrepreneurship and startups is provided to students at educational institutions					
10	Students are trained and encouraged to develop their own business ideas					
11	Organising startup camps/workshops in coordination with other actors in the ecosystem					

No.	Role of Supporting Actors	SDA	DA	N	A	SA
12	Provides incubation and research facilities for students to support their startup ideas with the help of the government or institution itself					
	Mentors					
13	Mentors are available to coordinate with incubators and help startups manage their businesses					
14	Mentors are ready to share their knowledge, time and resources with incubated startups					
15	Mentors support incubators in arranging seminars/workshops/ pitching sessions for startups					
16	Mentors help incubators evaluate and improve the performance of startups					

Thank You

Appendix 3

EFA Correlation Matrix – Activity Structure of Startups

1. Developing a business idea
2. Conducting a market survey
3. Conducting a feasibility study
4. Arranging seed capital to start a business
5. Formally registering a startup
6. Organising a startup team
7. Devoting full time to business development
8. Preparing a business plan
9. Hiring and training employees
10. Research and modeling of a prototype or sample
11. Meeting investors and pitching for funds
12. Approaching financial institutions for credit
13. Arranging the technical assistance needed for business
14. Arranging mentoring support
15. Arranging office infrastructure facilities
16. Applying for intellectual properties like patents, trademarks, etc.
17. Attending workshops and seminars
18. Arranging the assistance of professionals like accountants, lawyers, etc.
19. Purchasing stock or raw materials & arranging machinery/equipment
20. Marketing of the product
21. Customer generation and care
22. Sales and revenue generation
23. Evaluating the performance of startups

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
1	1	.680	.578	.510	.484	.439	.447	.493	.345	.149	.320	.188	.188	.303	.215	.012	.279	.226	-.125	.251	.345	.341	.313
2	.680	1	.800	.369	.457	.481	.426	.461	.213	.227	.358	.293	.286	.229	.319	.054	.348	.345	-.037	.244	.285	.277	.273
3	.578	.800	1	.386	.551	.531	.551	.454	.213	.222	.326	.294	.210	.260	.286	.110	.374	.384	-.056	.250	.321	.311	.327
4	.510	.369	.386	1	.549	.253	.302	.286	.155	.205	.234	.176	.137	.152	.221	.029	.240	.137	-.014	.111	.221	.212	.200
5	.484	.457	.551	.549	1	.531	.427	.504	.338	.183	.345	.285	.252	.222	.212	.172	.301	.382	-.117	.203	.248	.311	.297
6	.439	.481	.531	.253	.531	1	.680	.616	.542	.146	.448	.386	.287	.359	.365	.238	.445	.438	-.073	.215	.299	.373	.387
7	.447	.426	.551	.302	.427	.680	1	.673	.516	.151	.403	.354	.106	.289	.315	.120	.350	.356	-.146	.288	.398	.411	.413
8	.493	.461	.454	.286	.504	.616	.673	1	.557	.113	.402	.367	.101	.169	.296	.017	.205	.250	-.097	.277	.375	.412	.300
9	.345	.213	.213	.155	.338	.542	.516	.557	1	.190	.416	.305	.233	.374	.210	.146	.325	.263	-.021	.251	.288	.347	.301
10	.149	.227	.222	.205	.183	.146	.151	.113	.190	1	.349	.213	.342	.240	.210	.186	.332	.317	.053	.201	.113	.112	.163
11	.320	.358	.326	.234	.345	.448	.403	.402	.416	.349	1	.734	.066	.225	.169	.309	.447	.381	.089	.252	.303	.388	.465
12	.188	.293	.294	.176	.285	.386	.354	.367	.305	.213	.734	1	.177	.134	.043	.287	.334	.301	.119	.112	.195	.284	.303
13	.188	.286	.210	.137	.252	.287	.106	.101	.233	.342	.066	.177	1	.445	.201	.119	.361	.401	-.034	.190	.186	.256	.185
14	.303	.229	.260	.152	.222	.359	.289	.169	.374	.240	.225	.134	.445	1	.268	.190	.565	.131	-.084	.177	.102	.150	.238
15	.215	.319	.286	.221	.212	.365	.315	.296	.210	.210	.169	.043	.201	.268	1	-.122	.315	.303	.041	.212	.244	.286	.286
16	.012	.054	.110	.029	.172	.238	.120	.017	.146	.186	.309	.287	.119	.190	-.122	1	.281	.240	.275	.047	-.066	.032	.141
17	.279	.348	.374	.240	.301	.445	.350	.205	.325	.332	.447	.334	.361	.565	.315	.281	1	.292	-.157	.271	.290	.333	.331
18	.226	.345	.384	.137	.382	.438	.356	.250	.263	.317	.381	.301	.401	.131	.303	.240	.292	1	.057	.251	.333	.406	.381
19	-.125	-.037	-.056	-.014	-.117	-.073	-.146	-.097	-.021	.053	.089	.119	-.034	-.084	.041	.275	-.157	.057	1	-.057	-.091	-.109	-.021
20	.251	.244	.250	.111	.203	.215	.288	.277	.251	.201	.252	.112	.190	.177	.212	.047	.271	.251	-.057	1	.770	.671	.649
21	.345	.285	.321	.221	.248	.299	.398	.375	.288	.113	.303	.195	.186	.102	.244	-.066	.290	.333	-.091	.770	1	.788	.665
22	.341	.277	.311	.212	.311	.373	.411	.412	.347	.112	.388	.284	.256	.150	.286	.032	.333	.406	-.109	.671	.788	1	.833
23	.313	.273	.327	.200	.297	.387	.413	.300	.301	.163	.465	.303	.185	.238	.286	.141	.331	.381	-.021	.649	.665	.833	1

Appendix 4

EFA Correlation Matrix – Organisation Structure of Startups

1. There is a formal organisation structure for the startup
2. The individual positions of the members and the hierarchy of positions are well defined
3. The communication within the startup is formal and structured
4. The structure of the startup is simple and flexible
5. The structure of the startup is adaptable to changing environments
6. The structure of the startup is appropriate for achieving the planned goals
7. The structure of the startup is appropriate for building business relationships

	1	**2**	**3**	**4**	**5**	**6**	**7**
1	1.000	.927	.709	.560	.574	.611	.700
2	.927	1.000	.697	.579	.582	.625	.692
3	.709	.697	1.000	.548	.462	.474	.528
4	.560	.579	.548	1.000	.800	.693	.695
5	.574	.582	.462	.800	1.000	.766	.716
6	.611	.625	.474	.693	.766	1.000	.869
7	.700	.692	.528	.695	.716	.869	1.000

Appendix 5

EFA Correlation Matrix – Activity Links with Other Startups

1. Developing a business idea
2. Conducting a market survey
3. Conducting a feasibility study
4. Formally registering a startup
5. Organising a startup team
6. Devoting full time to business development
7. Hiring and training employees
8. Research and modelling of a prototype or sample
9. Arranging the technical assistance needed for business
10. Arranging mentoring support
11. Arranging office infrastructure facilities
12. Applying for intellectual properties like patents, trademarks etc.
13. Arranging assistance of professionals like accountants, lawyers etc.
14. Purchasing stock or raw materials & arranging machinery/equipment
15. Marketing of the product
16. Customer generation and care
17. Sales and revenue generation
18. Evaluating the performance of startups

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
1	1	.680	.578	.510	.484	.439	.447	.493	.345	.149	.320	.188	.188	.303	.215	.012	.279	.226
2	.680	1	.800	.369	.457	.481	.426	.461	.213	.227	.358	.293	.286	.229	.319	.054	.348	.345
3	.578	.800	1	.386	.551	.531	.551	.454	.213	.222	.326	.294	.210	.260	.286	.110	.374	.384
4	.510	.369	.386	1	.549	.253	.302	.286	.155	.205	.234	.176	.137	.152	.221	.029	.240	.137
5	.484	.457	.551	.549	1	.531	.427	.504	.338	.183	.345	.285	.252	.222	.212	.172	.301	.382
6	.439	.481	.531	.253	.531	1	.680	.616	.542	.146	.448	.386	.287	.359	.365	.238	.445	.438
7	.447	.426	.551	.302	.427	.680	1	.673	.516	.151	.403	.354	.106	.289	.315	.120	.350	.356
8	.493	.461	.454	.286	.504	.616	.673	1	.557	.113	.402	.367	.101	.169	.296	.017	.205	.250
9	.345	.213	.213	.155	.338	.542	.516	.557	1	.190	.416	.305	.233	.374	.210	.146	.325	.263
10	.149	.227	.222	.205	.183	.146	.151	.113	.190	1	.349	.213	.342	.240	.210	.186	.332	.317
11	.320	.358	.326	.234	.345	.448	.403	.402	.416	.349	1	.734	.066	.225	.169	.309	.447	.381
12	.188	.293	.294	.176	.285	.386	.354	.367	.305	.213	.734	1	.177	.134	.043	.287	.334	.301
13	.188	.286	.210	.137	.252	.287	.106	.101	.233	.342	.066	.177	1	.445	.201	.119	.361	.401
14	.303	.229	.260	.152	.222	.359	.289	.169	.374	.240	.225	.134	.445	1	.268	.190	.565	.131
15	.215	.319	.286	.221	.212	.365	.315	.296	.210	.210	.169	.043	.201	.268	1	-.122	.315	.303
16	.012	.054	.110	.029	.172	.238	.120	.017	.146	.186	.309	.287	.119	.190	-.122	1	.281	.240
17	.279	.348	.374	.240	.301	.445	.350	.205	.325	.332	.447	.334	.361	.565	.315	.281	1	.292
18	.226	.345	.384	.137	.382	.438	.356	.250	.263	.317	.381	.301	.401	.131	.303	.240	.292	1

Appendix 6

EFA Correlation Matrix – Actor Bonds with Other Startups

SB 1	-	Performing business activities with mutual support and coordination
SB 2	-	Sharing of facilities, equipments and other resources
SB 3	-	Formulating policies and programs that enhance business relationships
SB 4	-	Developing value added partnerships and collaborations
EB 1	-	Capital investment in startup
EB 2	-	Providing business credit/grant to startup
EB 3	-	Providing facilities/goods/services at lower rate and other financial incentives
EB 4	-	Joint investment in innovation projects
SOB 1	-	Personal attachment and friendship
SOB 2	-	Mutual interaction and communication
SOB 3	-	Mutual trust and belief
SOB 4	-	Commitment

	SB 1	SB 2	SB 3	SB 4	EB 1	EB 2	EB 3	EB 4	SOB 1	SOB 2	SOB 3	SOB 4
SB 1	1.000	.797	.685	.559	.324	.374	.355	.330	.526	.546	.559	.500
SB 2	.797	1.000	.785	.674	.340	.409	.439	.369	.536	.529	.547	.525
SB 3	.685	.785	1.000	.819	.261	.327	.441	.415	.477	.513	.550	.512
SB 4	.559	.674	.819	1.000	.199	.337	.450	.405	.460	.541	.570	.507
EB 1	.324	.340	.261	.199	1.000	.738	.585	.382	.183	.195	.225	.184
EB 2	.374	.409	.327	.337	.738	1.000	.589	.401	.303	.315	.373	.325
EB 3	.355	.439	.441	.450	.585	.589	1.000	.729	.280	.296	.361	.357
EB 4	.330	.369	.415	.405	.382	.401	.729	1.000	.348	.375	.438	.417
SOB 1	.526	.536	.477	.460	.183	.303	.280	.348	1.000	.911	.834	.835
SOB 2	.546	.529	.513	.541	.195	.315	.296	.375	.911	1.000	.860	.806
SOB 3	.559	.547	.550	.570	.225	.373	.361	.438	.834	.860	1.000	.917
SOB 4	.500	.525	.512	.507	.184	.325	.357	.417	.835	.806	.917	1.000

Appendix 7

EFA Correlation Matrix – Resource Ties with Other Startups

1. Financial Resources
2. Physical Infrastructure Resources
3. Human Resources
4. Business Knowledge
5. Technological Resources

	1	**2**	**3**	**4**	**5**
1	1.000	.322	.371	.390	.456
2	.322	1.000	.238	.442	.265
3	.371	.238	1.000	.551	.458
4	.390	.442	.551	1.000	.531
5	.456	.265	.458	.531	1.000

Appendix 8

EFA Correlation Matrix – Activity Links with Incubators

1. Developing a business idea
2. Conducting a market survey
3. Conducting a feasibility study
4. Arranging seed capital to start a business
5. Formally registering a startup
6. Organising a startup team
7. Devoting full time to business development
8. Preparing a business plan
9. Hiring and training employees
10. Research and modelling of a prototype or sample
11. Meeting investors and pitching for funds
12. Approaching financial institutions for credit
13. Arranging the technical assistance needed for business
14. Applying for intellectual properties like patents, trademarks, etc.
15. Arranging the assistance of professionals like accountants, lawyers, etc.
16. Purchasing stock or raw materials & arranging machinery/equipment
17. Marketing of the product
18. Customer generation and care
19. Sales and revenue generation
20. Evaluating the performance of startups

xxx

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	.797	.729	.450	.474	.529	.248	.392	.339	.020	.126	.147	.037	.180	.194	.128	.019	.147	.136	.065
2	.797	1	.892	.449	.546	.588	.324	.502	.415	.089	.101	.151	.115	.057	.171	.018	.033	.108	.122	.095
3	.729	.892	1	.452	.514	.613	.386	.522	.386	.106	.083	.121	.090	.029	.225	-.012	.044	.149	.154	.118
4	.450	.449	.452	1	.679	.626	.448	.535	.354	.172	.275	.308	.153	.202	.229	.153	.147	.157	.188	.282
5	.474	.546	.514	.679	1	.786	.519	.603	.463	.149	.210	.263	.169	.042	.247	.092	.101	.147	.179	.183
6	.529	.588	.613	.626	.786	1	.498	.672	.555	.211	.260	.267	.139	.126	.291	.151	.183	.276	.330	.299
7	.248	.324	.386	.448	.519	.498	1	.678	.443	.264	.141	.170	.167	.125	.178	.067	.105	.142	.209	.257
8	.392	.502	.522	.535	.603	.672	.678	1	.570	.270	.244	.294	.146	.018	.347	.026	.270	.313	.349	.382
9	.339	.415	.386	.354	.463	.555	.443	.570	1	.190	.300	.330	.233	.102	.316	.125	.341	.376	.371	.369
10	.020	.089	.106	.172	.149	.211	.264	.270	.190	1	.165	.236	.529	.177	.261	.293	.348	.236	.248	.202
11	.126	.101	.083	.275	.210	.260	.141	.244	.300	.165	1	.741	.158	.288	.544	.261	.290	.277	.253	.337
12	.147	.151	.121	.308	.263	.267	.170	.294	.330	.236	.741	1	.255	.290	.421	.320	.365	.281	.305	.296
13	.037	.115	.090	.153	.169	.139	.167	.146	.233	.529	.158	.255	1	.364	.259	.357	.292	.195	.160	.135
14	.180	.057	.029	.202	.042	.126	.125	.018	.102	.177	.288	.290	.364	1	.312	.409	.230	.144	.105	.089
15	.194	.171	.225	.229	.247	.291	.178	.347	.316	.261	.544	.421	.259	.312	1	.389	.413	.399	.329	.302
16	.128	.018	-.012	.153	.092	.151	.067	.026	.125	.293	.261	.320	.357	.409	.389	1	.476	.280	.234	.097
17	.019	.033	.044	.147	.101	.183	.105	.270	.341	.348	.290	.365	.292	.230	.413	.476	1	.730	.616	.481
18	.147	.108	.149	.157	.147	.276	.142	.313	.376	.236	.277	.281	.195	.144	.399	.280	.730	1	.857	.669
19	.136	.122	.154	.188	.179	.330	.209	.349	.371	.248	.253	.305	.160	.105	.329	.234	.616	.857	1	.815
20	.065	.095	.118	.282	.183	.299	.257	.382	.369	.202	.337	.296	.135	.089	.302	.097	.481	.669	.815	1

Appendix 9

EFA Correlation Matrix – Actor Bonds with Incubators

SB 1	-	Performing business activities with mutual support and coordination
SB 2	-	Sharing of facilities, equipments and other resources
SB 3	-	Formulating policies and programs that enhance business relationships
SB 4	-	Developing value added partnerships and collaborations
EB 1	-	Capital investment in startup
EB 2	-	Providing business credit/grant to startup
EB 3	-	Providing facilities/goods/services at lower rate and other financial incentives
EB 4	-	Joint investment in innovation projects
SOB 1	-	Personal attachment and friendship
SOB 2	-	Mutual interaction and communication
SOB 3	-	Mutual trust and belief
SOB 4	-	Commitment

	SB 1	SB 2	SB 3	SB 4	EB 1	EB 2	EB 3	EB 4	SOB 1	SOB 2	SOB 3	SOB 4
SB 1	1.000	.317	.709	.744	.225	.486	.398	.128	.563	.577	.483	.449
SB 2	.317	1.000	.305	.273	-.061	-.009	-.050	-.120	.086	.125	.198	.216
SB 3	.709	.305	1.000	.798	.331	.561	.374	.117	.566	.593	.555	.505
SB 4	.744	.273	.798	1.000	.278	.505	.434	.147	.605	.599	.513	.482
EB 1	.225	-.061	.331	.278	1.000	.444	.508	.522	.293	.345	.347	.336
EB 2	.486	-.009	.561	.505	.444	1.000	.476	.342	.408	.475	.445	.416
EB 3	.398	-.050	.374	.434	.508	.476	1.000	.456	.412	.479	.373	.370
EB 4	.128	-.120	.117	.147	.522	.342	.456	1.000	.217	.235	.302	.308
SOB 1	.563	.086	.566	.605	.293	.408	.412	.217	1.000	.904	.722	.629
SOB 2	.577	.125	.593	.599	.345	.475	.479	.235	.904	1.000	.779	.691
SOB 3	.483	.198	.555	.513	.347	.445	.373	.302	.722	.779	1.000	.930
SOB 4	.449	.216	.505	.482	.336	.416	.370	.308	.629	.691	.930	1.000

Appendix 10

EFA Correlation Matrix – Resource Ties with Incubators

1. Financial Resources
2. Human Resources
3. Business Knowledge
4. Technological Resources
5. Other Intangible Resources

	1	**2**	**3**	**4**	**5**
1	1.000	.514	.628	.298	.449
2	.514	1.000	.666	.592	.495
3	.628	.666	1.000	.466	.549
4	.298	.592	.466	1.000	.462
5	.449	.495	.549	.462	1.000

Appendix 11

EFA Correlation Matrix – Role of Supporting Actors

SG 1 - Adequate policies are formulated and implemented by the state government for the growth and development of startups in Kerala.

SG 2 - Startup policies adopted by the government are favourable for the functioning of startups in the state.

SG 3 - It is less time-consuming and involves only limited procedures for availing various benefits for startups through the government.

SG 4 - The startup activities in the state are effectively coordinated through the nodal agency, KSUM.

FI 1 - There are angel investors who are interested in investing in your sector of business.

FI 2 - The state financial institutions are ready to provide loans for startups, and the procedures to be followed are simple.

FI 3 - The loan amount is sanctioned and provided to the startups within an appropriate time period by the funding organisations.

FI 4 - There is no difficulty in arranging funds through investors and funding organisations in the state.

UN 1 - Basic education regarding entrepreneurship and startups is provided to students at educational institutions.

UN 2 - Students are trained and encouraged to develop their own business ideas.

UN 3 - Organising startup camps/workshops in coordination with other actors in the ecosystem.

UN 4 - Provides research and incubation facilities for students with the help of the government or institution itself.

MN 1 - It is easy and affordable for startups to get the help of mentors to support the management of their businesses.

MN 2 - Mentors are ready to share their knowledge, time and resources with startups.

MN 3 - Mentors help solve the technical, financial, marketing and other problems faced by startups.

MN 4 - Mentors help in the revenue generation and performance evaluation of startups.

	SG 1	SG 2	SG 3	SG 4	FI 1	FI 2	FI 3	FI 4	UN 1	UN 2	UN 3	UN 4	MN 1	MN 2	MN 3	MN 4
SG 1	1.000	.829	.688	.717	.390	.461	.247	.380	.293	.204	.248	.219	.346	.443	.440	.388
SG 2	.829	1.000	.769	.743	.381	.484	.198	.371	.258	.237	.238	.220	.387	.444	.422	.395
SG 3	.688	.769	1.000	.638	.310	.389	.150	.381	.218	.223	.225	.231	.351	.367	.378	.370
SG 4	.717	.743	.638	1.000	.417	.420	.279	.385	.245	.179	.231	.242	.267	.326	.320	.294
FI 1	.390	.381	.310	.417	1.000	.570	.172	.574	.244	.230	.293	.281	.412	.368	.396	.379
FI 2	.461	.484	.389	.420	.570	1.000	.238	.540	.268	.201	.206	.191	.283	.406	.397	.355
FI 3	.247	.198	.150	.279	.172	.238	1.000	.422	.098	.090	.098	.101	.039	.099	.114	.100
FI 4	.380	.371	.381	.385	.574	.540	.422	1.000	.180	.150	.203	.197	.337	.333	.348	.341
UN 1	.293	.258	.218	.245	.244	.268	.098	.180	1.000	.718	.714	.639	.215	.296	.287	.252
UN 2	.204	.237	.223	.179	.230	.201	.090	.150	.718	1.000	.749	.772	.278	.315	.307	.308
UN 3	.248	.238	.225	.231	.293	.206	.098	.203	.714	.749	1.000	.816	.274	.332	.313	.280
UN 4	.219	.220	.231	.242	.281	.191	.101	.197	.639	.772	.816	1.000	.305	.353	.341	.328
MN 1	.346	.387	.351	.267	.412	.283	.039	.337	.215	.278	.274	.305	1.000	.721	.691	.721
MN 2	.443	.444	.367	.326	.368	.406	.099	.333	.296	.315	.332	.353	.721	1.000	.887	.807
MN 3	.440	.422	.378	.320	.396	.397	.114	.348	.287	.307	.313	.341	.691	.887	1.000	.881
MN 4	.388	.395	.370	.294	.379	.355	.100	.341	.252	.308	.280	.328	.721	.807	.881	1.000