PRODUCT AND PROCESS INNOVATION: ANTECEDENTS AND PERFORMANCE OUTCOMES IN SMALL IT FIRMS IN INDIA

Thesis submitted to

Cochin University of Science and Technology

for the award of the Degree of

Doctor of Philosophy

under

The Faculty of Social Sciences

by

Rajeev Mukundan

Under the Guidance of

Dr. Sam Thomas

School of Management Studies
Cochin University of Science and Technology
Kochi – 682022

September 2015

‘Product and Process Innovation: Antecedents and Performance outcomes in small IT firms in India’

Ph. D Thesis under the Faculty of Social Sciences

Author

Rajeev Mukundan
School of Management Studies
Cochin University of Science and Technology
Cochin - 682 022, Kerala, India
email: rajeevmukundantampa@gmail.com

Supervising Guide

Dr. Sam Thomas
Assistant Professor,
School of Management Studies
Cochin University of Science and Technology
Cochin - 682 022, Kerala, India
email: sam@cusat.ac.in

School of Management Studies
Cochin University of Science and Technology
Kochi - 682 022

September 2015

School of Management Studies
Cochin University of Science and Technology
Kochi - 682 022

Dr. Sam Thomas
Assistant Professor

Mob: +91 9846 152127
E mail: sam@cusat.ac.in

Date: 09/09/2015

Certificate

This is to certify that thesis entitled **"Product and Process Innovation: Antecedents and Performance outcomes in small IT firms in India"** is a record of bonafide research work done by Mr. Rajeev Mukundan, part-time research scholar, under my supervision and guidance.

The thesis is the outcome of his original work and has not formed the basis for the award of any degree, diploma, associateship, fellowship or any other similar title and is worth submitting for the award of the degree of Doctor of Philosophy under the Faculty of Social Sciences of Cochin University of Science and Technology. All the relevant corrections and modifications suggested by the audience during the pre-synopsis seminar and recommended by the Doctoral committee have been incorporated in the thesis.

Dr. Sam Thomas
Research Guide

Declaration

I hereby declare that this thesis entitled **"Product and Process Innovation: Antecedents and Performance outcomes in small IT firms in India"** is a record of the bona-fide research work done by me and that it has not previously formed the basis for the award of any degree, diploma, associateship, fellowship, or any other title of recognition.

Kochi **Rajeev Mukundan**

Date: 09/09/2015

Acknowledgement

Foremost, I am grateful to God for the blessings, without which it would have been impossible to embark upon and sustain this journey.

I express my sincere gratitude to Dr. Sam Thomas, for being an extraordinary Research Guide and advisor. His support and encouragement was a constant source of motivation for me, throughout the duration of this work. His guidance has helped me evolve as a student and researcher, and I remain deeply indebted to him.

I place on record, my thanks to Prof. (Dr.) Sebastian Rupert Mampilly, Member of Doctoral Committee for this study, for his invaluable guidance at various stages of this project, particularly in the area of Research Methodology.

I thank the School of Management Studies, Cochin University of Science and Technology, for providing me the opportunity to conduct this Research, and the facilities extended to me. I also thank the Faculty Members of School of Management Studies, for sharing their rich experience and knowledge.

My gratitude goes out to my colleagues and peers at School of Management studies. I am extremely thankful to Prof. Veeva Mathew, K. Praveena, Prof. Sreekumar Pillai and Prof. Manoj Menon for providing help and suggestions at important junctures.

I am deeply indebted to the Organizations and the Managers who took part in this study. Responding to the survey was time consuming and intense, and without their commitment and immense help, this study would not have been possible.

I am extremely thankful to Dr. Kaja Rangus for sharing insights in her expertise area of Open Innovation. I would also like to thank Dr. Marcel Bogers of University of Southern Denmark, Prof. (Dr.) Yogesh Dwivedi of Swansea University, and Dr. Vigeswara Ilavarasan of Indian Institute of Technology, Delhi, for giving me the opportunity to tap into their wealth of knowledge related to the subject area of this research.

Special thanks to my friends and peers from various IT firms, for sharing their experiences and case studies from their organizations. The practitioner's perspective provided by them was of significant help to this study.

I will always remember with affection the motivation and encouragement of my parents, partner, daughters and brothers at all stages of this journey.

I have not been able to mention the names of several others who have assisted me directly in this research project significantly. And then others who have been a source of inspiration. A big thanks goes out to all of them.

Rajeev Mukundan

Abstract

Innovation is a strategic necessity for the survival of today's organizations. The wide recognition of innovation as a competitive necessity, particularly in dynamic market environments, makes it an evergreen domain for research. This dissertation deals with innovation in small Information Technology (IT) firms in India. The IT industry in India has been a phenomenal success story of the last three decades, and is today facing a crucial phase in its history characterized by the need for fundamental changes in strategies, driven by innovation. This study, while motivated by the dynamics of changing times, importantly addresses the research gap on small firm innovation in Indian IT.

This study addresses three main objectives: (a) drivers of innovation in small IT firms in India (b) impact of innovation on firm performance (c) variation in the extent of innovation adoption in small firms. Product and process innovation were identified as the two most contextually relevant types of innovation for small IT firms. The antecedents of innovation were identified as Intellectual Capital, Creative Capability, Top Management Support, Organization Learning Capability, Customer Involvement, External Networking and Employee Involvement.

Survey method was adopted for data collection and the study unit was the firm. Surveys were conducted in 2014 across five South Indian cities. Small firm was defined as one with 10-499 employees. Responses from 205 firms were chosen for analysis. Rigorous statistical analysis was done to generate meaningful insights. The set of drivers of product innovation (Intellectual Capital, Creative Capability, Top Management Support, Customer Involvement, External Networking, and Employee Involvement)

were different from that of process innovation (Creative Capability, Organization Learning Capability, External Networking, and Employee Involvement). Both product and process innovation had strong impact on firm performance. It was found that firms that adopted a combination of product innovation and process innovation had the highest levels of firm performance. Product innovation and process innovation fully mediated the relationship between all the seven antecedents and firm performance.

The results of this study have several important theoretical and practical implications. To the best of the researcher's knowledge, this is the first time that an empirical study of firm level innovation of this kind has been undertaken in India. A measurement model for product and process innovation was developed, and the drivers of innovation were established statistically. Customer Involvement, External Networking and Employee Involvement are elements of Open Innovation, and all three had strong association with product innovation, and the latter twohad strong association with process innovation. The results showed that proclivity for Open Innovation is healthy in the Indian context. Practical implications have been outlined along how firms can organize themselves for innovation, the human talent for innovation, the right culture for innovation and for open innovation.

While some specific examples of possible future studies have been recommended, the researcher believes that the study provides numerous opportunities to further this line of enquiry.

Contents

Chapter 1

Chapter 2

Chapter 3

Chapter 4

List of Tables

List of Figures

Abbreviations

ADM	Application Development and Maintenance
AICTE	All India Council for Technical Education
AVE	Average Variance Extracted
BPM	Business Process Management
CAD/CAM	Computer Aided Design/Computer Aided Manufacturing
CAGR	Cumulative Average Growth Rate
CBSEM	Co-variance Based Structural Equation Modeling
CC	Creative Capability
CEO	Chief Executive Officer
CI	Customer Involvement
CII	Confederation of Indian Industry
CIS	Community Innovation Survey
CMM	Capability Maturity Model
DST	Department of Science & Technology
EI	Employee Involvement
EN	External Networking
ER&D	Engineering Research & Development
ERP	Enterprise Resources Planning
FP	Firm Performance
GD	Group Discussion
HR	Human Resource
IaaS	Infrastructure as a Service
IC	Intellectual Capital
ICT	Information and Communications Technology

IoT	Internet of Things
IP	Intellectual Property
ISO	International Organization for Standardization
IT	Information Technology
ITES	Information Technology Enabled Services
KBV	Knowledge Based View
M&A	Mergers & Acquisitions
MIT	Massachusetts Institute of Technology
MNC	Multi National Corporation
MSME	Micro, Small and Medium Enterprise
MVP	Minimum Viable Product
NASSCOM	National Association of Software and Services Companies
OLC	Organization Learning Capability
OECD	Organization for Economic Co-operation and Development
PC	Personal Computer
PCA	Principal Component Analysis
PCI	Process Innovation
PDI	Product Innovation
PLS	Partial Least Squares
R&D	Research & Development
RBV	Resource Based View
SaaS	Software as a Service
SEM	Structural Equation Modeling
SEZ	Special Economic Zone
SLA	Service Level Agreement
SMAC	Social Media, Mobility, Analytics & Cloud

SMB	Small and Medium Business
SME	Small and Medium Enterprise
STP	Software Technology Park
TMS	Top Management Support
UML	Unified Modeling Language
VC	Venture Capital
Y2k	Year 2000

.....ꕤ.....

Chapter 1

INTRODUCTION

Contents

1.1 The Innovation Imperative

Innovation is central to the business strategies of today's organizations. Irrespective of an organization's size (small vs. big), markets (local vs. global), country of origin (developing vs. developed) and profit-orientation (for-profit vs. non-profit), innovation is a necessity for competitive survival and sustained growth. Increasing competition, globalization, rapid advances in technology, changing customer demographics & preferences, and shortening product life cycles demand strategic flexibility and agility. Companies have to constantly introduce new products & services, improve their business processes, and reinvent their business models.

Innovation is regarded as a necessary factor for competitiveness. Nations strive to foster and sustain innovation in their quest for global, economic competitiveness. Firms recognize innovation as a key ingredient in their competitive and business strategy. For project teams, groups and individuals, creativity & innovation are considered as essential factors for success.

Research on Innovation has been done in the context of industrialized countries as well as developing countries. Survey of existing literature indicates that vast extent of research focuses on developed & industrialized nations. Literature on holistic studies of innovation in developing nations is limited, on a relative basis (Uden, Knoben, & Vermeulen, 2014).

Innovation can happen at various levels – economic, sector-level, regional, firm-level and individual level. Creative individuals drive entrepreneurship and large-firm innovations. Innovative firms drive regional and cluster level efficiencies, and these in turn drive an entire economy. The role of innovation in driving an entire economy is critical, in terms of providing job opportunities, technology advance, growth of services industries, promotion of exports and gaining international recognition. This is increasingly being recognized by governing bodies of developing nations. The President of India declared the decade 2010-2020 as the decade of Innovation (DST, 2010), signaling the progression of focus from a knowledge-driven economy to an innovation-driven economy.

Innovation is often associated with specific industries in various countries. The Japanese automobile industry was discussed extensively in the 1980s as a significant case study of process improvements and manufacturing innovation (Cusumano M. A., 1988), and several lessons were subsequently drawn as best practices. Silicon Valley in the US has been associated with technology innovation and has constantly produced a number of technology firms that have grown to become leaders in their market segments. It is not just the advanced, industrialized nations that have accounted for the innovative industries. Through 'technology catch-up', developing countries have been able to develop and sustain competitive advantages in many industries. An example is that of semiconductor industry in Korea and Taiwan, where firms have achieved parity with their more illustrious counterparts from Germany, United Kingdom and France (Song, 2000).

Firms are key building blocks of a National level Innovation System. Firms generate new scientific concepts, technologies, ideas and improvements through R&D and experience, and act as the conduit for commercialization of many of these. For firms of today's era of hyper-competition, innovation is a matter of sustainability and survival. Innovation is what helps firms to constantly improve their production & operations, and introduce new products & services, thereby achieving a favorable impact on the business metrics, measured through both topline and bottom-line indicators.

A line of enquiry for innovation researchers historically has been based on the firm size. Large firms, endowed with resources, need innovation to grow their businesses into new markets & customer segments, and to constantly improve their operational efficiencies. Small firms rely on innovation to create differentiators that can help them achieve critical mass. For start-up and entrepreneurial firms, innovation is the very reason for existence.

If the need for innovation is so well recognized, why is it that some firms succeed and others do not? This has been a theme of research across the years. Firm level innovation studies have aimed to look at the differences in innovation strategies of firms at various levels, encompassing various factors of innovation. The highly contextual and dynamic nature of factors that drive innovation in firms makes it a constantly evolving research topic.

Innovation has been defined in many different ways in several contexts, by researchers. A definition that is commonly referred to is the one explained in OSLO Manual, which provides guidelines for conducting the Community Innovation Surveys (CIS) across the European Union. The definition is as follows:

*"An **innovation** is the implementation of a **new or significantly improved** product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations"* (OECD, 2005).

1.2 Emerging Role of Innovation in Indian Information Technology (IT)

The Indian Information Technology (IT) industry has been a remarkable success story for the country's growth in the last two decades. The industry grew from \$150 million in 1990 to \$118 billion in size in 2014 (Source: NASSCOM). Success of the IT industry has contributed to overall economic growth, growth in exports, enhancing the brand value of the country, job/employment creation & entrepreneurship, and increased technology adoption within the country itself(Jhamb, 2011; Illiyan, 2008). The leading players in the industry have secured their own place in the global map of Information Technology players, comprising product vendors, consulting firms, system integrators, and services providers. This growth has been facilitated by the ability of the industry to continuously move up the global outsourced Information Technology services value chain. Fig 1.1 shows the growth of the industry from 1995 onwards (combined revenues of IT and BPM players):

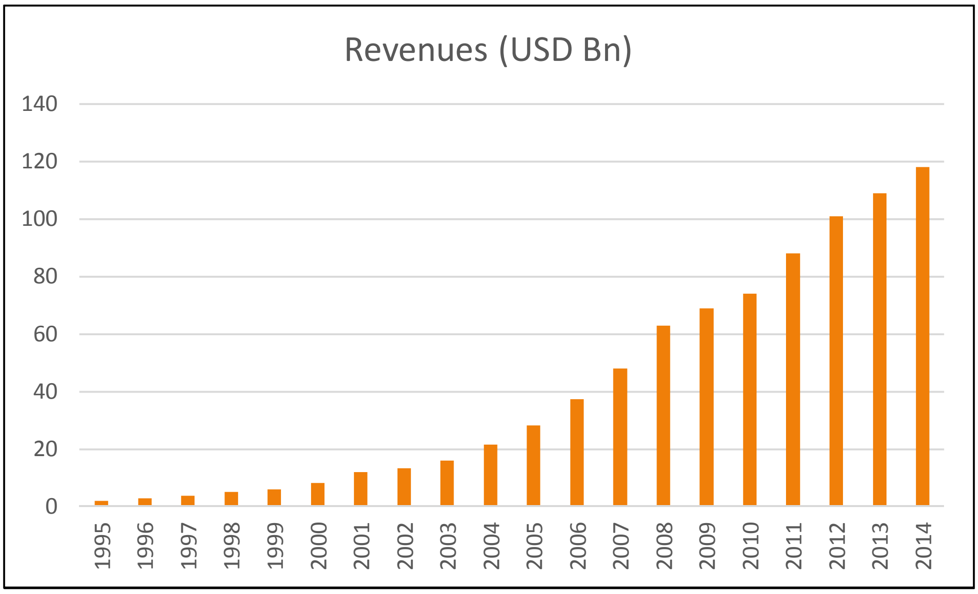


Fig. 1.1: Growth of Indian IT industry 1995-2014 (Source: NASSCOM)

While revenues have steadily increased during this period, an examination of the year-on-year growth rate of the industry shows that recent years have shown a moderation of the growth rates, as can be seen from Fig 1.2 below.

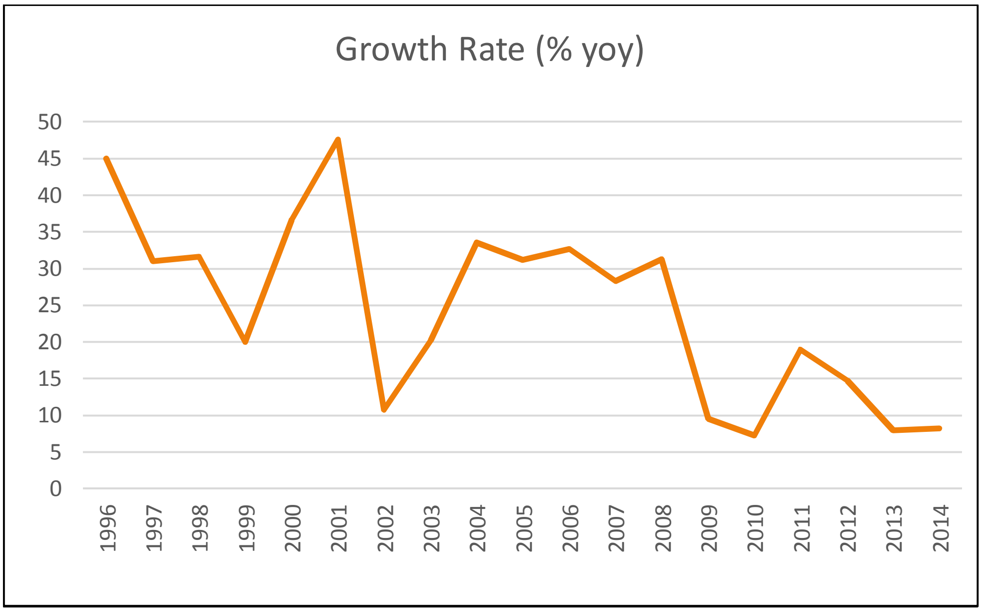


Fig. 1.2: Rate of Growth of Indian IT industry 1995-2014

There are multiple reasons for this. The industry is now growing from a huge revenue base, and a huge employment base of over 3 million. Additionally, industry life cycle theories propose a gradual slow-down of growth rates as an industry approaches maturity. Slowing of growth rates has signaled the need for companies to build new competencies, capabilities, products & services, go-to-market strategies and business models. This has resulted in an increasing emphasis (by firms) on creating innovation-led businesses for growth in the coming years.

An interesting trend in the industry in recent years has been the growth of small and mid-sized companies. While the industry continues to be dominated (in terms of revenue contribution) by the large companies, the emergence of small companies is a key catalyst for future growth, spurred by innovative potential of these companies. As can be seen from the statistics depicted in Table 1.1, a large proportion of the more than 16000 companies in India are the smaller and emerging companies.

Table 1.1: Break-up of IT firms based on Revenues

Firm Type	Firm Revenue	Contribution to Industry Revenue	# of firms
Large	>$1 bn	>40%	11
Mid-Sized	$100mn-1bn	~35-40%	120-150
Emerging	$10-100mn	~9-10%	~1000-1200
Small	<10mn	~9-10%	~15000

Source: Indian IT-BPM Industry Overview, 2014, NASSCOM

1.3 Line of Enquiry, its Motivation and the Research Gap

This study aims to investigate innovation in IT firms in India. The Indian IT industry has reached an inflection point with respect to innovation. Indian IT firms are looking at newer ways to innovate, in their quest to shift from traditional models of growth to newer, sustainable models.

The enquiry focuses on small firms. Small and large firms may follow different strategies and patterns of innovation, hence studies of innovation shall ideally differentiate small firms and large firms.

This is an appropriate time ***to study innovation in small firms in the Indian IT industry***. The growing number of small firms in Indian IT facilitated by emerging technology discontinuities, healthy start-up activity and limited understanding of innovation in small firms makes this a fertile domain for investigation. To compete with large, established IT services companies, small firms have to follow differentiated strategies, such as introducing new products and platforms, operating in niche service areas or markets, competing with unique business models etc. Emerging technologies have created discontinuities that provide the unique opportunity for Indian firms to advance from catch-up based innovations to more front-end, leading innovations. The policy ecosystem and support from industry bodies and associations offer encouragement to small firms. A key motivation for this study is the need to understand the innovation strategies and process in small companies, in this context.

The study aims to contextualize existing literature on small firm innovation, by bringing in fresh perspectives from Indian IT firms. Empirical studies on firm-level innovation in the Indian context are limited, while vast literature exists in international context. Enquiries into IT are dominated by practitioner & consulting studies, and sponsored work by Industry associations, based on Case Study and interview based qualitative approach. To the best knowledge of the researcher, an empirical study of drivers of innovation in small Indian IT companies, and establishing the linkage between the drivers and firm performance, based on analysis of large samples, is yet to be undertaken. This study seeks to fill this gap in literature.

An additional motivation stems from the fact that the author has been a professional in this industry for more than a decade. The understanding and experience gained from a practitioner's perspective was expected to be utilized this study.

Fig 1.3 summarizes the above discussion on the line of investigation.

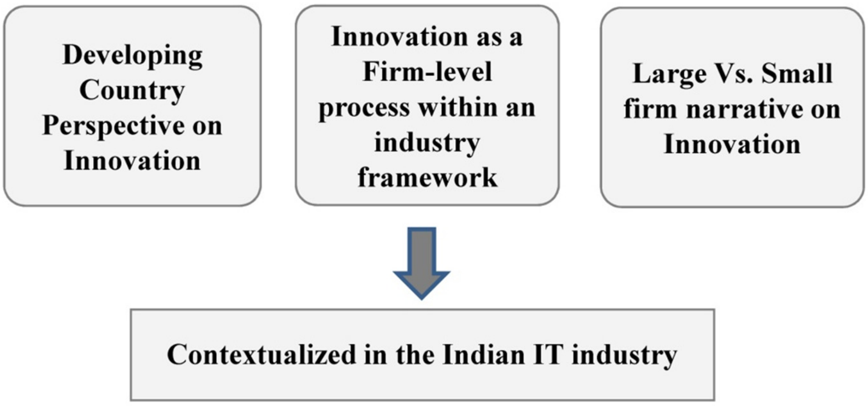


Fig. 1.3: High-level framework for the line of enquiry

1.4 Research Questions

Specifically, this study seeks to find answers to the following Research Questions:

a) What are the drivers of product innovation in small IT firms?

b) What are the drivers of process innovation in small IT firms?

c) What is the impact of product innovation on the performance of small IT firms?

d) What is the impact of process innovation on the performance of small IT firms?

e) What is the combined impact of product innovation and process innovation on the firm performance?

f) What are the key drivers of the variation of innovation among the firms?

1.5 Report Structure

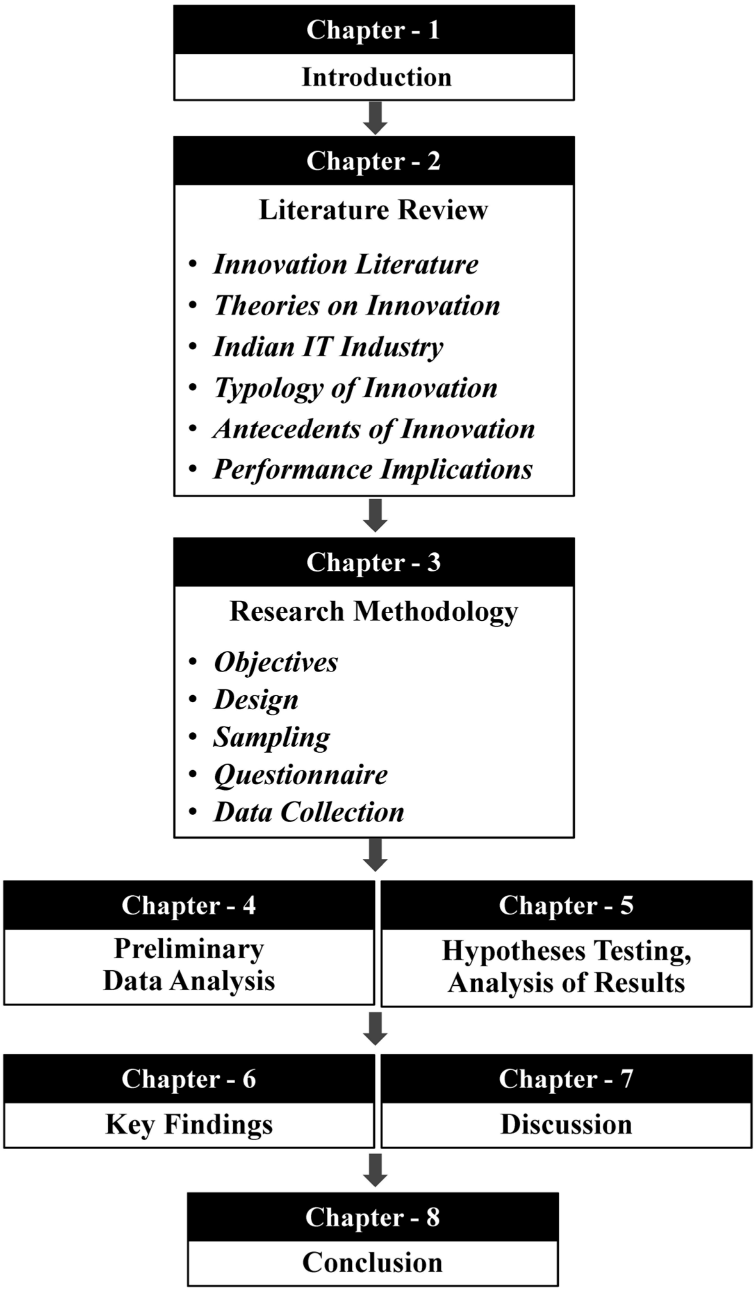


Fig. 1.4: Chapter-wise structure of the report

Chapter-2 discusses literature on innovation, and various theoretical strands investigated. The Chapter provides an overview of the Indian IT Industry, and the need for innovation among the IT firms. It also examines literature on antecedents and performance implications of firm level innovation. It leads to formulation of hypotheses.

Chapter-3 elaborates the Research Methodology, including the objectives, hypotheses and the theoretical model, instrument construction, sampling design & selection, survey administration and data collection. Chapter-4 provides preliminary details of the data analysis, such as descriptive statistics, respondent profile and further tests for the antecedents of product innovation and process innovation.

Chapter-5 explains the integrated structural model and analysis of the same. The Chapter covers various statistical analyses used to test the hypothesis and the research objectives.Chapter-6examines the variation of innovation among the sample firms. Chapter-7 is largely a qualitative discussion based on the key findings. Chapter-8 is the concluding Chapter. The Chapter covers practical and managerial implications and proposes possible topics for future enquiry.

.....ꙮꙮ.....

Chapter 2

LITERATURE REVIEW

Contents

2.1 Information Technology Industry in India

The Indian IT industry has a history of more than 45 years. Tata Consultancy Services (TCS) was the first IT firm to be set up in India in 1968. From modest beginnings the industry touched \$118 billion in revenues by 2014 and comprised of more than 15000 firms in 2014 (Source: NASSCOM). In the initial years, the industry relied on ‘body-shopping’, where Indian engineers were recruited to work in onsite locations such as the United States. Through the years, the industry has grown significantly in its capacity and capabilities. The Indian IT firms are segmented into IT Services, Business Process Management (BPM), Engineering Research &

Development (ER&D), Software Products and Hardware firms, with IT services companies having a market share of more than 50%(NASSCOM, 2014).

2.1.1 Key Success Factors of the Industry

The growth of the Indian IT industry has been attributed to several factors:

a) ***Large pool of English speaking, technical talent***: The Indian IT firms work predominantly with clients in English speaking countries, such as the United States and UK. The fact that Indian educational system produces large numbers of English speaking technical and science graduates is a distinct advantage in this context (Agrawal, Goswami, & Chatterjee, 2011; Agarwal, 2009; Arora, Arunachalam, Asundi, & Fernandes, 2001; Carmel, 2003). The Government played its part to promote technical education right from 1960s (when prominent institutions such as the Indian Institutes of Technology and the Indian Institutes of Management were set up), and by allowing private sector participation in setting up technical educational institutions and training institutions(Bhatnagar, 2006). India produces more than a million engineering graduates per year, from more than 3000 engineering colleges located around the country (Chaturvedi & Sachitanand,2013). The Government not only encouraged and facilitated the creation of a trained workforce, but also set up STPs (Software Technology Parks) where this Human Capital could flourish and create clusters of excellence (Aggarwal, 2013).

b) ***Favorable taxation and export-oriented policies:*** Realizing the potential of the IT industry, the Indian Government offered favorable fiscal policies (Carmel, 2003) such as tax holiday for a number of years. The Government was also instrumental in setting up the Software Technology Parks (Aggarwal, 2013). The STPs offered benefits to export oriented companies. Additionally, it helped develop regional clusters in cities like Bangalore. This enabled networking and exchange of tacit knowledge, and helped the smaller firms significantly as well. Some researchers have argued that the Government's role was more as a passive facilitator rather than an active participant within the industry matters (Arora, Arunachalam, Asundi, & Fernandes, 2001; Balakrishnan, 2006).

c) ***Opportunity to benefit from various industry trends:*** While the industry grew organically and steadily through the 1980s and early 1990s, the big fillip came in the form of the Y2K problem and the opportunities that came along with it. This provided the opportunity to work with very large corporations in the US and around the world, and to significantly boost financial resources. Software companies generated 16.5% of their export revenues from Y2K related work in 1999, while the figure was 12% in 2000(Illiyan, 2008). IT companies also recruited large pool of talent base at this time. The accumulated financial and human capital would form the foundation for future growth. Subsequent opportunities of growth came in the form of e-commerce and internet boom, Enterprise Resources Planning (ERP) & system integration solutions, and more complex Application Development and Maintenance across customer industries. Growth areas in recent years include Social Media, Mobility, Cloud Computing, Data & Business Analytics and Internet of Things. Indian IT firms have managed to build capabilities aligned to these global trends, thereby being able to create new market offerings. For taking these offerings to market, the Indian diaspora has immensely facilitated the connections between Indian companies and senior executives and decision makers in client organizations in Western countries (Leclerc, 2008).

d) ***Ability to come up with new offerings and move up the value chain:*** During the initial stages of the industry growth, the business model was based on what came to be known as 'body-shopping'. This involved placing Indian IT engineers at various client locations. The engineers would work on specific projects, working under the supervision of client managers. In the next stage of growth, the business model shifted to an 'offshore delivery model' where projects were executed by groups of engineers located in various locations in India. The value proposition was based on 'cost arbitrage' (lower salary and operating costs associated with India). The experience of working with clients in industries ranging from Airline, Insurance, Banking, Manufacturing, Telecom etc. helped the firms gather domain knowledge in these industries. New industry-specific offerings, such as platforms, tools and products, meant that the firms had the opportunity to move up the value chain. Some of the firms also ventured into consulting and IT advisory services. Recent times have seen a renewed focus on products and platforms, and offerings based on emerging technologies such as Mobility, Big Data and Internet of Things (IoT).

2.1.2 Business Model of Indian IT firms

The business model of the industry has been characterized by the following:

a) ***'Offshore delivery' model:*** Projects are executed from offshore locations based in India. Many large Indian companies have also opened facilities in other offshore (and near-shore) destinations such as Philippines, China, Eastern European countries such as Hungary, and Latin American countries. These locations offer lower cost of operations, including people costs and facility costs. Additionally, the time-zone differences work to the advantage of clients in countries like US, where the overnight time will be working hours in India.

b) ***Mature project management practices:*** Indian companies today have a long history of executing IT projects, and have come a long way along the learning curve. Quality certifications (such as CMM certification), productivity improvement strategies, lean approach to project management, robust documentation, delivery accelerators such as workflow & automation tools, are just few of the various interventions used. Noteworthy is the fact that the companies adopted highest levels of CMM certification (levels 4 and 5) quickly, migrating from ISO certifications, thereby achieving superior quality, process and project execution standards(Illiyan, 2008). This also helped create a large pool of project management practitioners in the country. Fluidity of experienced project managers from larger firms to smaller firms &

start-ups ensures that these best practices are transferred to younger companies and professionals.

c) ***Proven talent management philosophy:*** IT companies make it no secret of the fact that people are their biggest assets. As in the case of mature practices on project management, companies have also developed a time-tested process for recruitment, training & up-skilling, and retention of employees. A job with a leading Indian IT company is a dream job for a young technical or management graduate, and parents & families take pride in their employment. Again, the fluidity of HR managers across firms facilitates exchange of best practices in talent management.

d) ***Linear pricing and growth model:*** An important facet of the business model is the linear model of growth. The industry is predominantly a service-oriented one. The pricing is often done based on Time & Material basis, where employees' hours spent on projects are billed to customers. As a result, the industry revenues have, by and large, grown in direct proportion to the employment or headcount.

2.1.3 Need for Innovation in Indian IT Firms

Extensive review of company web sites, news articles, senior management interviews and analyst reports during the period 2009 to 2014 indicates (a) commentary on the need for the industry to move from linear to non-linear business models, implying higher Revenue per Employee realization and (b) the need for innovations going beyond incremental innovations. A recent report compiled by KPMG in partnership with CII (Confederation of Indian Industry) highlights the need for the industry to adopt non-linear growth models, and contains interviews with industry leaders (CEOs) who concur with it(KPMG, 2012). The report further recommends several strategies that firms can adopt to achieve this, such as building IP, developing products and platforms, leveraging cloud computing, acquiring companies with non-linear business models, and non-linear pricing models (KPMG, 2012).

The Indian IT industry is a service-oriented one. Less than 5% of total industry revenues in 2014 was generated from products (NASSCOM, 2014). The biggest challenge for the industry is to overcome the dominant design (based on services, cost-arbitrage, project-based execution, and process rigor) to build a product-based business model. A research report published by Morgan Stanley in 2011 indicates that Average Revenue per Employee of Indian vendors has declined by CAGR of -1.4% every year, from 2003 until 2011(Morgan Stanley, 2011). On the positive side, the emerging technologies such as Cloud, Social Media, Analytics, Mobility and Internet of Things offer non-linear opportunities because of the very nature of those technologies.

While several factors are driving the need for innovation-driven, non-linear growth models within the industry, three factors stand out:

Talent Shortage and Skill Deficit

NASSCOM, the industry body for software companies, estimated the industry headcount as about 3.29 million in 2014. This is further expected to go up to 3.52 million in 2015. Hence, the industry is expected to add 230000 professionals in 2015. The number of technical institutions in the country has been growing steadily in the last decade, with a corresponding increase in student in take. In 2014, the country had more than 3380 Engineering colleges, with a student in-take of more than 1.5 million per year(AICTE, 2015). While these are impressive numbers, the real problem has been one of employability, or ‘skill deficit’. A national level survey of employability of engineering graduates in the country conducted in 2014 suggested that only 18% graduates are ‘employable’ (The Times of India, 2014). The educational institutions not being fully equipped to train the students to make them industry ready, and the constantly changing nature of technology, have been cited as two reasons for this (KPMG, 2008). This implies that the IT companies’ ability to recruit young graduates in large numbers & train them to make ‘project-ready’, a unique skill that has served them well for many years, will become increasingly unviable. This has been recognized by the industry, and a variety of initiatives (such as finishing schools) have received impetus in recent years. However, the more practical solution to the situation is to develop business models that help the companies grow non-linearly (grow their revenues without needing a commensurate increase in headcount).

Changing customer expectations

The early operating model of IT companies was one of delivering software solutions based on specific customer requirements. An example would be developing a custom application, based on business and functional requirements shared by the customer. The clients of IT companies benefited by leveraging ‘cost arbitrage’, i.e. by getting work done at a relatively lower cost from an offshore location like India. Over the years, the customer expectations have been steadily increasing. Indian IT companies were expected to be consultants, capable of designing solutions to business pain areas by leveraging technology. The global financial meltdown that started in 2008 had its impact too, in terms of customer expectations. Though it may be argued that the industry has shown signs of resilience, there has been significant pressure on pricing and cut-down on discretionary spending from customers (Lakshmi & Balasingh, 2013; Kumar, 2011). However, global customers are also looking for meaningful cost and efficiency gains during turbulent times (Kumar, 2011), and this can also be seen as an opportunity for innovative technology-based solutions.

Nature of Emerging Technologies

The digital revolution is reshaping the IT industry. The Digital Technologies are popularly known by the acronym SMAC (Social Media, Mobility, Analytics and Cloud), shown in Fig 2.1.

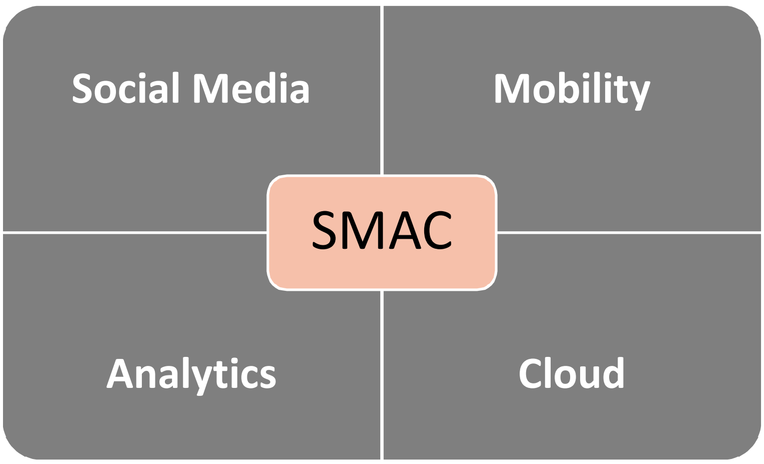


Fig. 2.1: The SMAC Technologies

Some of the salient characteristics of these technologies are as follows:

- Technology evolves rapidly. For instance, social media has found applications in a variety of areas such as Supply Chain management and Marketing.
- Many of these technologies are fundamentally disruptive in nature. For instance, cloud computing has enabled companies to develop solutions that can be targeted at the lower end of the market, using 'pay-as-you-go' pricing strategies.
- There is significant amount of interplay among these technologies. As an example, Data Analytics can be done on Social Media and Mobile data.
- The emerging technologies offer opportunities for companies to develop products and platforms, such as Mobile Applications, Text Mining platforms/tools for analyzing social media data, Big Data Analytics platforms and cloud-based solutions (SaaS - Software As A Service, IaaS - Infrastructure As A Service etc.)

The emergence of SMAC technologies requires fundamental shift in the strategies of the IT companies, away from the service-delivery based model, that has served them for several years (The Hindu, 2015). Product and Platform development using SMAC technologies is also assisted by Open source tools and Agile Project Management methodologies. This levels the playing field between the large and small companies, to an extent. Hence, it may be argued that the emerging technologies provide ample opportunities for non-linear growth to IT companies.

Fig 2.2 depicts the evolution of the IT industry over the years, and the current state that calls for new, innovative, models for growth.

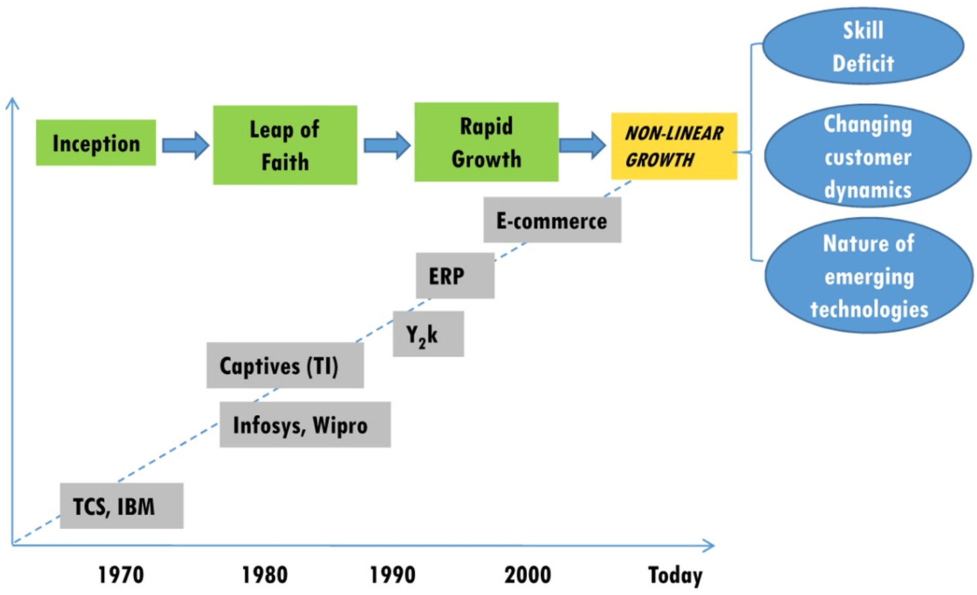


Fig. 2.2: Evolution of the Indian IT Industry

Emerging Technologies and Small Firm Innovation

The emergence of SMAC technologies has created a technology discontinuity that has benefited the Small and Medium sized firms. Small and emerging companies have a market share of 18-20% (NASSCOM, 2014) in Indian IT. The start-up activity has been healthy in the industry which has attracted the highest amount of Venture Capital/Private Equity investments, with 3 times new firms registered since 2005, and the number of VC/Angel funds going up from 50 in 2006 to 80 in 2012(NASSCOM, 2014). NASSCOM, the industry body in India for IT, recently launched the 10000 start-up initiative, with the target of creating 10000 technology start-ups in the country by 2023 (www.10000startups.com). The industry leaders like Infosys and Wipro have created $100 million funds to invest in start-ups (The Hindu, 2015).

Despite the emergence of a number of smaller firms, the IT services business is dominated by large players. Top 11 players together account for over 40% of the industry revenues (NASSCOM, 2014). Given this, it is extremely difficult for new entrants to compete with the big firms in traditional IT services, and hence innovation is a necessity for survival for them.

2.2 Early Literature on Innovation

The emphasis on innovation is not new. Joseph Schumpeter, the eminent Austrian economist, is often credited with some of the early literature and commentary on innovation in the context of Capitalist structures, in the post-depression era. In the 1930s and 1940s, Schumpeter wrote about the necessity of innovation driven by reconfiguration of resources within a capitalist regime, and the discontinuous nature of innovation owing to the difficulty to achieve it (Harvey, Kiessling, & Moeller, 2010). He famously coined the phrase '*creative destruction*', where older economic structures constantly get replaced by newer ones. This remained one of the fundamental premises in business and corporate strategy through the decades that followed, and remains so today. Firms that cannot reinvent themselves, and recreate their competencies, will perish.

Schumpeter himself, and several other research threads based on his view-points that emerged in the 1940s and 1950s, touched upon the evolutionary aspects of innovation, in terms of how various industries are impacted by innovation(Malerba, 2006). In the immediate, post Schumpeter era, 1950s and 1960s, new threads of innovation research focused on organizational theories emerged, such as relationship between innovation and firm size, R&D strategies & market structure.However, studies on relationship between innovation & industrial evolution re-emerged in late 1970s and 1980s(Malerba, 2006).

2.3 Review of Pertinent Theories on Innovation

Several useful and important theories are discussed in Innovation literature. This section describes the key innovation theories that are pertinent to the line of enquiry.

2.3.1 Resource-Based View (RBV) of Firm and Innovation

Innovation requires firms to build inward-looking as well as outward-focused capabilities simultaneously. Theorists from the Resource-Based-View (RBV) of firm, and variations of it such as the Knowledge-Based-View (KBV) of firm, underscore the importance of internal resources driving innovation and competitive advantage. Existing resources (including brand, technical knowhow, human & physical capital, trade contacts, business processes, etc.) have to be leveraged and new resources have to be acquired to build new products & competencies, and diversify into new markets (Wernerfelt, 1984). One key source of competitive advantage is the uniqueness of the resource or the configuration of multiple resources at a firm's disposal, and the level of control on the market for these resources (Barney, 1986). In a market where educated and skillful workforce is the key resource, the ability to attract and retain the best talent becomes the critical success factor. It is also argued that building internal resources and competencies is more constructive than focusing on external environment and market intelligence, as external information is available to all players in the public domain (Barney, 1986). This view has been endorsed and enhanced by several researchers who advocate that the right synergy has to be achieved between internal resources & capabilities, and externally oriented innovation strategies. Mobilizing high-end human resources, and investments in R&D & high quality physical infrastructure are expensive. External sources of knowledge, particularly for firms operating under rapidly changing market and technology conditions, can be critical. Informal and formal diffusion of external knowledge inside the firms depends upon its 'absorptive capacity', which in turn depends upon the level of R&D, presence of high-quality, well-trained human talent, effectiveness of communication between different departments, and previous experience in related fields (Cohen & Levinthal, 1990). This augments the viewpoint that external knowledge acquisition should be complemented by the right mix of internal resources.

A well-investigated strand of research is the impact of technology, and changes in technology, on Innovation. Industries such as semiconductor, microelectronics, biotechnology and computing & Information Technology, are characterized by rapid technology advance. Technology becomes the key environmental determinant and variable that needs to be constantly tracked. Innovation in these circumstances is about flexibility & agility, directing &optimizing R&D & investments, and timely entry into new product-market segments. Studies done on high technology industries have shown that periods of incremental improvements are followed by a radical technological advance, or a 'technological discontinuity' (Tushman & Anderson, 1986; Tushman & Anderson, 1990). A technological discontinuity provides smaller firms an opportunity to innovate and come up with unique value propositions. If originated or driven by a large incumbent, the technological discontinuity can enhance its existing competencies.

Breakthrough changes or advances in technology is not always a necessity for innovation. Smaller, incremental advances in technology facilitate new, innovative, ways of reconfiguring the components of a product's architecture (Henderson & Clark, 1990), which the larger incumbents may be myopic to. A technology discontinuity can, therefore, reorganize the pecking order in competitive positions, as happened to the semiconductor industry between 1955 and 1995 (Tushman & O'Reilly, 1996). Multiple product designs may emerge, which will co-exist and compete with each other, until a 'dominant design' emerges (Tushman & Anderson, 1986; Tushman & Anderson, 1990). Incremental innovations may further refine the dominant design, until the next technological innovation arrives on scene. The challenge for incumbents, especially the larger ones, is to be 'ambidextrous' in terms of competing in mature markets through incremental innovations, and competing simultaneously in new markets through revolutionary innovations(Tushman & O'Reilly, 1996).

While technology discontinuity offers innovation and new market entry opportunities for firms large and small alike, the timing of market entry can create a difference. Entering too early into a new technology space invites more risk. Entering too late can lead to a follower-strategy. Empirical studies have shown that entry before the emergence and acceptance of the dominant design leads to higher probability of survival and success. Entry timing and first-mover decisions are also dictated by the 'Appropriability' conditions; the decision to enter themarket early needs to be backed up by the belief that a unique technological or strategic position can be created and sustained (Dosi, 1988). In circumstances where technology diffusion happens freely and inexpensively, the benefits from innovations may not be sustainable for long periods of time.

Resource Based View (RBV) of innovation advocates building internal resources. Resources, by themselves, are raw materials. Resources, when combined in unique ways, create 'capabilities'(Barney, 1986; Amit & J.H.Schoemaker, 1993). Resources and capabilities together provide the engine of growth. A static view of resources and capabilities will work in an economic structure with little or no environmental flux or technological change. However, the reality is far from it. Market uncertainties and technological changes demand flexibility in configuration and combinations of resources & capabilities. 'Dynamic capabilities' is about complementing the internal resources with timely responsiveness to changing environment through rapid product innovations and a proactive management in reconfiguring the skills & resources(Teece & Pisano, 1994).

2.3.2 Network View of Innovation

One of the key research areas in Innovation that gathered momentum in 1990s and continues to date is Innovation networks. The network-view of innovation is motivated by several trends that have shown that firms that are part of collaborative networks and clusters tend to have advantages in innovative capacity. Technology, products and knowledge are increasingly becoming modular in nature, and being part of a network provides opportunities to access complementary assets and resources(Ahuja, 2000; A.C.Baum, Calabrese, & Silverman, 2000; Dyer & Singh, 1998; Combs & Ketchen, 1999).Drivers of inter-firm collaboration, apart from acquisition of complementary assets and resources, include the desire for parity with competition(Ahuja, 2000), technology and knowledge absorption/transfer (Ahuja, 2000; Bougrain & Haudeville, 2002; Mowery, Oxley, & Silverman, 1996), risk sharing, and co-evolution of capabilities(Dyer & Singh, 1998).

Studies have looked at how big and small companies participate & behave in, and benefit from networks of innovation. While it appears that big companies have inherent advantages of financial muscle, visibility and global reach, smaller companies find ways to benefit equally from collaborations. This is not surprising, particularly in the post-internet era, where access to open source and technology-enabled collaboration tools is relatively easier. Gautam Ahuja's '*Inducement-Opportunity framework*' for explaining networking behavior provides some interesting insights in this context (Ahuja, 2000). He postulates that *inducements* (the attractiveness in terms of being able to acquire resources not available internally) and *opportunities* (firm's favorable position within the network can bring in additional network opportunities) determine a firm's network strategy. He goes on to argue that large firms endowed with technical and commercial resources, may have limited incentives to participate actively in networks (Ahuja, 2000). However, globally distributed & diverse supply chains, customers & markets, and investing community makes it challenging for even large corporations to build all-round competencies and assets.Previous studies have shown the benefits associated with networking for smaller firms (A.C.Baum, Calabrese, & Silverman, 2000; Johnston & Lawrence, July 1988; Romin & Albu, 2002). Small firms have to consider the costs associated with being part of a network. The decision to participate in a network is influenced by the perceived comparison of benefits of networking with the cost of governance (i.e. the cost of managing the inter-firm collaborations) (Combs & Ketchen, 1999).The collaboration mix and depth need to be revisited and reconfigured dynamically in response to changing business conditions, which in turn triggers the need to revisit the innovation strategy, especially in industries where technology changes fast (Gemunden, Ritter, & Heydebreck, 1996). An additional managerial task is to determine the frequency of interactions, and the proximity of other network actors. These aspects are found to have a favorable impact on innovation (Romin & Albu, 2002). However, there are trade-offs too. Too frequent interactions can increase the governance overheads. Firms may also be sensitive about collaborating with other firms in close proximity.

Therefore, the decision to engage in networks, and the level of engagement (breadth, depth, contract nature etc.) depend upon a complex set of criteria and situational factors.

2.3.3 Open Innovation

Literature on innovation networks has evolved in recent times, more so into the concept of 'Open Innovation'. The Open Innovation postulate was crystallized into a structured stream of research after Henry Chesbrough's pioneering book (Chesbrough, 2003). He substantiated that the traditional model of 'closed innovation', which was primarily driven by internal R & D efforts, has limitations. In today's era, firms can look at sourcing innovations from a number of external sources, including customers, suppliers, R&D and educational institutions, Venture capital community and public agencies. While suggesting that *'knowledge is not a monopoly of industrial R&D any more'*, Chesbrough points to a system where knowledge is fluid, flowing into and out of organizations. He categorizes Open Innovation in two, namely, Outside-in Open Innovation (knowledge, technology and other intellectual assets flowing into the organization from external actors) and Inside-out Open Innovation (knowledge, technology, IP/patents etc. venturing out of the organization for commercialization and profits) (Chesbrough, 2003). From a research area confined largely to a small group of researchers, primarily investigating high technology industries, Open Innovation has become a structured research domain(Gassmann, Enkel, & Chesbrough, 2010).

Several elements of the Open Innovation existed earlier as well, such as relationships with customers, suppliers, competitors etc. In that sense, discussion on Open Innovation is a logical progression of that on Innovation networks. However, the Open Innovation paradigm advanced the research and literature on Innovation networks and collaborative innovation into wider realms. Firstly, the element of inside-out innovation is provided an equal emphasis to out-side in innovation, whereas literature on innovation networks primarily focused on outside-in element. Secondly, researchers have laid out several practices relating to inside-out and outside-in Open Innovation, which provides a structured approach to assessing the level of openness in open innovation (Burcharth, Knudsen, & Søndergaard, 2012; Vrande, Jong, Vanhaverbeke, & Rochemont, Open innovation in SMEs:

Trends, motives and management challenges, 2009). Thirdly, open innovation places significant emphasis on the downstream aspects of innovation, market dynamics, and commercialization (Wang, Vanhaverbeke, & Roijakkers, 2012). Recent trends in Open Innovation research suggest that it has expanded its scope from high-technology, large, product-oriented firms to include low/medium technology, SME and services-oriented firms as well (Gassmann, Enkel, & Chesbrough, 2010; Schroll & Mild, 2011).

Why do firms engage in Open Innovation? In today's world, even large firms find it practically impossible to have end-to-end knowledge and technological capabilities is specific domains. It makes economic and strategic sense to tap into vast amount of knowledge that resides outside a firm's walls. Increased labor fluidity, global talent base, existence of secondary markets for technology assets such as patents, and ICT-based collaboration techniques that facilitate knowledge transfer are some of the key drivers of open innovation (Dahlander & Gann, 2010). One of the well-publicized case studies of open innovation is the 'Connect & Develop' program at P&G, where the firm consciously developed a strategy to externally source up to 50% of its new product development ideas (Huston & Sakkab, 2006). By 2006, about 35% of new products at P&G originated outside the company, up from 15% in 2000 (Huston & Sakkab, 2006).

A number of different types of external network actors exist. Literature highlights customers, suppliers, universities, research laboratories & institutions, government agencies, Venture Capital firms, and consultancy firms as potential partners in/sources of innovation. Firms can reach out to these partners themselves, or seek the help of 'innovation intermediaries'.

Innovation brokering firms offer services such as business planning, market research, capital arrangement, deal making, technology road-mapping & brokering, knowledge gap management etc.(Howells, 2006). Technology has played it parts too, in facilitating such access. Collaboration tools can facilitate integration of external actors into a firm's ecosystem(Gassmann, Enkel, & Chesbrough, 2010; Dushnitsky & Klueter, 2011).

Studies have also looked at implementation factors for open innovation, such as conditions that favor it, and the critical success factors. While the significance of corporate R&D has been reduced to a certain degree, it still retains its importance in the context of build-up of absorptive capacity (Cohen & Levinthal, 1990). Particularly for firms adopting radical innovation strategies, the exploration is often done in areas away from their experience and competency domains, and this requires complementary networking and R & D capabilities (Lazzarotti, Manzini, & Pellegrini, 2010). Collaborative R & D is the other option, where the firm operates in parts of the R & D value chain, and can tie-up with universities, government institutions and research laboratories.

Governance is key in open innovation for several reasons. Firstly, for many firms, it is still a relatively new practice where they lack experience. Secondly, it involves IP, technology transfer and legalities around the same. Thirdly, the focus of innovation shifts from an individual firm to a network of firms, and the extent of network participation of a firm has to be controlled internally. Studies have shown that increasing the breadth of collaboration, in terms of the number of relationships, does not always yield linear benefits. The innovative performance has shown to have an inverted-

U shaped behavior with breadth of collaborations (Laursen & Salter, 2006; Rothaermel & Deeds, 2006). Open innovation strategy should also be aligned to the technology strategy and roadmap (Lichtenthaler, 2008), which in turn is derived from the business planning. Having clarity on the future technology & product direction that the firms needs to take helps in planning the type of networking required, the breadth & depth of relationships to be nurtured, and the overall relationship governance.

Success of open innovation also depends upon the innovation ecosystem that the firm is part of. A system with educated workforce, high technology absorptive capacity, means for knowledge exchange and network participation, presence of large number of potential collaboration partners such as high quality research institutions, and an efficient legal system reinforces open innovation behavior (Wang, Vanhaverbeke, & Roijakkers, 2012). Like other innovation initiatives, open innovation requires a conducive organizational culture to thrive. Studies have indicated the importance of an entrepreneurial culture (Hung & Chiang, 2010) and employee autonomy & skills (Burcharth, Knudsen, & Søndergaard, 2012). The author noticed a possible gap in literature connecting the cultural elements to success of open innovation initiatives.

The Resource-Based-View of firm suggests the importance of firm level resources in innovation. While resources could reside outside the firm as well, the emphasis is more on internal resources. Open innovation and network of innovation emphasize external collaboration. Hence the two approaches are complementary to each other. For innovation resources and open innovation to thrive, the firm also needs to have the right 'culture of innovation'.

2.3.4 Culture of Innovation

A major strand of research on innovation deals with the culture of innovation. Several research studies done across various countries, covering both small and large firms, have highlighted the impact of organizational culture on the ability to innovate.

Innovation starts at the employee level. Individuals' creativity is what generates new ideas that form the basis of innovation. Recruitment of individuals with high creative capacity is the first step towards the goal of building human capital for innovation. However, the true potential of creative workforce can only be realized in an organizational environment that supports creative behavior. Teresa Amabile, who conducted seminal work in the area of creativity and motivation at an individual level, describes *intrinsic* and *extrinsic* motivation in this context. Employees need to be intrinsically motivated, but the impact on creativity could be further enhanced through means of extrinsic motivation such as *rewards & recognitions, work atmosphere* and *supervisory encouragement* (Amabile, 1997). Individuals work in groups and teams. Work teams generate creative ideas themselves, and refine & advance the ideas generated by individual employees. Hence creativity can also be construed as a group-level attribute that drives innovation. The overall innovation potential of the firm is augmented by the right culture-related elements that foster group-level creativity(Kanter, 1988; McLean, 2005).This includes a supporting structure that permits the ideas generated to gather internal acceptance &

consensus, progress towards development, and eventual diffusion of the resulting benefits (Kanter, 1988). A culture that encourages communication, connectivity and inter-group collaboration has been highlighted in studies (Hurley & Hult, 1998; Lee, Rho, Kim, & Jun, 2007). It facilitates exchange of ideas, best practices and knowledge. This is particularly beneficial for companies operating in project-based scenarios, such as the ones in construction, software development, and biotechnology industries. It is also a common practice for companies to employ cross-functional teams in innovation projects. For instance, representatives from Marketing & Sales, R&D, and production & service delivery teams could join hands in the development of a new initiative. Knowledge sharing and cross-functional collaboration need an enabling organizational structure that provides flexibility, speed and agility(Kanter, 1988; Herrmann, Gassmann, & Eisert, 2007; Brockman & Morgan, 2003; Pandey & Sharma, 2009). The organizational structure that is conducive to innovation also depends upon the type of innovation pursued. One-size-fits-all approach to structure cannot work in this context. Strategies based on exploitation of existing capabilities/technologies require a different type of organization structure compared to strategies based on exploration of new capabilities/ technologies (Pandey & Sharma, 2009).

Culture of innovation is comprised of a set of ‘norms’ or ‘unwritten rules’ that drive and harness creativity of employees. It takes time for the cultural elements to take root in an organization. Numerous studies have shown the importance of senior management and leadership in the formation of culture of innovation. Leadership can inspire the required elements through direction setting, establishing the policies & processes, and promoting a tolerance for failure that is essential for innovation. Literature also discusses 'transformational leadership' that displays characteristics including vision formulation, performance benchmark setting & resource allocation (Sarros, Cooper, & Santora, 2008), inspiration and psychological empowerment (Gumusluoglu & Ilsev, 2009). Leadership for innovation itself is inspirational in nature. Middle and junior level managers imbibe it from the top/executive management. The leadership culture at all levels in important, as supervisory encouragement (Amabile, 1997; Sarros, Cooper, & Santora, 2008) and support for innovation (McLean, 2005) are essential ingredients for nurturing creativity. Top management, while facilitating inter-departmental collaboration (Tienne & Mallette, 2012), should also be able to distinguish between the requirements of various groups in the company. Business lines operating in mature markets may pursue incremental, process improvements, whereas a R&D team looking to leverage a new technology could choose a radical path to commercialization. The two groups will require different innovation strategies and approaches. Radical innovations require a high level of risk-taking capacity (Herrmann, Gassmann, & Eisert, 2007), and hence higher tolerance for failure. Innovations, especially those based on exploration into new areas, also involve an element of calculated bet. A well-documented organizational and senior management trait needed is willingness to take risks (Herrmann, Gassmann, & Eisert, 2007; Hurley & Hult, 1998; Tienne & Mallette, 2012).

Creativity is about thinking out of the box and finding new, innovative solutions for problems. This requires talented workforce and a supportive management. However, not everything about creativity and innovation needs to be new. Individuals often dig deep into their past experiences to generate solutions for the present. Groups/teams bank on their collective experience to invent new approaches. 'Organizational learning', a vital aspect of culture of innovation, is about continuously learning, individually and collectively, and leveraging that learning in new situations and/or contexts. Collective learning of individuals and groups roll up to the organizational level(Barker & Neailey, 1999). Organizational learning is often associated with shared insights, past knowledge and experience(Stata, 1989; Brockman & Morgan, 2003), and a learning philosophy that drives various departments to a common goal(Siguaw, Simpson, & Enz, 2006). Once again, the top management plays an active role in creating an environment of learning and knowledge sharing (Ven, 1986). Information Technology can be leveraged to enhance organizational learning (Stata, 1989; Zairi & Al-Mashari, 2005), in terms of exploiting historical data available within the organization.

Recruitment and retention of an educated and skillful workforce is the backbone of innovation. The HR department plays a key role in creating a favorable culture of innovation, by instituting relevant training & development programs, and implementing performance-based compensation regimes(Lau & Ngo, 2004; Zairi & Al-Mashari, 2005).

The impact of firm's innovation on its performance has been a subject of several innovation studies. Innovation is one of the most important sources of competitive advantage for firms in today's hypercompetitive business environment (Vazquez, Santos, & Alvarez, 2001; Soliman, 2013). This is particularly true when severe competition is shortening the product life cycles (Artz, Norman, Hatfield, & Cardinal, 2010). In most industries, customer preferences & technology constantly change, markets can remain uncertain, and innovation is what helps firms adjust, adapt and respond to it (Camisón & Villar-López, 2014; Han, Kim, & Srivastava, 1998). Market & Learning orientation is associated with innovation, which contributes to the flexibility and adaptability needed to respond to such changes (Hurley & Hult, 1998).

Porter proposed three generic strategies that can result in competitive advantage, namely, cost leadership, differentiation and focus (Porter, 1980). Capacity to innovate can significantly enhance a firm's ability to sustain any of these three broad strategies. For instance, constantly improving and innovating internal operations can help cut costs, thereby being able to pass through some of the benefits to customers. This is the reason for companies like Royal Dutch Shell to incentivize its managers for achieving operational excellence and improvements (Overvest & Veldman, 2008). By innovating on products, firms can introduce novel or significantly improved products, thereby being able to differentiate themselves from competition (Koellinger, 2008; Hashi & Stojcic, 2013; Camisón & Villar-López, 2014). Focus strategy is about addressing a niche market segment, and serving that segment well enough to generate strategic rents. Innovation often follows an evolutionary path, where organizational learning enables re-combination of existing skills and knowledge in novel ways(Ruiz-Jime´nez & Fuentes-Fuentes, 2013). Focus strategy involves formation of deep, entrenched relationships within one segment, which results in continuous learning as a by-product. While it is clear as to how innovation can help create competitive advantages, how long can these advantages last? Many of the innovations are often not patented, and the sustainability of the competitive advantage depends upon the appropriability regime in the industry, as competitors will eventually imitate and grab a share of the market value generated by the innovation(Koellinger, 2008; Artz, Norman, Hatfield, & Cardinal, 2010). However, it is pertinent to note that despite the competitors playing the catch up game, the firm that originally introduced the innovation still captures significant market share advantages for several years since introducing the innovation(Hashi & Stojcic, 2013; Camisón & Villar-López, 2014; Banbury & Mitchell, 1995), which is true even in the case of smaller firms (Robinson, 1990). This is the economic rationale for firms to invest in expensive innovation. Competitive pressure is one of the key reasons as to why firms invest in innovative behavior (Boone, 2000). Competitive catch up and imitation also makes it an imperative that a firm is able to come out with innovations from time to time. Hence the need for 'innovation speed' and 'innovation quality' (Wang & Wang, 2012; Siguaw, Simpson, & Enz, 2006), which may vary from industry to industry. For high technology sector, speed of innovation is critical, however, there is only so much that a firm can chew in terms of a portfolio of innovations (Siguaw, Simpson, & Enz, 2006), and managing a large portfolio can be time & resource consuming, and sub-optimal economically. While innovation needs to be a continuous activity, it does not need to be radical innovations all the time. For established incumbents, even incremental product innovations are found to provide market share benefits (Banbury & Mitchell, 1995).

Creating a culture of innovation and coming out with multiple innovations over a period of time brings home direct advantages in terms of enhanced firm performance, however, can also create indirect benefit in the form of transforming the company's innovative capacity(Geroski, Machin, & Reenen, 1993). The learning curve involved in the process of innovation and technological competencies provides the platform for future innovations. Hence, embedding innovation into the DNA is something that companies look to do. However, the need for a dynamic perspective to innovation is important, as the type of innovations that provide competitive advantage today may not work going forward (Schroeder, 1990).

As innovation can generate competitive advantages for a firm, it is one of the strongest factors that impact a firm's performance favorably (Ruiz-Jime´nez & Fuentes-Fuentes, 2013). Firm performance includes financial, market and product performance (Kalkan, Bozkurt, & Arman, 2014). Studies frequently use financial performance as the important indicator of overall firm performance. Numerous studies have conceptually highlighted or empirically illustrated the impact of innovation on a number of performance indicators such as Return on Investment, Return on Assets, Return on Sales or profitability, Revenue Growth, Market Share, Size of firm, Productivity, Cash Flows and Exports.

2.3.5 Developing Country Perspective

Firms are an important component in the Innovation value chain. Firms in developing countries, as opposed to those in developed countries, face several challenges, including inadequacies in quality of education and highly skilled workforce(Hobday, 2005), unsophisticated and often small markets (Szirmai, Naude, & Goedhuys, 2011), limitations in infrastructure etc. Availability of financial capital such as Venture Capital, Private Equity & growth funding may also be limited, though this is an area that has seen improvement in the last decade.

While a significant amount of technological breakthroughs and discontinuities originate in advanced countries, it is the fluidity of technology that enables firms in developing nations to develop competencies and compete. Known as the ‘Catch up’ process (Benhabib, Perla, & Tonetti, 2014), this phenomenon has been widely studied by researchers. Catch up involves acquisition, assimilation and improvement & commercialization of technologies in emerging nations that were initially developed in advanced countries (Kim, 1997). Rich R&D is at the heart of new technology development in developed nations (Hobday, 2005). Developing nations follow the ‘reverse R&D’ process, where acquisition and assimilation of new technologies in developing nations result in accumulation of capabilities, which further result in R&D in these countries aimed at improving these technologies and building new products and services around it (Kim, 1997). A conducive macroeconomic and policy environment moderates the impact of technology transfer, where the government supports science & technology policies, investment in education, build-up of required physical and communication infrastructure, and R&D incentives (Srholec, 2011; Kim, 1997). International trade is also a key factor that facilitates technology transfer, as mature technologies get transferred to developing nations (Almeida & Fernandes, 2008). In this context, Foreign Direct Investments (FDI) and Outsourcing are the other forms of international partnerships (Audretsch & Sanders, 2011). Successful firms in developing nations do not wait until technologies mature by getting time-tested in international markets. While exploiting commercially viable technologies, they constantly explore new technological frontiers at an early stage itself. In other words, their strategy is not that of pure ‘imitation’, but one based on proactive innovation(Fan, 2006). It has also been observed in prior research that this strategy is well supplemented by internal R&D and building of networks/alliances(Fan, 2006).

Constant improvements in absorptive capacity is what helps developing nations and their firms to constantly move up the technology value chain and start competing in international markets(Cohen & Levinthal, 1990; Audretsch & Sanders, 2011; Szirmai, Naude, & Goedhuys, 2011). One of the ways in which firms achieve this is by leveraging human capital. Countries like China and India, with over a billion in population, have vast pool of human resources. The diaspora also plays its part, by bringing in international best practices in business and technology, and facilitating networking with international communities. Considering that most of the developing nations are not endowed with the best educational infrastructure, intra-firm, on the job training can help neutralize some of these deficiencies(Uden, Knoben, & Vermeulen, 2014). R&D is also an essential component of improving absorptive capacity(Cohen & Levinthal, 1990), and should be one of the cornerstones of innovation in emerging economies and firms that operate there(Fan, 2006; Kim, 1997).

In the early stages of development, companies in emerging markets compete by doing established processes cost-effectively. Several examples have been cites in literature, including the Indian software industry, Bangladeshi textile industry, flower industry in Columbia and the Taiwanese bicycle industry (Stam & Stel, 2011). Competing based on cost-arbitrage is the starting point, and several economies have moved well beyond this stage, competing on the basis of knowledge and innovation, supported by human & intellectual capital and focused R&D. In recent times, several researchers have spoken about 'frugal' or 'resource-constrained' innovations (Bound & Thornton, 2012) emanating out of emerging economies like China and India. It is not just start-ups and local market players who are involved in these cost-effective innovations. Global majors such as General Electric, Tata Consultancy Services, P&G, and Unilever increasingly look at innovations originating from emerging markets as serious opportunities that can be leveraged in global markets (Economist, 2010).

2.3.6 Innovation in large and small firms

Innovation is the lifeblood of all organizations, irrespective of their nationality, industry, product/service orientation & characteristics, profit/ non-profit nature, and ownership structure. A major theme of innovation research over the years has been comparison of its nature in and applicability for both large firms and small. Do small firms need innovation more than large firms? How does innovation levels vary with firm size? What are the drivers of innovation in micro, small, medium and large enterprises? These are some of the questions that researchers have attempted to address.

Small firms are as, if not more, important to any innovation system as large firms are. A culture of entrepreneurship creates an ecosystem where small businessmen are recognized & supported. This fosters new job creation and economic growth. Innovation requires financial, physical & infrastructural, and human resources. The dynamics of innovation is very different for small and large firms(Acs & Audretsch, 1988).A technology discontinuity may provide an opportunity of incremental growth to large firms, however, may be the basis of existence itself and survival for a smaller firm(Capaldo, Iandoli, Raffa, & Zollo, 2003). Small firms are constrained for these resources, which is an inherent disadvantage in comparison with their larger counterparts (Palmer & Wright, 2010; Yap & Souder, 1994; Hadjimanolis, 2000; Roper, 1997). They are also handicapped by the lack of economies of scale that large firms enjoy (Roper, 1997). Large firms, by virtue of size benefits, are endowed with slack resources that they can invest in new technologies and opportunities (Hadjimanolis, 2000). Innovative firms compensate for scarcity of resources in multiple ways. Small firms are less formalized and structured in their processes, which provides the flexibility to deploy the resources (Bhattacharya & Bloch, 2004). They are able to form flexible and dynamic organization structures that can better leverage the resources in hand. While the need for adapting to change is higher and more critical for small firms, they are also able to be less bureaucratic, have better inter-departmental cohesion, and have closer connections between employees and the senior management (Mazzarol, 2002).

Small firms are also likely to be involved in all types of innovations. While it is more likely that they emphasize more on product innovations, process innovations are equally important and provide growth opportunities (Hoffman, Parejo, Bessant, & Perren, 1998). Life cycle theories on innovation suggest that when new technology opportunities open up, firms focus more on product innovations initially, and as the opportunity matures, process innovations take over (Abernathy & Utterback, 1978). Small, innovative firms have a higher probability of success in trying to harness new opportunities at early stages of growth. They are normally among the first ones to spot a market opportunity and pursue the same (Roper, 1997). While small firms are often associated with breakthrough innovations, incremental innovations are just as important (Hoffman, Parejo, Bessant, & Perren, 1998).

Large firms have certain inherent advantages such as availability of financial resources, physical resources, infrastructure, R&D capabilities etc. However, some of their inherent strengths can become weaknesses. Past learning often dictates the future strategies, including innovations, in large firms. '*Core capabilities'* of a large firm, which are a collection of knowledge sets assimilated over its existence, can become *'core rigidities'*, hindering progression along paths unfamiliar to the firm(Leonard-Barton, 1992). Large firms are built for optimization of ongoing operations or the 'performance engine', and new idea are often pitted against the discipline needed for ongoing efficiencies (Govindarajan & Timble, 2010). Additionally, innovation projects get owned by multiple leaders (from R&D, New Product Development Team, to Engineering and Production) during their course from ideas to commercialization, which can create weaknesses owing to wastages and different management styles (Lidow, 2014). Yet another challenge for large firms is to break out of their existing profit margin formulas, as new, disruptive innovations often start as low margin businesses (Christensen, The Innovator's Dilemma: When New Technologies Cause Great Firms to fail, 1997).

A key characteristic of small firms is the entrepreneurial nature of innovations. They are most often driven by owner-managers (Palmer & Wright, 2010), who take part actively in day to day operations, and are 'hands-on'. Research has shown that specific personality traits and skills of founder-managers or CEOs (such as questioning, experimenting and networking) have a direct bearing on the innovative capability of the firms they manage (Dyer, Gregersen, & Christensen, 2009). While the individual-level leadership skills are important to take a small firm through to a 'self-sustaining' stage, the skills need to be adapted dynamically to suit the various stage of growth of the enterprise (Lidow, 2014). The values of the top managers, and how much they are seen as role models by employees, form the underpinnings of the right culture of creativity (Mazzarol, 2002). The risk-taking orientation and capacity of the owner-managers also dictate the propensity to invest in and aggressively chase market opportunities (Bougrain & Haudeville, 2002). Additionally, owner-managers are instrumental in networking and collaborating with a number of external actors, which is essential for small firms.

While it is difficult for small firms to muster physical and financial resources compared to large firms, many small firms are able to attract the best talent and compete on an even keel on human capital. Small firms often operate in high technology areas, and experienced technical professionals find it attractive to be part of them. Management professionals often find opportunities to quickly grow in smaller companies. Flexible working environment, and open work culture are often the other motivational factors.

Smaller firms are also found to be more innovative in high technology industries, while larger firms generally tend to do better in manufacturing and capital intensive sectors (Hadjimanolis, 2000). High technology industries are driven more by the quality of engineering and scientific talent. Several research papers have drawn attention to the need for small firms to mobilize high quality scientists and engineers, R&D talent and product champions (Yap & Souder, 1994; Romijn & Albaladejo, 2002; Hoffman, Parejo, Bessant, & Perren, 1998; Acs & Audretsch, 1988; Bougrain & Haudeville, 2002; Roper, 1997; Capaldo, Iandoli, Raffa, & Zollo, 2003). R&D can also play a key role for smaller firms (Hadjimanolis, 2000; Romijn & Albaladejo, 2002; Freel, 2003). However, R&D is more likely to be informal (Bougrain & Haudeville, 2002) and not financially intensive, given the scarcity of infrastructural resources at disposal. Undertaking R&D in itself does not guarantee success in innovation. But backing up R&D efforts with skilled, scientific talent can enhance the absorptive capacity in terms of being able to better reap the rewards from R&D(Freel, 2003; Cohen & Levinthal, 1990).

Given that smaller firms can perform limited R&D, networking becomes a valuable source for knowledge assimilation. Owner-managed firms rely on the personal relationships of the senior managers to a large extent. Inter-firm linkages provide access to complementary assets, as well as avenues for joint go-to-market strategies (Ilavarasan & Parthasarathy, 2012; Jong & Vermeulen, 2006). Tie-ups with universities & other academic institutions, and research laboratories provide opportunities for inexpensive R&D. Networking enables exchange of latent knowledge and spreading of risks between the partners (Bougrain & Haudeville, 2002). The nature of networking and inter-firm linkages also depends upon the type of business that the firm is engaged in. For instance, export oriented firms may look to build international partnerships and local market players may emphasize more on building local partners (Freel, 2003).

To summarize, while small firms play an important role in driving innovation at an economic system level, the dynamics of their innovation are very different from large firms. Theoretical frameworks utilized in studying innovation in small firms, including those relating to the antecedents of innovation, need to take into consideration these differences.

2.4 Typology of Innovation

Literature defines a number of different types of innovation. Broadly, the innovation typology is based on two aspects, namely, the nature of innovation and the magnitude of innovation.

2.4.1 Typology based on the nature of innovation

a) ***Product Innovation***: Product innovation is defined in the Oslo Manual as *"the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses*" (OECD, 2005). 'Product Innovativeness' has been used as a key component of firm-level innovation in several studies in the past(Avlonitis, Kouremenos, & Tzokas, 1994; Wang & Ahmed, 2004; Jong & Vermeulen, 2006). Product innovation, by definition, includes service innovation as well, thereby encompassing services companies also into its scope. Examples of product innovation for companies in the IT industry include development of a new software application, or introduction of a new service line such as software testing services.

b) ***Process Innovation:*** Process innovation is defined in the Oslo Manual as *"the implementation of a new or significantly improved production or delivery method*" (OECD, 2005). Clayton Christensen, the eminent innovation researcher and author, and co-author Michael Overdorf, describe processes as "*the patterns of interaction, coordination, communication, and decision making employees use to transform resources into products and services"*(Christensen & Overdorf, 2000). Christensen postulates that it is a combination of Resources, Processes and Values within a firm that creates unique organizational 'capabilities' that are in turn leveraged for innovation. Continuously improving the processes is not only a cost-optimization initiative, but also can improve customer service & satisfaction, thereby generating a positive impact on the top-line. Examples of process innovation in IT companies include continuous improvement in software project management, productivity & quality implementation programs etc.

c) ***Business Model Innovation*****:** 'Business Model' itself has been defined in different ways in existing literature, though the definitions point to the same conceptual philosophy. Essentially, a business model is the 'design or architecture of an organization that determines the value creation mechanism, value delivery to customers, and the profit capture formula (Teece D. J., 2010). Business model can be unique source of advantage for a firm. Business Model Innovation involves reconfiguration of firm's resources and capabilities to achieve fundamental changes in the business model, leading to enhanced overall performance (Amit & Zott, 2010). A well-known example is that of Dell, when the company introduced a direct-sales, made-to-order model for PCs, which enabled it to create a competitive differentiator in a highly competitive industry.

d) ***Architectural Innovation:*** The concept of Architectural Innovation was introduced by Henderson and Clark in 1990(Henderson & Clark, 1990). They posit that every product has an underlying architecture, which is a configuration of the various components of the product. A reconfiguration of the underlying components in innovative ways can create new product designs that can compete effectively compared to the original product version (Henderson & Clark, 1990). The concept of Architectural Innovation may only have limited applicability in the IT industry, where products and services have significantly larger proportion of intangible attributes than tangible components.

e) ***Organizational Innovation:*** This is to do with the structure and organization of resources and processes in the firm that become set procedures and management practices (Armbrustera, Bikfalvi, Kinkel, & Lay, 2008; Martins, Lopes, & Barbos, 2012). The Oslo Manual defines organizational innovation as '*implementation of new organizational methods'* (OECD, 2005).

f) ***Marketing innovation:*** Companies can innovate along the 4 P's of marketing, namely, pricing, promotions, place/distribution and product features. Oslo Manual defines marketing innovation as *'implementation of new marketing methods'* (OECD, 2005). An example from the IT industry would be innovative pricing mechanisms. Many companies have tried to move away from traditional Time & Material based pricing to output/outcome based pricing for customers.

2.4.2 Typology based on the magnitude of innovation

a) ***Disruptive/Sustaining Innovation:*** The concepts of sustaining and disruptive innovation was elaborated by Clayton Christensen, the eminent Innovation researcher and expert. He defines sustaining innovations as those facilitate improvements in product performance, and disruptive innovations result in cheaper, simpler, smaller and convenient products (Christensen, 1997). A series of incremental innovations on a product can eventually lead to 'overshooting' performance, where the customers no longer value several of its attributes; this scenario creates opportunities for disruptive innovations(Anthony, Johnson, Sinfield, & Altman, 2008).

b) ***Radical or Breakthrough Innovations*** involve significant improvement (s) in a technology, concept, product, service, process etc**.** ***Incremental innovations*** involve, as the name suggests, small changes to an existing technology, concept, product, service, process etc., but meaningful enough to be construed as an innovation. Radical innovations are often associated with technology discontinuities (Baker & Sinkula, 2005).

Several previous firm-level innovation studies have considered Product and Process innovation as the two key innovation variables (Inauen & Schenker-Wicki, 2012; Inauen & Schenker-Wicki, 2011; Wang & Ahmed, 2004). This study draws upon the work done by Ilker Murat Ar and Birdogan Baki in Turkey, where they investigated the antecedents and performance impact of product and process innovation (Ar & Baki, 2011). The companies considered for that study were SMEs from STPs (Science and Technology Parks) located in Turkey.

The OSLO Manual has four pillars of innovation, namely, product, process, organizational and marketing (OECD, 2005). The first two editions of the manual prescribed product and process innovation as the two most important aspects of firm level innovation to be measured in surveys. The third edition, released in 2005 added the other two pillars. It can be argued that organizational innovation is one type of process innovation. It has been referred to as *'non-technical, process innovation'* in a recent work (Armbrustera, Bikfalvi, Kinkel, & Lay, 2008). Further, it may be argued that marketing innovation may be more applicable to retail/consumer scenarios, and its relevance may be limited to the Indian IT industry scenario, barring the possibilities in innovative pricing mechanisms. Other qualitative considerations such as the need for model and survey parsimony have also contributed to the decision to restrict this study to product and process innovation typologies.

The industry life cycle theory of innovation also postulates a gradual shift of emphasis from product innovation to process innovation, as the industry grows and matures (Abernathy & Utterback, 1978). The theory considers product and process innovation as the two dominant forms of innovation, adding further credence to the approach adopted for this study.

Hence, for the purposes of this study, Product and Process have been chosen as the most relevant types of innovation, specifically in the context of Indian IT firms.

2.4.3 Product and Process Innovation: Indian IT industry Context

The Indian IT industry derives majority of its revenues from IT services, as opposed to IT products. As discussed in detail earlier in this report, there is a loud clamor for achieving non-linear growth models in the industry. Central to this strategy is building products and platforms. However, the line that divides IT products and IT services is not always a bold one. A custom application built for an industrial client in the USA is considered an IT service – Application Development and Maintenance (ADM) service in the industry parlance. However, the same application, when built for multiple customers (and often backed by an Intellectual Property) becomes a product. It can be sold to multiple clients, bringing revenues with every sale, and therefore becoming non-linear in revenue potential. Most of the large players have such instances of custom-made services eventually getting 'platformized' or 'productized'(Arora, Arunachalam, Asundi, & Fernandes, 2001). This being the case, it is surprising that the Indian firms have fallen short of making it big on the global IT/software product stage. Several reasons have been attributed to this.

The IT firms in India, dominated by the large IT services companies, have been riding the wave of success and excellent profitability for many years. Some industry experts have spoken about a possible sense of complacency (Venkatesan, 2013), and diversifying into products and non-linear growth models has not been an utmost necessity for survival. The offshore based service delivery model at significantly lower costs has been a disruptive innovation. The services-based dominant logic has been characterized by the highly successful mechanism to hire engineers, train them, deploy them on projects, and follow standard project management processes that ensure documentation, quality & productivity. As a result, most of the innovations have been process innovations; in the areas of hiring

& training, project execution, quality management etc., which have been incremental in nature (Venkatesan, 2013). The new offerings that companies came up with were based on learning from previous experience of engaging in projects, and leveraging the new technology areas on offer, and did not require too much of R&D support. Limited need for, support for, and hence execution of R&D has been cited as another factor limiting product development in IT firms (Economictimes, 2011).

Indian IT firms generate majority of their revenues from exporting to markets like the US and Europe. In a typical onsite-offshore project execution, the bulk of the project team is located in an offshore location (in India, in most cases), with a handful of team members located onsite, at client premises. And the endeavor most of the time is to 'move work offshore', in the quest to constantly reduce the cost of operations. Most of the communication between the project members and the client stakeholders happens through email and telephonic conference & one-on-one calls. This limits the exchange of tacit knowledge, for which proximity with customers and users has been well established (Desrochers, 2001).

While the larger firms generate majority of their revenues from services and leverage process & incremental innovations, the smaller firms rely on product innovation as a necessity for survival. The new firm registration increased three-fold between 2005 and 2012 (NASSCOM, 2014). A large number of these new firms focus on products and platforms, in areas such as mobility, social media and cloud computing. Recognizing the need for collaboration, networking & knowledge exchange, the smaller firms engage in various industry associations and forums. ISPIRT (Indian

Software Product Industry Roundtable) is one such network of a number of product companies and seasoned industry experts (www.ispirt.in). This association makes policy recommendations on behalf of small companies to the government & NASSCOM, promotes and supports cloud-based software product offerings to domestic SMB segment, and facilitates networking events and M&A leads (Source: www.ispirt.in). NASSCOM too supports product companies and ideas through programs such as NASSCOM Product conclave, Emerge-50 awards for innovative companies, and the 10000 start-up program (www.nasscom.in).

Hence, this is an appropriate time to study product innovation and process innovation in small IT companies in India. While pure start-up firms are likely to engage primarily in product innovation, small companies that have moved beyond the early start-up phase look to engage in both product and process innovation.

2.5 Antecedents of Innovation

Earlier sections of this Chapter outlined three broad streams of theoretical literature on innovation, namely:

- Resource-Based View of Innovation
- Theories on culture of Innovation
- Theory of Open Innovation

This sub-section of the report seeks to identify the specific, relevant variables that determine innovation in small IT companies in the Indian context, based on the innovation theories examined.

2.5.1 Intellectual Capital

Information Technology is a knowledge-intensive domain, characterized by rapid change, variety, varying complexity, and interconnectedness between technologies. This creates an environment where management of knowledge and intangible assets becomes paramount, often providing competitive advantages to firms (Seleim & Ashour, 2004; Bontis, 1998; Harrison & Sullivan, 2000). Knowledge is embedded in people in tacit form, and when combined with collective organizational knowledge gained through experience, leads to new knowledge (Smith, Collins, & Clark, 2005). Such capital that a firm builds up over a period of time is known as Intellectual Capital. It has replaced production and capital assets of companies as the most valuable asset (Therin, 2003). Literature on Intellectual Capital gained momentum through the 1980s (Harrison & Sullivan, 2000) and was later in the 1990s used to explain the exceptionally high stock market valuation of companies like Microsoft and Netscape, driven by 'intangible, intellectual assets'(Bontis, 1998).

Previous studies have attempted to disaggregate Intellectual Capital into components. Bontis proposed that Intellectual Capital is an aggregation of Human Capital, Structural Capital (cultural factors that enable the human capital to flourish) and Customer Capital (Bontis, 1998). A more simplified approach has Intellectual Capital being componentized into Human Capital and Intellectual Assets such as IP/Patents, the role of Human Capital being 'Value Creation', and the role of Intellectual Assets being 'Value Extraction' (Harrison & Sullivan, 2000).

The importance of Human Capital in the IT industry is well-recognized, in both IT services and IT products (Arora & Bagde, 2010).

Services companies that engage in projects for clients require complementary skills in technology, project management and industry-domain knowledge. Cross-sectoral studies have shown that sectors that employ high proportion of skilled employees correlate higher with product innovation (Schneider, Günther, & Brandenburg, 2010). IT companies engaged in building products need deep industry domain knowledge, product life-cycle management, and marketing capabilities. Technologists and Engineers form the primary talent pool in IT. Recruitment of a highly educated workforce, including scientists and engineers, enhances the Human Capital (Romijn & Albaladejo, 2002; Carmel, 2003) and thereby the absorptive capacity (Hadjimanolis, 2000), and the capability to innovate (Kanter, 1988; Capaldo, Iandoli, Raffa, & Zollo, 2003). Indian IT firms invest significantly in hiring the best available talent and in retaining them. Globally, companies like Microsoft and Google have set the benchmarks in talent acquisition, and creating the right workplace culture for such talent to flourish.

Previous experience and training enhance Intellectual Capital(Romijn & Albaladejo, 2002; Hadjimanolis, 2000; Seleim & Ashour, 2004). Many small IT companies in India are started by entrepreneurs who had prior experience with larger firms. They would have gained from their earlier stint, in terms of working with international clients, understanding of technology enhanced by sophisticated training, and building networks. On the job training is as, if not more, important as formal training (Becker, 1962), and small firms pay a lot of attention in retaining their best and brightest employees.

It has been argued that developing countries are constrained in Human Capital base, vis-à-vis the developed countries (Uden, Knoben, & Vermeulen, 2014). However, the Indian IT firms have benefited from large numbers of science & engineering talent graduating every year, favorable government policy in allowing private sector participation in higher education, and by forging effective partnerships with academia. But in recent times, the industry has also raised concerns about the 'employability' of young engineers and technical talent in India, evoking a concerted response from academic community, industry and the Government to improve the skillset of graduate students.

An important component of Intellectual Capital is Intellectual Property(Harrison & Sullivan, 2000). Patenting activity in India was largely quiet during 1970 to 2000, but picked up from 2001 onwards(Suman, Nishy, & Gupta, 2009). A recent report by KPMG has indicated that the patenting activity by the Indian IT players has increased significantly since 2009(KPMG, 2014). For smaller IT companies, particularly the ones focusing on building products, Patents, Copyrights and Trademarks offer protection of their IP, thereby reducing the risk-perception of opening up the innovations to the external world.

A firm's ability to innovate depends upon its Intellectual Capital, which consists of Human Capital and Intellectual Assets. This brings us to the first two hypotheses:

Hypothesis

Hypothesis 1a: Intellectual Capital of the firm has a positive impact on product innovation

Hypothesis 1b: Intellectual Capital of the firm has a positive impact on process innovation

2.5.2 Creative Capability

Creativity and innovation are closely inter-related. Creativity is often referred to as a precursor or precondition/pre-requisite to innovation (Gumusluoglu & Ilsev, 2009; Ogunleye & Tankeh, 2006). Creativity is about doing things differently, and challenging conventional ways of doing things in newer, more efficient ways. The power of Intellectual and Human Capital, key resources in an IT firm, can be better harnessed through creative use of that capital. Creative individuals and creative utilization of assets form the foundation of innovation.

IT industry is one of the creative industries, as the ability to succeed depends upon the ability to manage constant change & dynamism associated with the industry (Lugoboni, Zittei, Moraes, & Kaveski, 2014). Software engineering and development is considered to be an inherently creative activity (Ulrich & Mengiste, 2014). One of the reasons young graduates from leading educational institutions in India are attracted to a career in the IT industry is the knowledge intensive and creative nature associated with it.

A software product, by its very nature, most often has its genesis in a creative idea generated by either an individual or a group of individuals. This will be true for the most successful products created by pioneering companies such as Microsoft or Intel. A software product usually addresses a specific need of an individual or corporate user; which could be specific to a certain industry (such as an ATM application for a bank) or more generic and applicable to a number of industries (such as an ERP solution). The critical success factors of a software product includes functional attributes (such as the features it offers) and non-functional attributes such as performance, scalability, security, robustness etc. Unlike physical or hardware products where most of the features can be felt and compared tangibly, software products also involve a high level of ‘intangibles’. For instance, the stickiness associated with some of the web sites cannot be fully explained in quantitative terms. Hence, developing a software product requires creative application of a combination of skills, including technical knowhow, industry knowledge, understanding of customer needs (both explicit and latent), and expertise in software product development methodologies.

Software service projects are executed in a well-planned manner, following definite, clearly defined phases such as understanding and documenting the system requirements, designing the solution, constructing the software by writing the required programs, and testing the developed solution. Though this process is fairly standardized, there are numerous ways in which individuals and project teams can come out with creative, better ways of doing things. Automation of a set of activities (for example, testing automation or MS Excel based macros for performing specific tasks), building tools for project management (for example, for customer interaction and work transfer), custom built applications for reporting etc. are creative ways of achieving process improvements. Computer programming in itself is an activity where individual creativity plays a significant role in determining the efficiency of the programs written.

Creativity can operate at various levels: individual, group and organizational (Woodman, Sawyer, & Griffin, 1993). Creative individuals form the basis of creative organizations, proposing new ideas for products, processes and procedures (Gumusluoglu & Ilsev, 2009; Oldham & Cummings, 1996). IT companies predominantly work on projects, where multiple group members work together. The knowledge and perspectives that the group members collectively bring to table drive a lot of new ideas on the project. The notion of 'collective creativity' of the individuals in groups has been highlighted in prior literature (Parjanen, 2012). Indian IT companies emphasize teamwork and communication as key skill requirements amongst their employees, owing to the nature of the projects that demand inter-personal skills. Brainstorming, knowledge-sharing and ideation sessions are common at workplaces in these organizations. Group creativity also depends upon the characteristics of the groups, such as member diversity and the approach to problem solving (Woodman, Sawyer, & Griffin, 1993).

Creativity in IT is also needed multi-dimensionally. It requires combining existing knowledge, both scientific and technical, with new knowledge, and applying this knowledge to contexts/situations that are familiar as well as unfamiliar to the firm (Ogunleye & Tankeh, 2006). New knowledge and technical knowhow is always important in the industry, where new technologies emerge continuously. From a scalability point of view, companies need to constantly look at not only the adjacencies, but also contexts that may be distant, where an existing solution or offering can be leveraged. For example, a CRM solution built for the Telecom industry may find applications in other industries such as Airline or Hotel.

Small firms are constrained in their ability to undertake large scale R&D, and hence has to rely more on creative ideas of their employees and managers. In recent times, they have benefited from the proliferation of Open technologies and tools that they can use to test new ideas and concepts.

Thus, creativity is associated with new software product development, as well with IT services. And it is not just important in the context of development of new products and services, but also in process improvements. It is equally important, if not more, in small companies as large companies. The above discussion leads us to the following hypotheses:

Hypothesis

Hypothesis 2a: Creative Capability of the firm has a positive impact on product innovation

Hypothesis 2b: Creative Capability of the firm has a positive impact on process innovation

2.5.3 Top Management Support for Innovation

A distinctive characteristic of small firms in the context of innovation is the role played by senior management and founders(Bougrain & Haudeville, 2002; Palmer & Wright, 2010; Yap & Souder, 1994). For a small company operating in IT, success depends upon the ability to spot a market opportunity, identify a technical solution to it, and respond with an appropriate product or service. Top Management of the firm plays a critical role in this process by leveraging their market knowledge, technical knowhow (often based on previous work experience), ability to network and internal project management skills. Equally important is how the top management creates an organizational culture (Agbor, 2008) where employees can be creative, can experiment with new ideas, and do not fear failure of their ideas. Studies have highlighted the *'vision-setting and motivational role'* of senior management(Mazzarol, 2002; Agbor, 2008), particularly when technological and market choices are varied and dynamic, as is the case with IT. Market and technological choices pose inherent risks in decision making. For instance, a firm looking to develop products for mobile platforms should have a view on the market share of various operating systems compatible with mobile platforms. Similar risks exist for services firms too, in choosing certain technology platforms over others. The risk-taking capacity of the managers dictates the choices that firms make in such situations(Bougrain & Haudeville, 2002). The willingness to take risk, accompanied by a healthy tolerance for failure, creates a culture where employees feel confident and secure to experiment with technological choices and ideas. Successful managers also have the ability to make interim assessments of an investment into a new area, and to make course-corrections efficiently. This is even more critical in scenarios where market uncertainty is high, and technology changes fast (Islam, Doshi, Mahtab, & Ahmad, 2009). Eric Ries, the author of 'The Lean Startup', discusses the concept of '*pivoting*' in the context of small firms, which is about changing the strategic/market/product direction based on the initial market feedback the organization receives(Ries, 2011).

Management commitment towards, and support for creativity and innovation gets manifested in other ways too. Innovative leaders recognize the importance of creative workforce for innovation, and ensure recruitment of the right talent. This is especially true for an industry like IT, where skills are highly compartmentalized. For instance, an application development project may require a mix of business SMEs, designers, programmers and database & testing experts. True leaders recognize the fact that no single individual can combine all the needed skills; hence the need for talent diversity, and create an environment where diversity can thrive and flourish

(Agbor, 2008). Since IT projects are executed by groups, it is imperative to create a participatory work culture that emphasizes communication and collaboration.

Ever since the opening up of Indian economy in 1991, Indian managers have increasingly started making it to the top in global MNCs. Multiple reasons have been attributed to this, such as the openness to international assignments, and the experience of having managed companies in a complex business/market ecosystem that exists in India (Pinto, 2014). The large Indian IT firms are also able to attract some of the best leaders from other industries too. However, experts have pointed out the 'management deficit' that exists in a number of small IT firms (Gulati, 2014). Different types of leadership contexts exist in these companies:

(a) Firms started by IT professionals returning from countries such as US

(b) Firms started by IT professionals experienced with large IT companies in India

(c) Young professionals (including fresh graduates) setting up Technology start-ups

(d) Well-established family businesses expanding into IT

The management style and, hence, the approach towards innovation may also depend upon the background of the founder-managers. Previous experience spanning many years in IT, and of working with international customers and technologies give leaders an edge not only in terms of knowhow, but also in terms of being able to leverage personal contacts and networks.

Top Management support for innovation could take different forms as the firm evolves and grows. In the initial, start-up phase, it is common to find IT entrepreneurs working alongside the rest of the team members. This is an '*immersive'* style management, where they get hands-on in programming and software development activities. As the firm grows, the management style becomes more *'participatory and collaborative'*, where the leaders actively switch roles from being a team member to a mentor to the salesman of the company. Further, as the firm becomes much larger, the role of top management becomes more about balancing the trade-off between too much innovation and stability(Henkin & Davis, 1991).

To summarize, top management support for innovation in small companies involves setting the technology/market vision for the company, forming the right organization culture and structure that is conducive to innovation, hiring creative recruits, and willingness to take risks and tolerate failure of new ideas. The top management style may depend upon the background of the leaders/founders, and the stage of growth that the company is in. The nature and extent of top management support for innovation in small IT companies is expected to vary from firm to firm, and some firms may have to cope with 'management deficit'. This leads us to the following hypotheses:

Hypothesis

Hypothesis 3a: Top Management Support for Innovation has a positive impact on product innovation

Hypothesis 3b: Top Management Support for Innovation has a positive impact on process innovation

2.5.4 Organization Learning Capability

As with most knowledge-intensive industries, employees of companies operating in the IT industry require skills along multiple dimensions:

- ***Technical Knowhow:*** This encompasses knowledge of various programming languages, databases, operating systems and computer science. This can also be very specific, such as CAD/CAM (Computer Aided Design/Computer Aided Manufacturing), or specialized design areas within electronics engineering.
- ***Tools Expertise:*** This includes knowledge of specialized tools, such as ERP platforms like SAP, Testing tools, Design and Analysis tools such as UML, and analytical tools such as SAS.
- ***Software Engineering Process Knowledge:*** This is about the various processes involved in software development. Several Indian companies, including smaller ones, go for certifications such as CMM, which require them to comply with a number of process and quality standards.
- ***Domain Expertise:*** Indian IT companies have placed significant emphasis on building domain knowledge, in areas such as Banking & Financial Services, Telecom, Pharma and Manufacturing. To a certain extent, this has also helped them to move up the value chain, into areas like consultancy services and products/platforms. Combination of technical and domain skills is a highly sought after skill among IT professionals.

- ***Project Management Skills***: This is required at middle to senior level roles in IT companies, and includes people management skills, project tracking/monitoring, quality management, and client relationship management.

These are generic skill requirements, and the huge breadth of areas where IT companies operate in implies that the skill requirements are highly contextual as well. For instance, several IT companies have ventured into high-end Analytics services that require advanced Analytical modeling skills and tools skills. The transitory nature of technologies involved makes the skill requirements highly dynamic. Clearly, it can be seen that many of these skills go beyond what is learned academically, and can only be learned through experience.

Individuals and teams in IT companies generate significant amount of knowledge through R&D, project execution and client interactions. This includes both tangible knowledge (residing in artifacts and documents) and tacit knowledge. A truly, learning organization finds effective ways of exchanging both tangible and tacit knowledge between employees. Knowledge Management systems, platforms and tools facilitate acquisition & generation, and sharing & exchange of knowledge (Donate & Guadamillas, 2011). A recent survey done among the large Indian IT companies has shown that most of them have fairly advanced Knowledge Management capabilities, which they have developed with the objectives of retaining talent, managing customer expectations, developing new service offerings and thereby creating competitive advantages (Chaudhuri, 2011). Smaller companies adopt miniature and cost effective tools for Knowledge Management.

While the unit of learning is an individual, collective learning happens at group/project levels, that further enhances the learning of the whole organization (Barker & Neailey, 1999). ‘Knowledge Transfer sessions’, peer trainings, brainstorming & ideation sessions etc. are common forums in IT companies where knowledge sharing and learning happens collectively. Best practices are also shared from project to project.

Learning new knowledge is facilitated to a great extent by training. IT companies spend a lot of money on training on new technology, tools and domain. In the Indian context, training institutions operate specifically in various areas in IT. Companies like NIIT have been among the leaders in this space, and offer IT services along with its training portfolio (www.niit.com). Small companies are unlikely to have well-evolved, comprehensive training programs for its employees, however, reply more on informal, ad hoc training(Salim & Sulaiman, 2011).

Past research has established Organizational Learning as an antecedent to innovation in ICT and technology companies (Salim & Sulaiman, 2011; Ar & Baki, 2011). Distinction has to be made between the Learning Organization and Organizational Learning. ‘Learning Organization’ is a state where commitment to and culture for innovation exists, and organizational learning is the process by which learning happens (Therin, 2003). A learning culture emphasizes on sharing best practices and learning from past mistakes, both required for continuous improvement of processes. Software development is a process-driven activity, and benefits from continuous improvement. Improvements and innovations in processes can not only generate cost benefits, but also lead to competitive differentiators.

Organizational learning enhances the absorptive capacity and knowledge needed to come up with new products/services and/or improve existing products/services(Islam, Doshi, Mahtab, & Ahmad, 2009).

Therefore, the following hypotheses have been formulated:

Hypothesis

Hypothesis 4a: Organization Learning Capability has a positive impact on product innovation

Hypothesis 4b: Organization Learning Capability has a positive impact onprocess innovation

2.5.5 Customer Involvement

An examination of the history of evolution of IT companies in India reveals the multiple roles that customers have played in the growth of the industry as a whole:

- ***Early growth of the industry:*** During the 1980s and early 1990s, the industry was growing rapidly, and seeking to strengthen its global base and credibility. The early customers who worked with Indian IT vendors during this period provided the much needed financial resources (which would help in future scaling up), proof of concept, and market visibility.
- ***Technology Spillover:*** One of the criticisms of the Indian IT firms is that they have traditionally been ‘followers’ as opposed to ‘leaders’. New technological concepts were created by technology companies predominantly located in the developed nations, and the Indian companies benefitted through technology

transfer. A large number of Indian IT firms operate in the 'customized software' segment, where close ties are necessary with customers (Arora, Arunachalam, Asundi, & Fernandes, 2001).

- ***Sharing of Best Practices in software engineering & IT:*** The Indian vendors work closely with client IT organizations, which helps them imbibe best processes and practices followed. Vendors are often bound by stringent Service Level Agreements with customers that require the vendors to adhere to quality and project management standards(Brinkkemper & Jansen, 2012).
- ***Transfer of Industry Domain Knowledge:*** The experience of working with clients across various industries has helped the Indian vendors to continuously learn new domains and build focused solutions. Therefore, the industry has constantly moved up the value chain from the early days of 'body-shopping' (Bhatnagar, 2006).
- ***Innovation &Product Management:*** Some of the work done by Indian vendors involve offshore product development for companies located in clusters such as the Silicon Valley, thereby helping them imbibe the strategies/methodologies for innovation and new product development. Engineering Research & Development and Product Development contributed about $17 billion in revenues for Indian IT industry in 2014(NASSCOM, 2014)

Indian IT vendors' relationship with customers today is far more than just transactional. Customers see Indian companies as much more than order-takers, and are ready to engage with them in strategic areas. On their part, the Indian companies are proactively looking to build new, strategic offerings that can add value to their customers' businesses. As a result, transactions are not solely based on cost arbitrage anymore (Verma, 2015).

Involvement of customers can be a significant source for innovation in IT. IT projects done for customers last for several months (and years, in some cases), which means that there is a long timeframe of interaction that happens between the vendor and the customer. This long time-period of interaction creates build trust, and collaboration opportunities in innovation. Several vendors involve in 'co-creation' of products and solutions with their customers. For instance, Infosys and P&G jointly created a new solution named 'Distributor Connect' for capturing insights on P&G's distributors, thereby enabling downstream supply chain visibility and optimization (Infosys.com, 2013).

Previous research has highlighted the importance of customer involvement leading to new ideas, concepts and innovations (Vrande, Jong, Vanhaverbeke, & Rochemont, 2009). Users have been cited as source of innovations in high technology industries (Hippel, 1988). This is quite applicable in the software industry, where customers are often the users. Small firms that do not have the financial muscle to go for a 'big bang' approach to software product development, stand to gain by involving customers at early stages of product development. This approach, known as 'customer development', was proposed by Steve Blank as an alternative and more cost effective approach to product development life cycle(Blank, 2006). The customer development principle was further extended into the concept of MVP (Minimum Viable Product), which talks about building skeletal versions of a software product and getting it validated by the customers before building it up(Ries, 2011).

IT vendors have stringent SLAs (Service Level Agreements) with their customers, where the expectations regarding quality, productivity etc. are agreed upon upfront (Brinkkemper & Jansen, 2012). Several Indian vendors pride on the improvements they have been able to achieve on the SLAs, in terms of being able to consistently beat the expectations. This is made possible through process streamlining and re-engineering, standardization, comprehensive documentation and process automation. Ongoing interactions with customer stakeholders and regular feedback from them add value to the process improvements. Intensity and breadth of end-user collaborations have been linked to a firm's process innovation capability(Ashok, Narula, & Martinez-Noya, 2014).

The above discussion leads us to the following hypotheses:

Hypothesis

Hypothesis 5a: Customer Involvement has a positive impact on product innovation

Hypothesis 5b: Customer Involvement has a positive impact on process innovation

2.5.6 External Networking

While customers are a key source of innovation for IT companies, there are other external knowledge sources, as substantiated and recommended by open innovation experts/literature. Suppliers, Universities & Research

Institutions (public and private), Consultants who possess specialized knowledge or expertise, and competitors are potential sources for collaboration in innovation. Table 2.1 shows some studies that highlight such linkages.

Table 2.1: Previous studies that considered 'External Networking'

Study	Description	Customers/Users	Suppliers	R&D Labs (Public/Private)	Universities/Academia	Consultants/Interediary	Competitors/Inter-firm
Burcharth, Knudsen, & Søndergaard, 2012	Imapct of previous Partnering experience on OI performance	y	y	y	y	y	y
Dahlander & Gann, 2010	Analysis of different forms of openness based on survey of all papers on OI published on Thomson's ISI in 1999	y	y	y	y	y	y
Howells, 2006	Analyzes the role played by intermediaries or innovation brokers					y	
Inauen & Schenker-Wicki, 2011	Impact of openness to external actors and innovation performance (product & process innovation)	y	y		y		y
Laursen & Salter, 2006	Impact of open innovation breadth and depth on innovation performance	y	y	y	y	y	y
Lazzarotti, Manzini, & Pellegrini, 2010	Classification of open innovation into 4 models based on extent of partners and innovation phases opened up	y	y	y	y		y
Lee, Park, Yoon, & Park, 2010	SME perspective and intermediation in Open Innovation	y	y	y	y	y	y
Schroll & Mild, 2011	Empirically examine the prevalence/acceptance of open innovation in European countries	y	y	y	y	y	y

Suppliers for IT companies are mainly suppliers of human talent and suppliers of technology. Larger IT companies collaborate with educational institutions in the areas of training (both teaching staff and students) and other student programs, to ensure a steady supply of high quality talent. However, such alliances are limited for smaller companies, owing to scarcity of resources as well as bandwidth. Technology (software and hardware) vendors to IT companies include the likes of Microsoft, Oracle and Dell, to name a few. The partnerships with these technology giants can take multiple forms. Some of these leading technology firms are clients of IT firms themselves (thereby having a bi-directional vendor-customer relationship). Indian IT firms are also implementation partners to many leading, global enterprise solutions vendors. These partnerships evolve with time, and lead to long term relationships & trust. While it is difficult to quantify the technology transfer that takes place, it can be safely assumed that Indian IT firms benefit from the spillover effects.

Indian IT companies predominantly offer software products and services based on existing technology. As discussed earlier, new technologies or technology discontinuities typically originate in developed ecosystems such as the Silicon Valley. Hence, the R&D needs of these companies are mainly ‘applied’, as opposed to ‘basic’. Consequently, the alliances with pure scientific research laboratories etc. may not yield synergies, especially for the smaller players.

Extant literature on industry-academia collaboration corroborate the positive impact it has on innovation (Pertuze, Calder, Greitzer, & Lucas, 2010). Encouraging such alliances is an integral part of Government policies on fostering innovation around the world (Sharma, Kumar, & Lalande, 2006). Several studies have pointed out the role played by Stanford University in the birth and growth of Silicon Valley (Al-Mubaraki & Busler, 2012; Sharma, Kumar, & Lalande, 2006), and the impact that MIT has on fostering innovation in regions around Boston(Saxenian, 1995). It is not only the large corporations that benefit from university collaborations. Universities provide the ecosystem for start-up and small firms to access fresh talent, and encourage dialogue between academic community and entrepreneurs, as happened in the case of Stanford-Silicon Valley(Moore & Davis, 2001). There are thousands of Technology & Business incubators around the world, growing at a rapid rate, and about one-third of these are affiliated with universities (Al-Mubaraki & Busler, 2012). Industry-academia collaborations have been on the rise in India in recent years, albeit at a moderate pace (Gandhi, 2014). These partnerships include joint research initiatives, consultancy studies, and student programs (such as industry projects done by students). Shifting of university research emphasis from basic research to applied research has been a recent trend(Sharma, Kumar, & Lalande, 2006). There are indications that this is happening in India as well, based on the recent initiatives announced by leading universities, Government bodies and companies in recent years. National Science and Technology Entrepreneurship Development, an initiative of the Department of Science & Technology (DST), has taken the leadership role in setting up a number of Technology Business Incubators in the country, and many of them are affiliated with leading universities in the country (NSTEDB.com, 2015). Industry-academia partnerships are set to take off in the country, and the tangible impact it will have on fostering innovation in firms will become clear in due course.

The usefulness of inter-firm linkages and alliances on innovation is a well-established stream of research. Small IT firms in India face barriers in building strategic alliances with the larger firms(Ilavarasan & Parthasarathy, 2012), and most such relationships are limited to sub-contracting work and tactical tie-ups. On the other hand, the small firms could benefit by building alliances with startup firms. Startups usually work on the latest technological discontinuities, and generally give an indication of the direction in which technology is changing. Small firms also stand to benefit by formally partnering with capable startups in join-commercialization of new products, and the attractiveness of the startups for partnering improves with its success in new product development, geographical location etc. (Rothaermel, 2002). Successful and fast-growing startups in the Indian IT ecosystem have high visibility, through NASSCOM awards and other industry recognition.

Yet another type of inter-firm linkages is collaborating with your competitors. One of the well-articulated and widely cited publications in this topic is the article *'Collaborate with your competitors-and win'* written by Hamel, Doz and Prahalad in The Harvard Business Review way back in 1989(Hamel, Doz, & Prahalad, 1989). The authors propose that such alliances make more sense when each partner brings to table unique skills, and help firms gain access to new technologies, enhance product capabilities & process competences, and reduce costs (Hamel, Doz, & Prahalad, 1989). They go on to suggest that robust governance is needed in such agreements to protect Intellectual property and proprietary knowledge. Small IT companies in India often have unique skills that are not necessarily protected through patents/IP, and this may hinder these firms' ability to engage in such partnerships. Despite this, selective partnerships do help. 'System Integration' services is something that is offered by some IT services companies, where they act as a consultant who selects multiple products/platforms, and implement the integrated solution for a client. Most of the software application areas are broad by nature, and a single firm may not be able to occupy the entire value chain. Collaborations (joint go to market strategy) make business sense in such situations.

While it is evident that external networking (and the knowledge/ideas generated) can contribute directly to product development initiatives, it can also lead to process innovations. The relationship between external networking and process innovation has been highlighted in previous research; process ideas learned from external collaborations can be adapted by a firm for its internal use(Robertson, Casali, & Jacobson, 2012). Intensity and breath of external collaborations have been linked to both product and process innovations (Ashok, Narula, & Martinez-Noya, 2014).
The above discussion leads us to the following hypotheses:

Hypothesis

Hypothesis 6a: External Networking has a positive impact on product innovation

Hypothesis 6b: External Networking has a positive impact on process innovation

2.5.7 Employee Involvement

Hypotheses 5a/5b and 6a/6b represent two important dimensions of Open Innovation, namely, Customer Involvement and External Networking, respectively. In other words, they indicate the 'exploration' aspect of Open Innovation, where new knowledge can be brought in from external sources. However, these constructs do not take into consideration how this knowledge can be 'exploited' within the organization. An emerging strand of research on Open Innovation is to do with employee (non-CxO, non-managerial) involvement in innovation. Open Innovation theories de-emphasize the role played by corporate R&D, putting emphasis on collaborations and networking as more efficient sources of innovation. The diminishing role of R&D staff brings the operational staff members to the center stage of innovation.

Literature of 'Employee-driven innovation' is based on the following principles: (a) individuals are creative, and this creativity needs to be exploited (Amundsen, Aasen, Gressgård, & Hansen, 2014; Vrande, Jong, Vanhaverbeke, & Rochemont, 2009) (b) collective creativity of employees creates synergies, and outweigh the sum of individual capabilities(Tidd & Bessant, 2005) (c) individual employees have the potential to leverage the ties they have with individual in the larger ecosystem(Vrande, Jong, Vanhaverbeke, & Rochemont, 2009) (b) organization should have the favorable culture where individual employees can involve themselves in innovation(Burcharth, Knudsen, & Søndergaard, 2012) and middle/top management have the responsibility to instill this mindset among employees (Enkel, 2011).

Indian IT industry comprises more than 15000 companies(NASSCOM, 2014). 40% revenues in the industry is contributed by top 11 firms, which indicates the fragmented nature of the industry (NASSCOM, 2014). There exists significant fluidity of human resources across these companies, and hence, cross-pollination of best practices and ideas between these companies. Firms stand to gain the accumulated knowledge base and creative ideas that reside among these employees. Additionally, two-thirds of the entrepreneurs who have started new IT companies are aged less than 30(NASSCOM, 2014). Young entrepreneurs do not have the luxury of world knowledge and deep experience gained in the industry, and hence will benefit by picking the brains of the larger talent base in their companies. A large number of small IT companies in India are located within clusters. Bangalore as a leading IT cluster has been well-researched, and has been recently ranked among the top 20 start-up ecosystems globally(NASSCOM, 2014). This not only aids labor mobility, but also fosters regular interactions and networking (both informally and through formal knowledge sharing/networking events), keeping the professionals abreast with latest technologies and market trends.

Technology changes rapidly in IT; new and improved technologies emerge constantly as old ones become obsolete. Built up absorptive capacity is what helps firms to quickly absorb the new technologies and assimilate those into their value chain (Cohen & Levinthal, 1990). It is important to gather intelligence through in-depth market & technology research, and learn about the new technologies before investing in it (Vanhaverbeke, Vrande, & Chesbrough, 2008). Managers may not be able to do all this by themselves, and will need active participation of non-managerial employees in these initiatives. The responsibility of management is to create a conducive environment where employees are encouraged to collaborate, communicate and ‘search’ for new opportunities. This could be a challenge for many small Indian companies, particularly the family-owned ones, where founder-managers may have the propensity to centralize power within themselves (Gulati, 2014).

An emerging open innovation platform that IT firms leverage is ‘Innovation communities’. An innovation community is a network of individuals, users or firms (of a software application, for instance), who have common interests and objectives (Hippel E. v., 2005). These include virtual, online communities, social networking communities etc. (Ståhlbröst & Bergvall-Kåreborn, 2011). Individuals can interact through their PCs or mobile phones, and user-friendly tools are available today that facilitate such interactions. Benefits of participation in innovation communities are many, including knowledge gathering, idea exchange, testing & feedback on beta versions of products etc. Furthermore *development communities* enable joint product development with external entities such as customers, users and other interested developers (Ståhlbröst & Bergvall-Kåreborn, 2011). A well-known example of an innovation community is open source software (Hippel E. v., 2005). A large number of small firms leverage open source software tools, platforms and collaborations with Open Source System Communities (Piva, Rentocchini, & Rossi-Lamastra, 2012) to develop their products, owing to the obvious cost benefits vis-à-vis licensed software. Employees of IT firms are natural participants in these forums and communities. The skills, knowledge and experience they gather through such means can enhance the overall innovation capacity of the firm.

To summarize, employees at all levels can collectively add to the innovation capacity of a firm. Innovation-oriented firms engage their non-managerial employees, foster internal collaboration & communication, support risk-taking behavior, make the employees feel that their contributions are recognized(Siguaw, Simpson, & Enz, 2006). Numerous platforms exist today for IT employees to interact with entities outside the firm, such as innovation communities, and this enhances their innovation potential. This leads us to the following hypotheses:

Hypothesis

Hypothesis 7a: ***Employee Involvement in innovation has a positive impact on product innovation***

Hypothesis 7b: ***Employee Involvement in innovation has a positive impact on process innovation***

2.6 Performance Implications of Innovation for IT Firms

One of the objectives of this study is to assess the performance implications of product and process innovation in small IT firms in India. It firms in India include IT services firms and software product companies. At the outset, it needs to be clarified that product innovation in this context includes both IT services and IT products.

For small companies, introduction of new or improved products is the primary approach to compete. Two points that have been discussed earlier need to be revisited:

- Technology discontinuities is the norm in Information Technology industry. Scope for introducing new products always exists. Growing technology areas such as Analytics, Cloud Computing, Mobility and Big Data create avenues for introduction of new offerings.
- The stated intention of Indian IT firms to look for innovation-based ‘non-linear’ growth models, focusing on differentiated, value-based offerings.

Innovation is about newness and new applications of technologies (Gunday, Ulusoy, Kilic, & Alpkan, 2011). Introduction of new and improved products is associated with differentiation of a firm's offerings(Koellinger, 2008; Hashi & Stojcic, 2013; Camisón & Villar-López, 2014). Differentiation leads to competitive advantages, and hence growth & profitability(Porter, 1980). Globally, the likes of Microsoft and Google are examples of companies that started small, created sustainable competitive advantages through innovation-driven, differentiated offerings, and as a result have grown revenues & profits over very long periods of time. Large Indian IT companies have traditionally competed on the basis of cost advantages, but have later on introduced several differentiated offerings. While most of these offerings were built around the service-based delivery model, there have been many examples of successful IT product innovations as well.

Several scholars have highlighted the impact of process innovations on productivity, efficiency and cost reduction, which leads to higher profitability (Goedhuys & Veugelers, 2012; Koellinger, 2008; Hashi & Stojcic, 2013; Camisón & Villar-López, 2014; Gunday, Ulusoy, Kilic, & Alpkan, 2011; Rochina-Barrachina, Mañez, & Sanchis-Llopis, 2010). This applies to smaller firms as well(Ruiz-Jime´nez & Fuentes-Fuentes, 2013), although their ability to retain the competitive advantages may be limited in terms of duration(Rochina-Barrachina, Mañez, & Sanchis-Llopis, 2010).

The relationship between product innovation and process innovation is complex, and as discussed earlier, sometimes it is a thin line that divides the two types of innovation in the context of an IT firm. Many scholars have suggested the complementary and synergistic nature of product and process innovation(Camisón & Villar-López, 2014; Gunday, Ulusoy, Kilic, & Alpkan, 2011). Both, when implemented together, reinforce each other to create unique competencies. This can be illustrated with an example from Indian IT. While the technologies involved in developing specific applications and solutions remain the same, and individual firm can create unique competencies by packaging a new product with unique processes, such as an inventive pricing model. Cloud based delivery and pay-as-you-go model was an early example of an inventive pricing model, which remained an innovation for a while. It also makes economic sense, as product innovation if riskier and more expensive(Li & Atuahene-Gima, 2001), and enhancing the attractiveness of a product innovation with unique processes makes the innovation far more attractive. For process innovation to reap benefits, there ought to be the right organizational cultural and structural attributes(Baer & Frese, 2003), which automatically assists product innovation too.

Numerous studies have shown that product and process innovation leads to better firm performance(Goedhuys & Veugelers, 2012; Hashi & Stojcic, 2013; Camisón & Villar-López, 2014; Gunday, Ulusoy, Kilic, & Alpkan, 2011; Artz, Norman, Hatfield, & Cardinal, 2010; Atalay, Anafarta, & Sarvan, 2013; Kalkan, Bozkurt, & Arman, 2014; Ruiz-Jime´nez & Fuentes-Fuentes, 2013). Extant literature exists in the context of developed nations. Studies have also been done on both small and large firms linking innovation to firm performance in emerging economies such as China(Qiao, Ju, & Fung, 2014), Brazil(Sérgio Kannebley & Araújo, 2010) and Russia (Chadee & Roxas, 2013).

An interesting aspect that is relevant to the Indian IT firms is the mutually reinforcing effects of innovation and export orientation. Innovations can lead to differentiated products, as seen earlier. Innovative products open up new markets for firms, and hence growth opportunities through exports(Hashi & Stojcic, 2013). Exporting creates international linkages, and hence opportunity to learn best practices from leading international clients, thus furthering the firm's innovation capacity(Golovko & Valentini, 2011). This is pertinent to Indian IT firms, as the industry as a whole generates majority of revenues from exports. Export intensity has contributed to firms' performance, not just through cost advantages associated with Indian companies, but also through the continuous learning opportunities.

The above discussion leads us to the following hypotheses:

Hypothesis

Hypothesis 8a: Product innovation in firms leads to higher levels of Firm Performance

Hypothesis 8b: Process innovation in firms leads to higher levels of Firm Performance

2.7 Theoretical Model

The literature review looked at the current status of the Indian IT industry and concluded that need for innovation in the industry is paramount. Key theories on innovation were reviewed, and seven variables were hypothesized as antecedents of innovation. Two types of innovation have been recognized as relevant in the context, namely, product innovation and process innovation. It has also been hypothesized that product and process innovation lead to better firm performance. This leads to the formation of the theoretical model that forms the basis for analysis. The Theoretical Model is depicted in Fig 2.3.

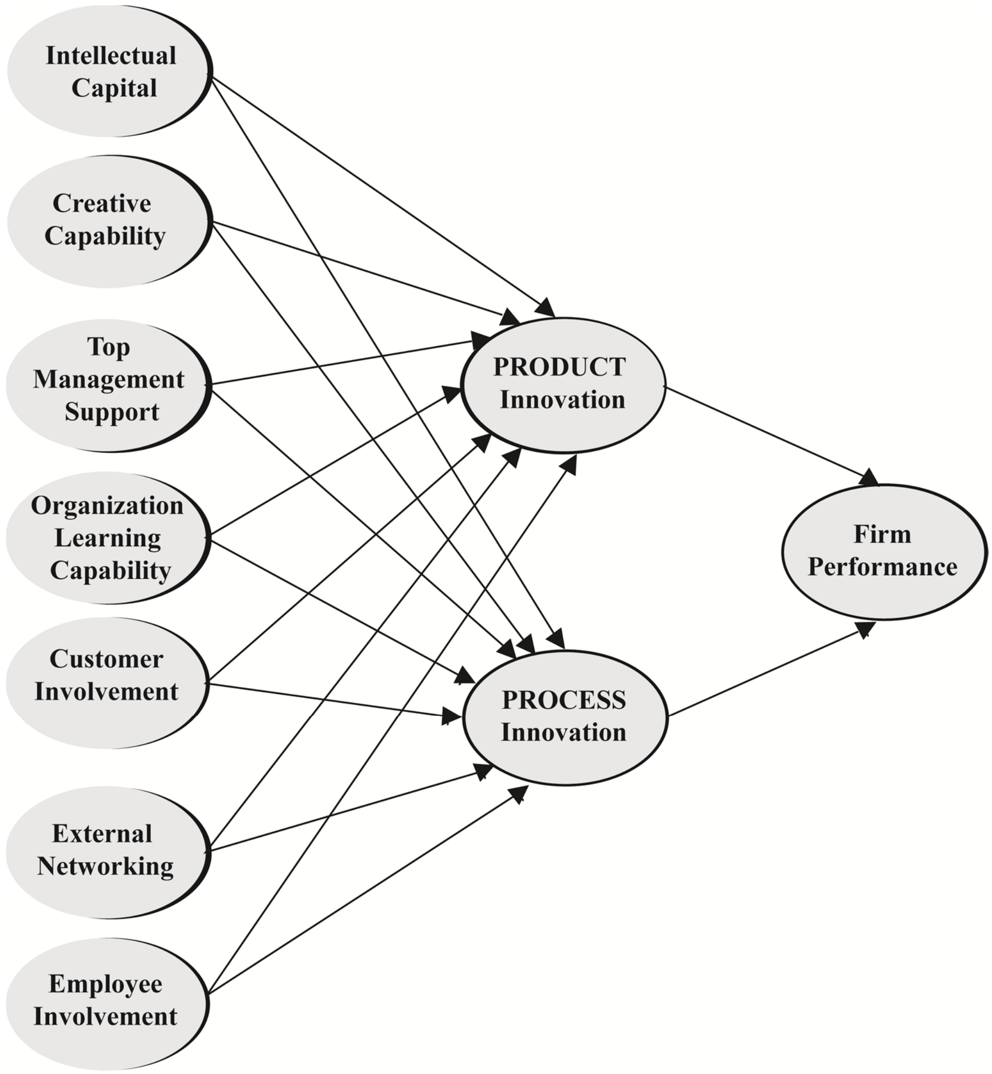


Fig. 2.3: Theoretical Model

.....ജൽ.....

Chapter 3

RESEARCH METHODOLOGY

Contents

Chapter-2 discussed the literature pertaining to Innovation in general, and more specifically in the context of Indian IT firms. Chapter-2 also discussed the contextual antecedents & performance implications of innovation, based on which the hypotheses were formulated. This Chapter outlines the Research Problem & the specific Research Objectives, and elaborates the Methodology adopted to conduct this study.

3.1 Significance of the Study

The current state that the Indian IT industry is in, which places significant emphasis on innovation-driven business models, implies that this may be an appropriate time to conduct this study. The unique characteristics of IT firms and the Indian ecosystem gives this study the opportunity to investigate aspects unfamiliar to previous studies. Multiple antecedents of Innovation and relationships between variables are considered, which creates ample avenues for researchers and the academic community to further extend this study along related lines. The insights relating to the drivers of innovation, in particular, may benefit practitioners.

3.2 Statement of the Research Problem

The Research Problem is summarized as follows:

Indian IT industry has reached an inflection point, with companies looking to create non-linear growth models. The industry is fragmented, with large number of small firms co-existing with a small number of large firms. While innovation is critical to the success of these firms, there is very limited understanding of innovation in small IT firms. Existing literature on innovation is dominated by consulting studies and analyst reports, primarily based on case studies and qualitative approaches. This research seeks to address this information gap by empirically studying the factors leading to innovation in small firms, the linkage between innovation & firm performance, and the variation of adoption of innovation in small firms.

3.3 Research Objective

The main Research Objective is as follows:

To study and explain the Antecedents and the Performance Outcomes of Product Innovation and Process Innovation in small IT firms in India.

The specific objectives of the study are as follows:

- To understand the drivers of innovation in small IT firms
- To assess the relationship between innovation and firm performance in small IT firms
- To understand the variation in adoption of innovation among the firms

3.4 Hypotheses Formulation & the Theoretical Model

While the descriptions in Chapter-2 established the significance of the variables incorporated and the hypothesized relationships among the variables, the hypotheses formulated are enlisted in Table 3.1.

Table 3.1: Research Hypotheses

Hypothesis #	Hypothesis Description
1a	**Intellectual Capital of the firm has a positive impact onproduct innovation**
1b	**Intellectual Capital of the firm has a positive impact onprocess innovation**
2a	**Creative Capability of the firm has a positive impact onproduct innovation**
2b	**Creative Capability of the firm has a positive impact onprocess innovation**
3a	**Top Management Support for Innovation has a positive impact on product innovation**
3b	**Top Management Support for Innovation has a positive impact onprocess innovation**
4a	**Organization Learning Capability has a positive impact onproduct innovation**
4b	**Organization Learning Capability has a positive impact onprocess innovation**
5a	**Customer Involvement has a positive impact on product innovation**
5b	**Customer Involvement has a positive impact on process innovation**
6a	**External Networking has a positive impact on product innovation**
6b	**External Networking has a positive impact onprocess innovation**
7a	**Employee Involvement in innovation has a positive impact on product innovation**
7b	**Employee Involvement in innovation has a positive impact on process innovation**
8a	**Product innovation in firms leads to higher levels of Firm Performance**
8b	**Process innovation in firms leads to higher levels of Firm Performance**

The 16 hypotheses are also pictorially represented in the Theoretical Model in Fig 3.1. Hypotheses 1 to 7 pertain to the relationship between the antecedent variables and Product & Process Innovation. Hypotheses 8a & 8b relate Product & Process Innovation to Firm Performance.

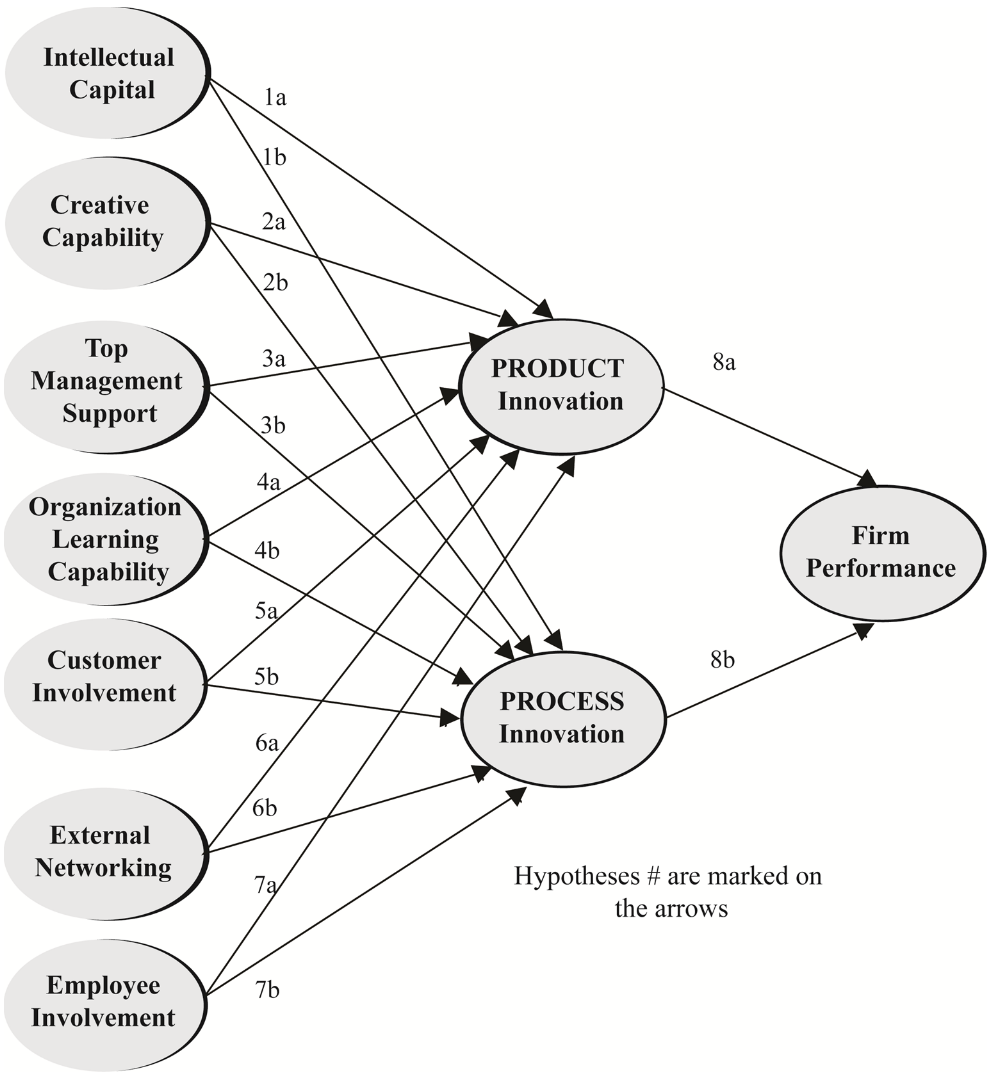


Fig. 3.1: Research Hypotheses represented on Theoretical Model

3.5 Theoretical and Operational Definitions

Definition: Intellectual Capital

Theoretical Definition

Intellectual Capital refers to the explicit and tacit knowledge base of a company, which when leveraged, may lead to competitive advantages. Intellectual Capital is considered to have three dimensions, namely, Human Capital, Structural Capital, and Relational Capital (Seleim & Ashour, 2004). Human Capital refers to the quality of human talent at the disposal of the firm, Structural Capital refers to the 'codified knowledge base' or the tangible knowledge base, and Relational Capital refers to intangible knowledge created through interactions with customers and other partners (Seleim & Ashour, 2004).

Operational Definition

Intellectual Capital has been operationalized as the combination of Human Capital and Intellectual Assets, recognizing the value creation role of the former, and the value extraction role of the latter (Harrison & Sullivan, 2000). A self-developed scale was used for measurement of Intellectual Capital, which considers the quality of talent including the selection process, and the emphasis on R&D & Patenting.

Definition: Creative Capability

Theoretical Definition

An organization's creative capability is the ability to create valuable, useful new products, services, ideas, procedures, or processes by individuals working together in a complex social system (Woodman, Sawyer, & Griffin, 1993). While the individual employee is the key driver of creative capability, it accumulates in groups (Kanter, 1988)and eventually at the firm level, enhancing the overall creative capability. Open communication & networking between employees creates knowledge diversity, which in turn impacts the creative capability of employees (Jen, 2014).

Operational Definition

For the purposes of this study, Creative Capability is measured as the combination of diversity of employee skills & communication, a facilitating organizational climate of encouragement, investment of time/resources, and recognition. The measures for Creative Capability was adopted from a previous study of Innovation antecedents done in Turkey among high-technology SMEs (Ar & Baki, 2011).

Definition: Top Management Support

Theoretical Definition

Top Management Support for Innovation is the *'expectation, approval and support of new and improved ways of doing things, and new & improved products and services at the work place through encouragement of thinking & doing things differently/innovatively, and risk taking.'*(Choi, Moon, & Ko, 2013). Supervisory encouragement and support for innovation nurtures creativity (Amabile, 1997; McLean, 2005; Sarros, Cooper, & Santora, 2008), while risk taking & tolerance for failure are essential for committing adequate resources towards development of new, innovative ideas (Herrmann, Gassmann, & Eisert, 2007; Hurley & Hult, 1998; Tienne & Mallette, 2012).

Operational Definition

The scale for Top Management Support was adopted from a previous study of Innovation antecedents done in Turkey among high-technology SMEs (Ar & Baki, 2011). The scale considers measures relating to support & encouragement given to the employees on innovative activities, and the tolerance for mistakes of employees in the quest for new ideas.

Definition: Organization Learning Capability

Theoretical Definition

Organization Learning is the collection of shared insights, knowledge and experiences that reside within an organization, which, when leveraged, shall create competitive advantages (Stata, 1989). The pace at which organizational learning happens is critical, especially in knowledge intensive industries (Stata, 1989). Learning within groups and teams is important for project based organizations, such as IT firms (Barker & Neailey, 1999). Training and Development facilitates new knowledge creation and knowledge exchange (Lau & Ngo, 2004; Zairi & Al-Mashari, 2005). The capacity to learn is fully realized only in an environment of learning & knowledge sharing (Ven, 1986).

Operational Definition

The scale for Organization Learning capability was adopted from a previous study of Innovation antecedents done in Turkey among high-technology SMEs (Ar & Baki, 2011). It considers training & development initiatives, learning opportunities & support provided by the organization for learning, and managerial commitment towards learning as its key elements.

Definition: Customer Involvement

Theoretical Definition

Customer Involvement is about the inclusion of customers & users at various stages of the innovation process. It refers to the 'direct involvement of customers in the innovation process, development of products & services based on customer inputs, requirements & feedback, and conducting routine market research to assess customer needs'(Vrande, Jong, Vanhaverbeke, & Rochemont, 2009).For small companies, involvement of customers at early stages, and early validation of ideas help in building new products iteratively, without committing huge resources upfront (Ries, 2011).

Operational Definition

In this study, Customer Involvement is measured as a combination of customer involvement in product conception stages, consideration of customer wishes and suggestions, validation of concepts by customers, and customers as a source of knowledge (Rangus, Drnovsek, & Minin, 2013).

Definition: External Networking

Theoretical Definition

External Networking for innovation is one of the key principles of the theory of Open Innovation, popularized by Henry Chesbrough. Open Innovation is about leveraging customers, suppliers, R&D institutions, universities, consultants, and competition as potential source of innovation (Chesbrough, 2003). It has been defined as '*drawing on external network &*

partners for knowledge in the innovation process of the company'(Vrande, Jong, Vanhaverbeke, & Rochemont, 2009).

Operational Definition

A scale for External Networking was adapted from a recent study that dealt with scale construction of the dimensions of Open Innovation (Rangus, 2014; Rangus, Drnovsek, & Minin, 2013). In this study, External Networking is measured as collaboration with Universities & Research institutions, High technology start-up companies, leading technology vendors, competitors, and consultants on innovation. Both formal and informal collaborations/ networking with external sources of knowhow (Vrande, Jong, Vanhaverbeke, & Rochemont, 2009) were considered important for the purposes of this study.

Definition: Employee Involvement

Theoretical Definition

Employee Involvement is leveraging non-R&D employees for generation of ideas & suggestions, formation of independent teams for development of new ideas & innovations, and considering the employees as a source of knowledge & innovation (Vrande, Jong, Vanhaverbeke, & Rochemont, 2009). This is based on the philosophy that all employees, given the right support & encouragement, have the capacity to innovate (Amundsen, Aasen, Gressgård, & Hansen, 2014). An '*internal organizational policy' or 'stimulation'* may be necessary for active employee involvement, and hence regular communication by and facilitating role of management is paramount (Vrande, Jong, Vanhaverbeke,

& Rochemont, 2009). Small firms often operate in niche technology areas, and employees need to nurture a culture of 'opportunity searching' (Burcharth, Knudsen, & Søndergaard, 2012).

Operational Definition

Active communication to and between employees, rotation between job tasks, external orientation of employees for knowledge & ideas, and the existence of a reward system have been considered as key operational measures of Employee Innovation, adapted from a recent study that dealt with scale construction of elements of Open Innovation(Rangus, Drnovsek, & Minin, 2013).

Definition: Product Innovation

Theoretical Definition

The commonly cited definition of Product Innovation is as explained in the OSLO Manual, which is as follows:

"A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics" (OECD, 2005)

Product innovation is deemed to create differentiated offerings (Hashi & Stojcic, 2013; Koellinger, 2008), and hence the novelty factor assumes significance.

Operational Definition

Introduction of new and/or improved products, the 'novelty' aspect of the products, and perceived success rate vis-à-vis competition (Wang & Ahmed, 2004) have also been considered as key measures of product innovation. Operationally, 'product innovation' in this study encompasses both software products and services.

Definition: Process Innovation

Theoretical Definition

The commonly cited definition of Process Innovation is as explained in the OSLO Manual, which is as follows:

"A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software."(OECD, 2005)

Operational Definition

The scale for Process Innovation was adapted from Wang & Ahmed (2004), and considers constant improvements in processes, introduction of new management approaches, novelty of processes, and improvisation in the way of doing things in the firm.

This study considers firms that have been in existence for a minimum of three years. Currency of innovations was considered as important, as innovations (both product and process) introduced only in the last three years were considered for analysis, in line with similar studies done in the past (Burcharth, Knudsen, & Søndergaard, 2012; Vrande, Jong, Vanhaverbeke, & Rochemont, 2009).

Definition: Firm Performance

Theoretical Definition

Firm Performance theoretically encompasses financial, market and product performance (Kalkan, Bozkurt, & Arman, 2014). Most studies consider firm performance or business performance in terms of financial performance of the company, measured using metrics including Revenues, Profits, Return of Investment, Size, Sales Growth, Profitability, Market Share, Return on Assets, Cash Flows, Capacity Utilization etc.(Vazquez, Santos, & Alvarez, 2001; Hadjimanolis, 2000; Artz, Norman, Hatfield, & Cardinal, 2010; Kalkan, Bozkurt, & Arman, 2014; Li & Atuahene-Gima, 2001; Donate & Guadamillas, 2011; Chadee & Roxas, 2013; Sérgio Kannebley & Araújo, 2010).

Operational Definition

A self-developed scale has been used to measure Firm Performance, in terms of revenue growth, profitability, customer acquisition growth and employee growth as the main elements. The perceived performance of the company vis-à-vis competition has also been considered.

3.6 Research Design

The unit of analysis of this study is the firm. The study involves testing of hypotheses that have been formulated, and Diagnostic/ Explanatory Research Design has been adopted. This is a cross-sectional study, and information was collected from the sample firms only once. Survey approach was adopted using a structured questionnaire. Where possible, the questionnaire was administered directly (face-to-face), and where not possible, it was administered indirectly (through telephonic survey).

3.6.1 Definition of 'Small Firm' and Inclusion Criteria

Since this study focuses on 'small firms', one of the early questions that needed to be answered was regarding the definition of a small firm in Indian IT industry. The Indian Government has a Ministry of Micro, Small and Medium Enterprises (MSME), and the MSME Development Act, 2006 distinguishes micro, small and medium enterprises based on Investments in Plant & Machinery (for manufacturing companies) or investments in equipment (for services companies). Based on this definition, a small firm operating in the services sector is one with equipment investment falling in the range INR 1000000 to INR 50000000 (DCMSME, 2015). However, this definition is difficult to operationalize for IT companies, as getting such data from small companies was found to be difficult.

Headcount based classification of firms as micro, small, medium and large is frequently found in literature on firm level surveys. One of the commonly used benchmarks is the guidance provide by European Commission, where it defines micro firms as those employing less than 10, small firms as those with less than 50 employees, and medium-sized firms with less than 250 employees(EC, 2005). As other scholars have also pointed out, there is no universal cut-off point for headcount/size of a small firm, and different regions & industry follow different rules(Ilavarasan & Parthasarathy, 2012). As a result, scholars have adopted various thresholds in studies. Table 3.2 depicts the variation in small firm definition found in some of the studies reviewed.

Table 3.2: Reference Studies on Small Firm Definition

Reference Study	Small Firm Definition employed
(Burcharth, Knudsen, & Søndergaard, 2012)	Micro firm < 10 employees Small Firm < 50 employees Medium Firm < 250 employees Large firm 251-500 employees
(Vrande, Jong, Vanhaverbeke, & Rochemont, Open innovation in SMEs: Trends, motives and management challenges, 2009)	Less than 500 employees
(Hadjimanolis, 2000)	10-100 employees
(Ilavarasan & Parthasarathy, 2012)	Less than 73 employees
(Acs & Audretsch, 1988)	Less than 500 employees
(Mazzarol, 2002)	Less than 200 employees
(Freel, 2003)	Less than 500 employees
(Jong & Vermeulen, 2006)	Less than 500 employees
(Romijn & Albaladejo, 2002)	5-166 employees
(Inauen & Schenker-Wicki, 2012)	Small firm < 50 employees Medium firm 50-500 employees
(Allocca & Kessler, 2006)	SME <= 500 employees
(Chetty & Stangl, 2010)	Small firms 10-250

As can be seen, there appears to be no consensus in literature on the headcount based definition of a small firm. However, a number of studies have used 500 as the cut-off valuefor headcount for small firms. This study uses this criterion and considers small firm to be one that has less than 500 employees.

Companies that have less than 10 employees have also not been considered for this study, consistent with previous studies of similar kind. These are micro-firms that have the characteristics associated with start-ups, with little, formalized innovation processes (Vrande, Jong, Vanhaverbeke, & Rochemont, 2009). This is also in line with several small-firm level innovation studies done in the past that did not consider such firms in scope (Chetty & Stangl, 2010; Hadjimanolis, 2000).

Additionally, the firms taking the survey were also required to have a minimum of 3 years' existence. This is also in line with previous studies that often considered innovations introduced in the past 3 years (Burcharth, Knudsen, & Søndergaard, 2012; Vrande, Jong, Vanhaverbeke, & Rochemont, 2009). The rationale is that firms with less than 3 years in existence tend to exhibit characteristics of a pure start-up.

3.6.2 Sample Design

The study focuses on small Indian IT firms. The population comprises all small IT firms in India. The Sampling Unit is the firm.

The study was conducted in three Tier-1 Cities and two Tier-2 Cities of India. Bangalore, Chennai, and Hyderabad were chosen as the Tier-1 cities. These cities are the top 3 cities in IT exports from India, and account for more than 50% of India's IT exports (The New Indian Express, 2014). Thiruvananthapuram and Kochi, were chosen as the Tier-2 cities for conducting the study.

A directory of IT companies in the cities chosen, provided by NASSCOM, was used to draw up a sampling frame of 976 companies.

3.6.3 Method of Data Collection

Survey approach was adopted using a structured questionnaire. Where possible, the questionnaire was administered directly (face-to-face), and where not possible, it was administered indirectly (through telephonic survey).

3.6.4 Development of Tool for Data Collection

There are 10 latent variables used in the conceptual model for this study, which are:

- Intellectual Capital
- Creative Capability
- Top Management Support
- Organization Learning Capability
- Customer Involvement
- External Networking
- Employee Involvement
- Product Innovation
- Process Innovation
- Firm Performance

Intellectual Capital

A five-point scale was constructed for Intellectual Capital. This was done based on the theory that Intellectual Capital comprises Human Capital (Value creation role) and Intellectual Assets (Value extraction role)(Harrison & Sullivan, 2000). Unique aspects of Indian IT companies were taken into account. Based on the pre-pilot study conducted, the items were validated for content and completeness. The work experience and professional background of the senior management, the quality of human capital reflected by the talent recruitment/selection process, intensity of R&D and presence of patents were the factors represented by the items. All five were measured on a Likert Scale with options ranging from 'Strongly Agree' [5] to 'Strongly Disagree' [1].

Creative Capability, Top Management Support, Organization Learning Capability

A five-item scale for Creative Capability, five-item scale for Top Management Support, and six-item scale for Organization Learning capability was adopted from a previous study of Innovation antecedents done in Turkey among high-technology SMEs (Ar & Baki, 2011). All sixteen items across these three latent variables were measured on a Likert Scale with options ranging from 'Strongly Agree' [5] to 'Strongly Disagree' [1].

Customer Involvement, External Networking, Employee Involvement

A four-item scale for Customer Involvement, five-item scale for External Networking, and six-item scale for Employee Involvement was adapted from a recent study that dealt with scale construction of these latent variables as three of the dimensions of Open Innovation (Rangus, 2014; Rangus, Drnovsek, & Minin, 2013). All fifteen items across these three latent variables were measured on a Likert Scale with options ranging from 'Strongly Agree' [5] to 'Strongly Disagree' [1].

Product Innovation and Process Innovation

A four-item scale for Product Innovation, and five-item scale for Process Innovation was adapted from (Wang & Ahmed, 2004). All items were measured on a Likert Scale with options ranging from 'Strongly Agree' [5] to 'Strongly Disagree' [1].

Firm Performance

A five-item, self-constructed scale was used to measure Firm Performance. Literature review revealed a number of items that have been used in a variety of contexts to measure Firm Performance. Revenue growth, Profitability, Customer Acquisition growth, Employee headcount growth and performance vis-à-vis competition were the measures used, after content validation through pre-pilot.

Based on the items selected for the 10 latent variables, an initial version of the questionnaire was prepared with a total of 69 items, including the firm's demographic information sought. Innovation is a strategic activity in firms. Responding to a survey on innovation requires the respondent to be familiar with the firm's all round operations including innovation initiatives, and a part of the senior management of the company. Response from the CEO was solicited, and in the absence of CEO's availability, participation from another CxO level executive was requested for. A careful examination of items revealed that some of the items were not ideally responded to by the CEO or a CxO level executive. For instance, items relating to Top Management Support are better responded to by an employee of the company, and not the CEO himself/herself. Hence it was decided that the survey would be administered with two individuals from each company. Apart from the senior executive, a staff representative was also required to participate in the survey. Therefore, the questionnaire was split into two:

- Part-A of the Questionnaire, with 47 items, to be administered with Senior Management
- Part-B of the Questionnaire, with 22 items, to be administered with Staff Member

3.6.5 Validation of the Tool for Data Collection

The survey instrument was validated with experts from industry and academia. Nine senior professionals from the industry, including CEO level executives, were shared a copy of the questionnaire. Additionally, three experts from academia were also consulted. The main objectives of these interactions were:

- To ascertain the face validity of the questionnaire
- To validate the variables selected for the study

3.6.6 Pre-Testing the Questionnaire

Pilot testing was done with 50 firms initially surveyed. The main purpose of the pilot study was to ascertain the content validity and reliability. Minor changes to wording, language and structure of the questionnaire were incorporated, based on the findings from the pilot study.

An initial level of reliability analysis was also done with the data collected from the pilot study. The latent variables had acceptable reliability (Cronbach Alpha >0.7) at this stage.

Please refer to Appendix-1 and Appendix-2 for the Questionnaire for Senior Management and the Questionnaire for Staff Member respectively.

3.7 Data Collection

The surveys were administered in 2014. Data collection was done through face-to-face interviews and telephonic interviews. The process of data collection was as follows. An initial email was sent to the 976 companies in the sampling frame, requesting participation in the survey. An overview of the study was provided in a concise manner, and the importance& objectives of the study. Those companies that accepted participation were sent out the questionnaire (Part-A & Part-B) through email. Discussions were fixed up at mutually convenient time slots. For those companies that did not respond within a few days, a follow up email request was sent. In several cases, the initial email was also followed up through telephone contact. Two separate interviews were done with each responding company, the primary respondent being the CEO in most cases or a senior management representative, and the second respondent being a staff member. The interaction with the CEO/Senior Management typically lasted for 40-60 minutes, and longer in some cases. The interaction with the staff representatives had a typical duration of 10-15 minutes.

During the survey, the importance of the topic being addressed was conveyed upfront, and the respondents were requested to provide unbiased responses based on careful attention to every question. Confidentiality was guaranteed, as most of the respondents requested for anonymity of company & personnel names.

Fig 3.2 depicts the process followed for conducting the survey.

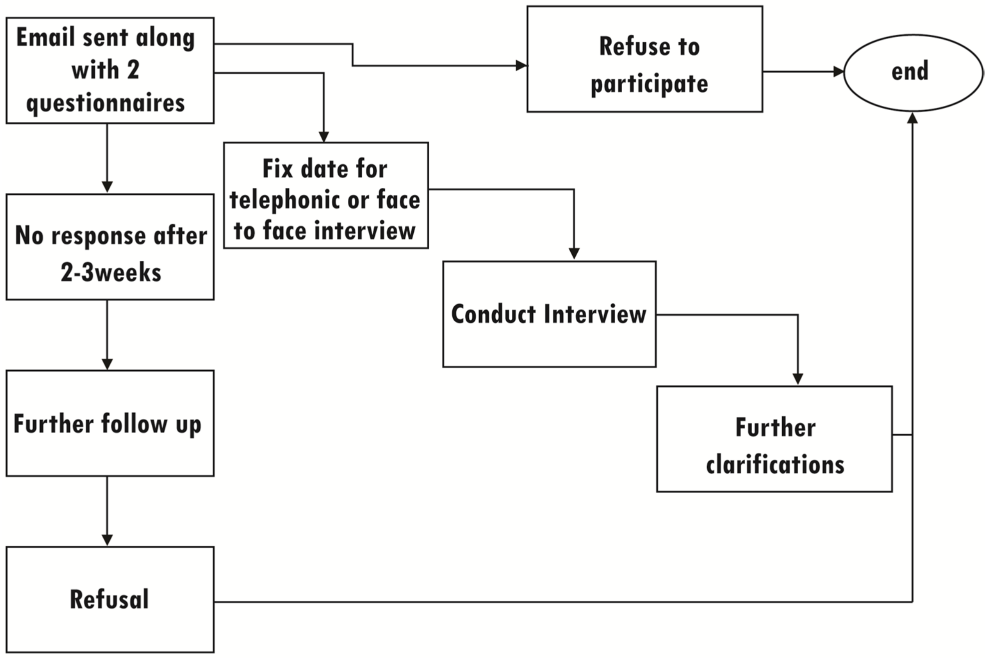


Fig. 3.2: Process flow for Survey Administration

A total of 205 valid responses were collected, translating into a response rate of 21%. This response rate is healthy, considering the requirement for senior management participation.

3.8 Editing and Coding

On completion of Data Collection, the data was entered on a spreadsheet, and each question was assigned a code. Since there were two parts to the questionnaire, the coding was done as A1 to A47 for Part A (which had 47 questions) and B1 to B22 for Part-B (which had 22 questions). Appendix-3 shows the Item-to-question mapping for all the items across the 10 constructs used in the study.

3.9 Statistical Tools for Analysis and Sample Size Adequacy

SPSS was used for descriptive statistical analysis & Exploratory Factor Analysis, and WarpPLS 4.0 was used for detailed data analysis using Structural Equation Modeling (SEM).

Structural Equation Modeling or more commonly known as SEM, employed to test theoretical assumptions with empirical data, was chosen as the preferred method to conduct this study. Introduced and popularized in the 1970s, SEM addresses many of the deficiencies of the first generation, regression-based techniques, in terms of its ability to handle unobservable constructs, and allow simultaneous modeling of relationships between multiple independent and dependent variables (Haenlein & Kaplan, 2004). While co-variance based SEM (CBSEM) techniques have been widely applied in research studies in social sciences, marketing & strategic management over the last few decades (enabled by tools such as IBM AMOS, LISREL, and EQS), variance based techniques have gained acceptance in recent times(Haenlein & Kaplan, 2004; Peng & Lai, 2012). Partial Least Squares (PLS) based SEM is one type of variance-based approach. PLS-based studies are gaining increasing popularity in spheres ranging from Management Information Systems, Psychology & Social Sciences, and International Marketing, as evidenced by the large number of journal publications that have adopted this method (Henseler, Ringle, & Sinkovics, 2009).

Both CBSEM and PLS-SEM approaches were evaluated for analysis. One of the considerations was the sample size (205), in conjunction with the number of constructs (10) involved in this study. Opinions on the required sample size for SEM varies in literature. The recommended sample size for CBSEM is more than 400, when the model has more than five constructs (Malhotra & Dash, 2011). It was decided to employ PLSSEM approach, which accommodates smaller sample sizes, and additionally, is considered to have better predictive accuracy (Wong, 2013; Anderson & Gerbing, 1988). Sample size requirement in PLSSEM varies from 52 to 91, depending upon the number of relationships investigated (Wong, 2013). PLSSEM can also handle non-normal or skewed data for performing structural modeling (Afthanorhan, 2013; Henseler, Ringle, & Sinkovics, 2009), and hence item level data normality tests were not undertaken.

3.10 Testing for Common Method Bias

Common Method Bias or Common Method Variance can be a source of error, when self-reported data is collected for dependent and independent variables at the same time (Chang, Witteloostuijn, & Eden, 2010). This study involves data being collected from senior management (CEO in vast majority cases) for the dependent variable (Firm performance), and the innovation & antecedent variables. While data is collected for some of the variables from an employee outside the senior management, it was decided that common method bias be tested for, to eliminate any resultant error. Common method bias is a type of measurement error, which may have both systematic and random components to it (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Harman's one factor test is often used to test for Common Method Bias. It involves combining all the items involved in analysis (dependent & independent), and conducting an Exploratory Factor Analysis to see if majority of variance is contributed by one dominant factor (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Appendix-4 depicts the results of exploratory factor analysis (PCA) done with all 10 constructs. As can be seen, the first component accounts for 28.518% of the total variance, which is well below the cut-off value of 50% recommended by practitioners (Roni, 2014).

3.11 Reliability & Validity Tests

The following denotations shall be used for the latent variables:

Table 3.3: Denotation of the Latent Variables

Latent Variable	Denotation
Intellectual Capital	IC
Creative Capability	CC
Top Management Support	TMS
Organization Learning Capability	OLC
Customer Involvement	CI
External Networking	EN
Employee Involvement	EI
Product Innovation	PDI
Process Innovation	PCI
Firm Performance	FP

Structural Equation Modeling involves two distinctive steps in modeling:

- Modeling the relationship between latent variables and the measured indicators. This is called as the ‘Measurement Model’ in CBSEM techniques. PLS-SEM refers to this as the ‘Outer Model’

- Modeling the relationship between the latent variables, which is referred to as the 'Structural Model' in CBSEM, and the 'inner Model' in PLS-SEM(Henseler, Ringle, & Sinkovics, 2009)

Once the latent variables have been identified, the measured variables (or items or indicators) are assigned to each of the latent variables, to build the measurement model (Malhotra & Dash, 2011). Before proceeding to build the structural model to examine the relationships, it is important to ascertain the validity and reliability of the measurement model (Fornell & Larcker, 1981).

3.11.1 Testing for Reliability

Reliability of the measurement scale is about obtaining consistent measures upon its repeated administration, and Validity ensures that the measurement scale is measuring what it is intended to (Carmines & Zeller, 1979). While there are multiple methods forascertaining reliability (test-retest, alternative form, split-halves, internal consistency etc.), the internal consistency method is most commonly used, and Cronbach's Alpha is the widely used measure because of it being a conservative estimate of reliability and easy to administer (Carmines & Zeller, 1979). The Composite Reliability measure is often cited as a better indicator compared to Cronbach's Alpha, and is usually assessed along with Cronbach's Alpha, with a value greater than 0.7 (for both indices) being acceptable(Wilson, 2010).

The Composite Reliability, Cronbach's Alpha and AVE values of the constructs are shown in Table 3.4

Table 3.4: Composite Reliability, Cronbach's Alpha and AVE

	Composite Reliability	Cronbach's Alpha	AVE
IC	0.879	0.816	0.644
CC	0.846	0.772	0.525
TMS	0.881	0.829	0.601
OLC	0.92	0.895	0.657
CI	0.872	0.804	0.631
EN	0.831	0.745	0.496
EI	0.882	0.831	0.6
PDI	0.902	0.854	0.697
PCI	0.878	0.825	0.591
FP	0.918	0.886	0.692

Cronbach's Alpha values were above 0.7 in all cases; Composite Reliability index was more than 0.7 in all cases, pointing out acceptable reliability of the scales used.

3.11.2 Testing for Construct Validity

The measurement model is assessed for construct validity, which includes two types of validity. Convergent Validity indicates the degree to which different items within a construct are related to each other (which should be high), and Discriminant Validity indicates the degree to which items within a construct are related to another construct (which should be low). The techniques employed for evaluating convergent and discriminant validity will be explained subsequently.

Result of initial Construct Validity tests is summarized in Table 3.5.

Table 3.5: Results summary of Initial Construct Validity Tests

Test	Result
Convergent Validity test	Items IC1 and EI2 did not load with their respective constructs adequately. Hence, items IC1 and EI2 were deleted and reliability & validity analysis was done again
Discriminant Validity test	Acceptable results for all constructs

Consequently, items IC1 and EI2 were deleted and the model was redrawn and re-investigated sans those two items.

Results of Convergent Validity Testing

Convergent validity was ascertained as follows. Appendix-5 depicts the loadings of items to their respective constructs (shaded portions of the Table in Appendix-5) and with the other constructs in the model. The conditions for convergent validity, for reflective variables, are (a) item-construct loading values of more than 0.5(Kock, 2014; Duarte & Raposo, 2010; Streukens, MartinWetzels, Daryanto, & Ruyter, 2010) (b) and a significance of < 0.05(Kock, 2014; Anderson & Gerbing, 1988). As can be seen on the Table, the items load well with the constructs, with only three out of 48 items (CC2, TMS5 and EN2) loading well below 0.7 (0.647, 0.597 and 0.648 respectively). An additional test for convergent validity is by using the AVE (Average Variance Extracted) for each construct, where a value of at least 0.5 is deemed acceptable (Peng & Lai, 2012; Fornell & Larcker, 1981; Camisón & Villar-López, 2014). From the Table above, it can be seen that this condition is met for all constructs, except in the case of EN. However item deletion was not considered in this case, owing to the value of 0.496, which is marginally below the cut off value of 0.5. Hence, it may be concluded that the convergent validity conditions have been met, after the deletion of two items.

Results of Discriminant Validity Testing

Further, the discriminant validity conditions have been met, as shown in Table 3.6. The square root of AVE (diagonal values that are shaded in grey) values are higher that the off-diagonal values (which represent the inter-construct correlations), which is the condition for discriminant validity (Camisón & Villar-López, 2014; Peng & Lai, 2012).

Table 3.6: Square Root of AVE for Discriminant Validity

	IC	**CC**	**TMS**	**OLC**	**CI**	**EN**	**EI**	**PDI**	**PCI**	**FP**
IC	0.803	0.397	0.344	0.224	0.2	0.348	0.36	0.513	0.269	0.353
CC	0.397	0.725	0.57	0.384	0.386	0.331	0.557	0.608	0.53	0.419
TMS	0.344	0.57	0.775	0.336	0.309	0.221	0.472	0.522	0.405	0.351
OLC	0.224	0.384	0.336	0.81	0.293	0.219	0.199	0.312	0.368	0.297
CI	0.2	0.386	0.309	0.293	0.794	0.258	0.307	0.437	0.302	0.273
EN	0.348	0.331	0.221	0.219	0.258	0.704	0.295	0.644	0.37	0.384
EI	0.36	0.557	0.472	0.199	0.307	0.295	0.774	0.554	0.55	0.435
PDI	0.513	0.608	0.522	0.312	0.437	0.644	0.554	0.835	0.577	0.603
PCI	0.269	0.53	0.405	0.368	0.302	0.37	0.55	0.577	0.769	0.634
FP	0.353	0.419	0.351	0.297	0.273	0.384	0.435	0.603	0.634	0.832

3.12 Limitations of the Study

This study has the following limitations. Firstly, this is a cross-sectional analysis, and hence causal effects do not take into consideration the lag associated with innovation. Efforts on innovation can have a lag of several months before a firm can start reaping benefits from it. Secondly, self-reported, perception data was used for analysis. In most cases, the CEO of the firm provided responses to variables on financial performance, innovation and many of the antecedents of innovation. This was largely owing to the fact that majority of the companies surveyed were private companies, and availability of quantitative data in the public domain was virtually negligible. Some of the data was collected from an employee in each firm, which cannot be assumed as free from subjectivity and bias. Thirdly, the sample is skewed towards smaller companies in terms of age and firm size. Fourthly, the study was contextual in nature, to small IT companies in India. The industry is associated with unique business model characteristics. Generalizations should be made judiciously and cautiously. Fifthly, no distinction is made between product and service companies. Most of the product companies offer IT services as well, and this distinction was difficult to be operationalized.

.....ഋ.....

Chapter 4

ANTECEDENTS OF PRODUCT INNOVATION & PROCESS INNOVATION

Contents

4.1 Profile of the Firms Surveyed and the Respondents

The responding firms belonged to five South Indian cities, namely, Bangalore, Hyderabad, Chennai, Thiruvananthapuram and Kochi. Each firm had two individual respondents to the survey. This section explains the key characteristics of the firms, such as Age, Size and Business Line classification, as well as the profile of the primary respondents.

4.1.1 Age of the firms

The age of the firms surveyed varied from 3 years to 32 years, with the average age being a little above 8 years. Fig 4.1 depicts the distribution of the firm age in the sample surveyed.

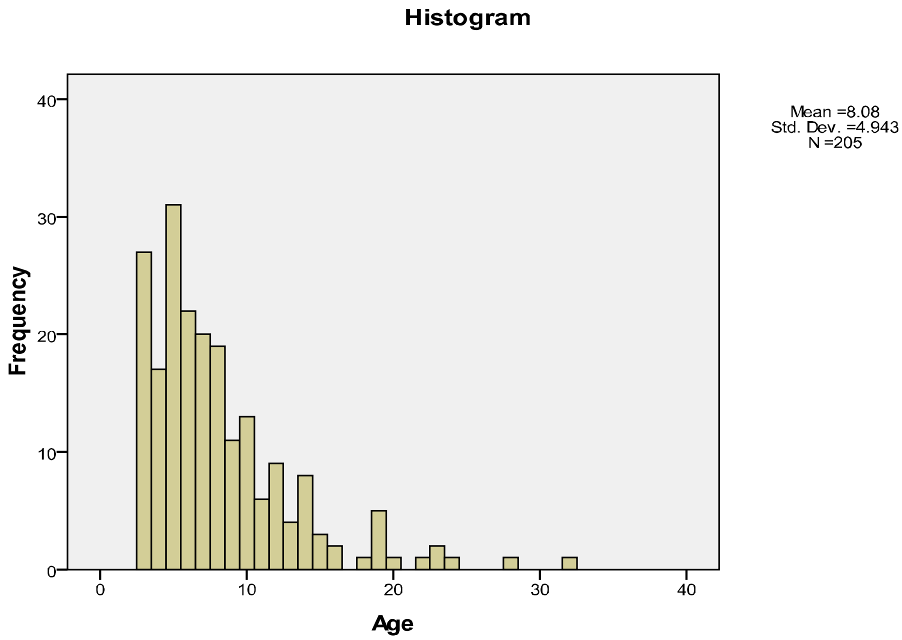


Fig. 4.1: Distribution of Firm Age

4.1.2 Size of the firms

The size of the firms surveyed varied from 10 to 495. The average size of the firms surveyed is 106 employees.

4.1.3 Business Line Classification of the firms

The IT companies in India operate across various service and product lines. 116 companies had a product focus, while 89 companies had a services focus. Most of the product companies also offered services as part of their offerings portfolio. Similarly, several services companies also offered products, though services contributed more to their revenues at the time of taking the survey.

4.1.4 Respondent Profile

Fig 4.2 shows the break-up of the profile of senior management executives who participated in the survey, representing their companies. In 92% cases (188 out of 205), the CEO himself/herself was the respondent, and in 13 cases it was the CTO/COO who responded, and in 6 cases other executives (such as head of products) were the respondents. That a large number of CEOs participated in the survey was one of the high points.

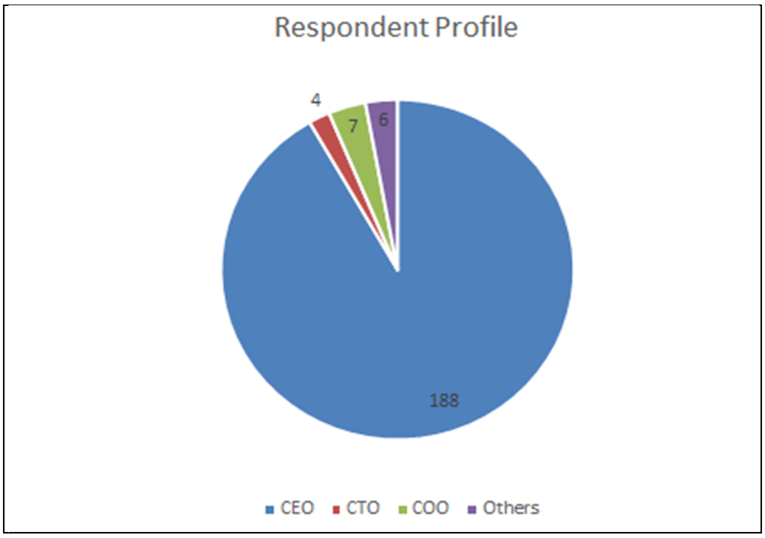


Fig. 4.2: Respondent Profile

4.2 Descriptive Statistics

The Descriptive Statistics associated with the 10 latent variables are shown in Table 4.1. This includes the minimum and maximum values, Mean and Standard Deviation associated with each of the variables. The output has been taken from SPSS.

Table 4.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PDI	205	2	5	3.67	.802
PCI	205	2	5	3.83	.647
FP	205	1	4.8	3.23	.854
IC	205	1	5	3.09	.808
TMS	205	2	5	4.24	.559
OLC	205	2	5	3.75	.651
CC	205	3	5	4.09	.512
CI	205	2	5	3.95	.695
EI	205	2	5	3.89	.638
EN	205	1	5	3.04	.771
Valid N (listwise)	205				

4.3 Antecedents of Product Innovation

A key objective of this study is to establish the drivers of Product Innovation. The seven antecedent variables have been hypothesized to have a positive impact on Product Innovation (hypotheses 1a to 7a). At a first level, regression analysis has been done for testing the posited relationships. Multiple Regression was done with Product Innovation as the Dependent Variable, and Intellectual Capital, Top Management Support, Organization Learning Capability, Creative Capability, Customer Involvement, Employee Involvement & External Networking as the Independent variables. The results are shown in Tables 4.2.

Table 4.2: Multiple Regression of Product Innovation and its Antecedents

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.614	.302		-5.348	.000
	IC	.167	.045	.168	3.689	.000
	TMS	.239	.073	.166	3.288	.001
	OLC	-.013	.054	-.010	-.237	.813
	CC	.285	.087	.182	3.263	.001
	CI	.154	.051	.133	3.000	.003
	EI	.189	.063	.150	3.000	.003
	EN	.427	.046	.411	9.305	.000

a. Dependent Variable: Product Innovation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831[a]	.691	.680	.453

a. Predictors: (Constant), EN, OLC, EI, CI, IC, TMS, CC
b. Dependent Variable: Product Innovation

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	90.578	7	12.940	62.956	.000[a]
	Residual	40.491	197	.206		
	Total	131.069	204			

a. Predictors: (Constant), EN, OLC, EI, CI, IC, TMS, CC
b. Dependent Variable: Product Innovation

Intellectual Capital, Top Management Support, Creative Capability, Customer Involvement, Employee Involvement & External Networking were found to be significant drivers of Product Innovation. The R-Square value for the model is 0.691. On comparing the path coefficients, it can be seen that External Networking is the most significant predictor of Product Innovation.

Therefore, hypotheses 1a, 2a, 3a, 5a, 6a and 7a are supported by Multiple Regression testing, whereas hypothesis 4a is not.

4.4 Antecedents of Process Innovation

An important objective of this study is to establish the drivers of Process Innovation. The seven antecedent variables have been hypothesized to have a positive impact on Process Innovation (hypotheses 1b to 7b). At a first level, regression analysis has been done for testing the posited relationships.

Multiple Regression was done with Process Innovation as the Dependent Variable, and Intellectual Capital, Top Management Support, Organization Learning Capability, Creative Capability, Customer Involvement, Employee Involvement & External Networking as the Independent variables. The results are shown in Table 4.3.

Table 4.3: Multiple Regression of Process Innovation and its Antecedents

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.173	.330		.524	.601
	IC	-.039	.049	-.049	-.797	.426
	TMS	.047	.079	.041	.594	.553
	OLC	.182	.059	.183	3.073	.002
	CC	.261	.095	.206	2.739	.007
	CI	.013	.056	.014	.232	.817
	EI	.344	.069	.340	5.005	.000
	EN	.143	.050	.171	2.859	.005

a. Dependent Variable: Process Innovation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.659[a]	.434	.414	.495

a. Predictors: (Constant), EN, OLC, EI, CI, IC, TMS, CC
b. Dependent Variable: Process Innovation

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36.995	7	5.285	21.559	.000[a]
	Residual	48.293	197	.245		
	Total	85.287	204			

a. Predictors: (Constant), EN, OLC, EI, CI, IC, TMS, CC

b. Dependent Variable: Process Innovation

Organization Learning Capability, Creative Capability, Employee Involvement & External Networking were found to be significant drivers of Process Innovation. The R-Square value for the model is 0.434. On comparing the path coefficients, it can be seen that Employee Involvement is the most significant predictor of Process Innovation.

Therefore, hypotheses 2b, 4b, 6b and 7b are supported by Multiple Regression testing, whereas hypotheses 1b, 3b and 5b are not.

.....ഇൻ.....

Chapter 5

INNOVATION ANTECEDENTS AND FIRM PERFORMANCE

Contents

In Chapter-4, the hypotheses relating to antecedents of Product Innovation and Process Innovation were tested using Multiple Regression. This Chapter discusses testing of the integrated Theoretical Model. The set of 16 hypotheses formulated indicate the relationships between the constructs that are being tested. The theoretical model and hypotheses are revisited in Fig 5.1.

Structural Equation Modeling (SEM) technique has been adopted (on WarpPLS) to test the various relationships shown in Fig 5.1. SEM modeling differentiates two components (a) *measurement model*, which represents the relationship between latent variables and their indicators, and (b) *structural model*, which depicts the relationships amongst the latent variables.

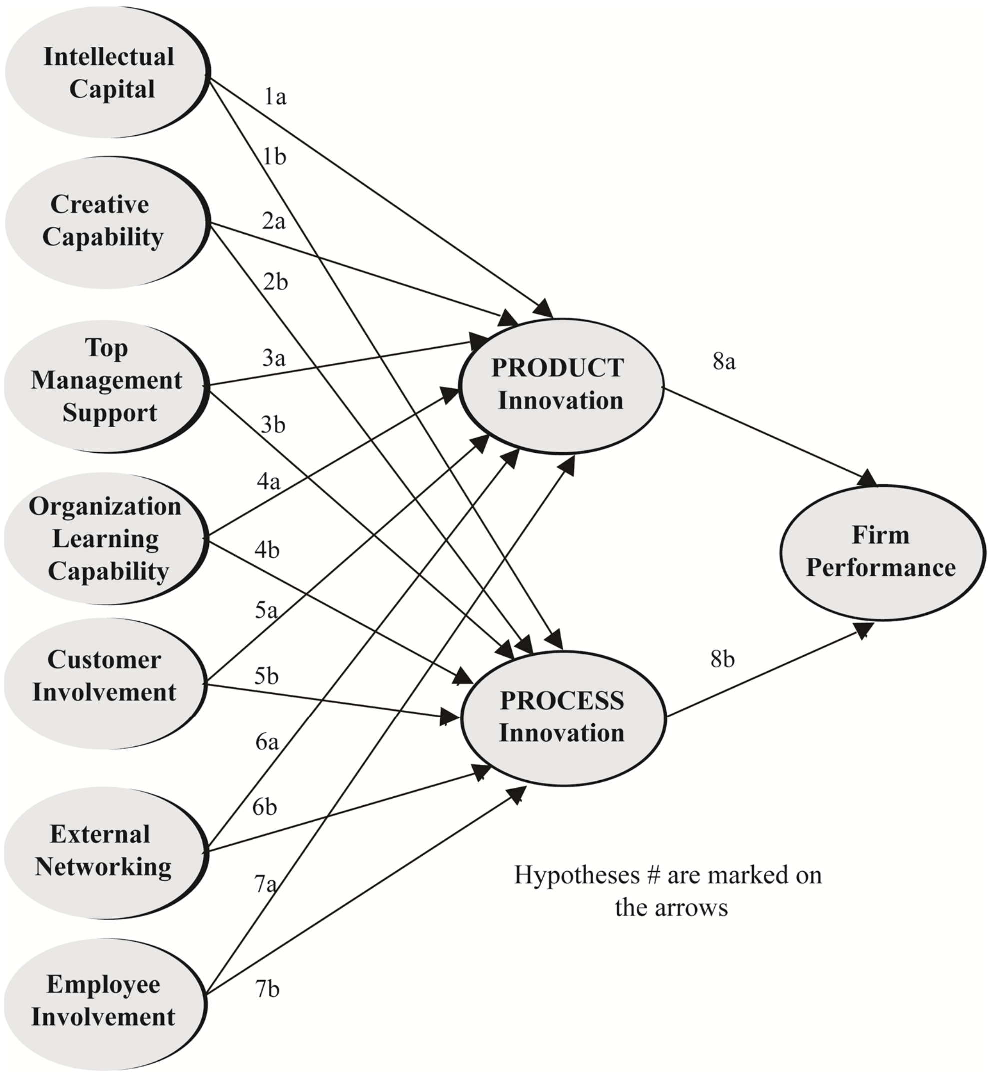


Fig. 5.1: Theoretical Model and Hypotheses

5.1 Structural Model for Innovation Antecedents & Performance Implications

The structural model output obtained from WarpPLS is depicted in Fig 5.2.This is the integrated model with seven antecedent variables, two mediating variables (Product Innovation and Process Innovation) and the dependent variable (Firm Performance). Shown on the arrows are the path coefficients (beta value) and the path significance (p-value).

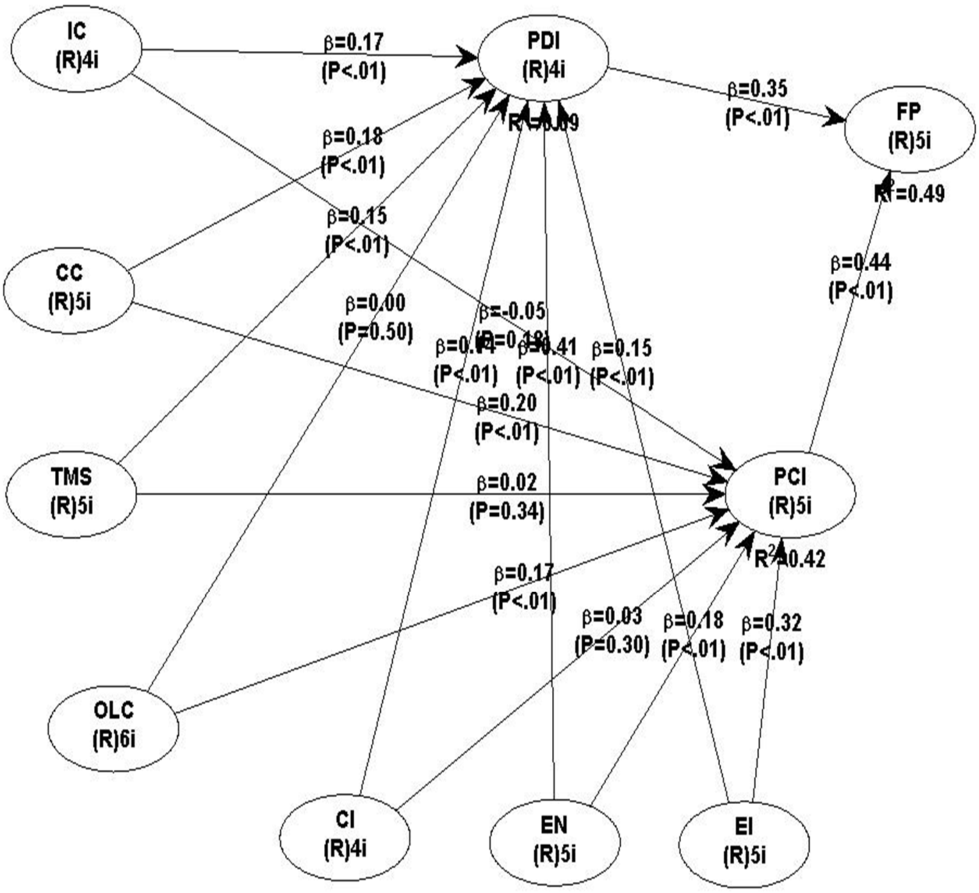


Fig. 5.2: The Structural Model

5.1.1 Antecedents and Performance Implications of Product Innovation

Table 5.1 shows the path coefficients and significance of the relationships involving Product Innovation. Except Organization Learning Capability (OLC), all the other six antecedent variables have significant impact on product innovation. Comparing the path coefficients, it can be seen that External Networking has the highest impact on Product Innovation.

Additionally, product innovation is also found to have a strong, positive influence on the Firm Performance (FP).

Table 5.1: Path Coefficients for relationship between Antecedent variables and Product Innovation

Relationship	Path Coefficient	p-value
IC -->PDI	0.173**	0.002
CC -->PDI	0.18**	0.001
TMS -->PDI	0.15**	0.005
OLC -->PDI	0	0.499
CI -->PDI	0.14**	0.008
EN -->PDI	0.406***	<0.001
EI -->PDI	0.154**	0.004
PDI --> FP	0.349***	<0.001

5.1.2 Antecedents and Performance Implications of Process Innovation

Table 5.2 shows the path coefficients and significance of the relationships involving Process Innovation. Intellectual Capital (IC), Top Management Support (TMS) and Customer Involvement (CI) were not found to have significant relationship with process innovation, whereas Creative Capability (CC), Organization Learning Capability (OLC), External Networking (EN) and Employee Involvement (EI) were found to have a significant, positive effect on Process Innovation. Comparing the path coefficients, it can be seen that Employee Involvement has the highest impact on Process Innovation.

Furthermore, process innovation has a significant positive impact on Firm Performance (FP).

Table 5.2: Path Coefficients for relationship between Antecedent variables and Process Innovation

Relationship	Path Coefficient	p-value
IC -->PCI	-0.052	0.184
CC -->PCI	0.204***	<0.001
TMS -->PCI	0.024	0.338
OLC -->PCI	0.168**	0.002
CI -->PCI	0.03	0.301
EN -->PCI	0.179**	0.001
EI -->PCI	0.316***	<0.001
PCI --> FP	0.44***	<0.001

5.1.3 Analysis of the Structural Model

Analysis of path coefficients and significance values of relationships leads us to conclude that 4 out of the 16 hypotheses are not supported (1b, 3b, 4a & 5b). Results of hypotheses testing is summarized in Table 5.3.

Table 5.3: Summary of results of hypotheses testing

Hypothesis #	Hypothesis Description	Hypothesis Supported?
1a	**Intellectual Capital → product innovation**	**Yes**
1b	**Intellectual Capital → process innovation**	**No**
2a	**Creative Capability → product innovation**	**Yes**
2b	**Creative Capability → process innovation**	**Yes**
3a	**Top Management Support → product innovation**	**Yes**
3b	**Top Management Support → process innovation**	**No**
4a	**Organization Learning Capability → product innovation**	**No**
4b	**Organization Learning Capability → process innovation**	**Yes**
5a	**Customer Involvement → product innovation**	**Yes**
5b	**Customer Involvement → process innovation**	**No**
6a	**External Networking → product innovation**	**Yes**
6b	**External Networking → process innovation**	**Yes**
7a	**Employee Involvement → product innovation**	**Yes**
7b	**Employee Involvement → process innovation**	**Yes**
8a	**Product innovation → Firm Performance**	**Yes**
8b	**Process innovation → Firm Performance**	**Yes**

R-Squared values for Product Innovation, Process Innovation & Firm Performance constructs are 0.689 (Substantial), 0.418 (Moderate) and 0.494 (Moderate), as shown in Table 5.4. R-Squared values are considered substantial for values above 0.67, and moderate for values 0.33-0.67(Peng & Lai, 2012).

An indicator of the predictive validity of the model is the Stone-Geisser Q-Squared. A value of greater than zero indicates predictive validity, and a higher value indicates better predictive power (Duarte & Raposo, 2010; Peng & Lai, 2012). Hence, Q-Squared values of 0.693, 0.458 and 0.495 indicate substantial predictive validity of the model.

Table 5.4: R-Squared and Q-Squared values

	PDI	PCI	FP
R-Squared	0.689	0.418	0.494
Adjusted R-Squared	0.678	0.397	0.489
Q-Squared	0.693	0.458	0.495

Tenenhaus GoF index is the widely accepted model fit index for PLS-based path modeling(Henseler & Sarstedt, 2013). The index value was 0.572, as can be seen on Table 5.5, which was above the cut-off value of 0.1 (for small effect size), 0.25 (for medium effect size), and 0.36 (for large effect size). Since the value of 0.572 was higher than 0.36, investigation vis-à-vis effect size was not carried out.

5.1.4 Model Fit, Quality Indices & Model Elements from WarpPLS

WarpPLS software generates two broad categories of Fit Indices, namely, Model Fit and Quality Indices and General Model Elements. These are shown in Table 5.5 below.

Table 5.5: Fit Indices from WarpPLS

Model fit and quality indices
Average path coefficient (APC)=0.185, P<0.001
Average R-squared (ARS)=0.534, P<0.001
Average adjusted R-squared (AARS)=0.521, P<0.001
Average block VIF (AVIF)=1.472, acceptable if <= 5, ideally <= 3.3
Average full collinearity VIF (AFVIF)=1.936, acceptable if <= 5, ideally <= 3.3
Tenenhaus GoF (GoF)=0.572, small >= 0.1, medium >= 0.25, large >= 0.36
Sympson's paradox ratio (SPR)=0.938, acceptable if >= 0.7, ideally = 1
R-squared contribution ratio (RSCR)=0.990, acceptable if >= 0.9, ideally = 1
Statistical suppression ratio (SSR)=1.000, acceptable if >= 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)=1.000, acceptable if >= 0.7

General model elements
Outer model analysis algorithm: PLS regression
Default inner model analysis algorithm: Warp3
Multiple inner model analysis algorithms used? No
Resampling method used in the analysis: Stable
Number of data resamples used: 100
Number of cases (rows) in model data: 205
Number of latent variables in model: 10
Number of indicators used in model: 48
Number of iterations to obtain estimates: 6
Range restriction variable type: None
Range restriction variable: None
Range restriction variable min value: 0.000
Range restriction variable max value: 0.000
Only ranked data used in analysis? No

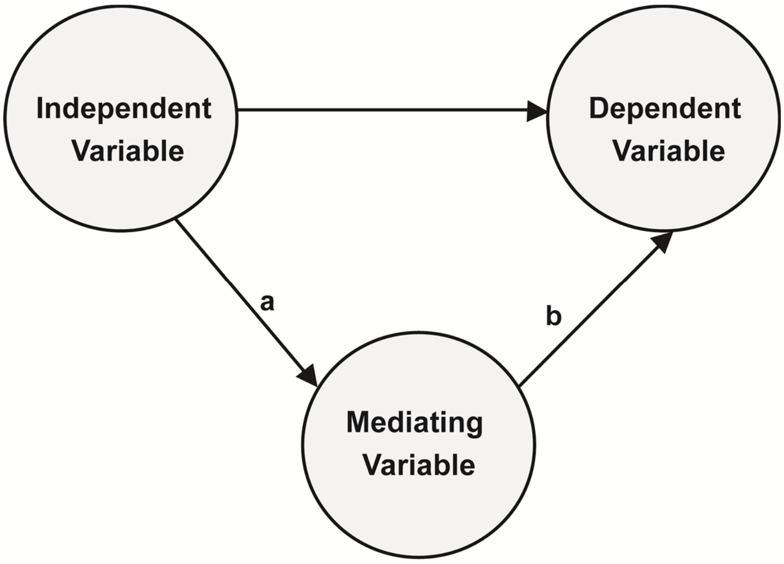
5.2 Mediating Role of Product & Process Innovation

The integrated model discussed in Section 5.1 considers both Product Innovation and Process Innovation as mediating the relationship between the antecedent variables and the dependent variable. To test the effect of mediation of Product & Process Innovation, the conceptual framework initially proposed by Baron and Kenny (1986) was utilized, with additional operational guidance taken from Preacher and Hayes (2004). Mediation is expected to exist when three conditions are met (Baron & Kenny, 1986; Preacher & Hayes, 2004):

- There exists a significant relationship between the independent variable & the dependent variable ***(Total Effect)***
- When the mediator is introduced, there exists a significant relationship between the independent variable & the mediator; and there exists a significant relationship between the mediator & the dependent variable. The effect of independent variable on the dependent variable via the mediator (which is the product of the two path coefficients) is the ***Indirect Effect****or* ***Mediated Effect***
- In the presence of the mediator, the strength of relationship between the dependent variable & the independent variable (***Direct Effect)*** becomes either (a) insignificant or (b) significant, but reduced. In case of (a) PERFECT of FULL Mediation is considered to occur, and in the case of (b), PARTIAL mediation is considered to have occurred

One special case of this scenario is where there existed no significant relationship between the dependent variable and the independent variable initially, in which case the phrase ‘Mediated effect’ loses significance. In such cases only ***Indirect Effect*** is said to exist (Preacher & Hayes, 2004). Hence, though the phrases ‘mediated effect’ and ‘indirect effect’ are often used interchangeably in literature, there exists a difference between the two.

Baron and Kelly also recommends an additional test of significance of the indirect effect, using a statistical method originally put forward by Sobel (1982). The indirect effect is calculated as a*b, where ‘a’ is the strength of path from independent variable to the mediator, and 'b' from the mediator to the dependent variable, as shown below.



The Sobel Test statistic is then calculated as(Kock, 2014):

$$T_{ab} = (a.b)/SE_{ab}$$

$SE_{ab,}$ the Standard Error of the indirect effect a*b, is calculated as (Preacher & Hayes, 2004; Kock, 2014):

$$SE_{ab} = \sqrt{b^2S_a^2 + a^2S_b^2 + S_a^2S_b^2}$$

[S_a is the S.E of path a, and S_b is the S.E of path b]

For the strength of the indirect relationship to be significant, the absolute value of Sobel Statistic should have a value above 1.96, with a significance < 0.05(Preacher & Hayes, 2004).

Following the approach described above, the mediation effects were examined in a step-wise manner, as explained below.

5.2.1 Step 1: Direct effect of Antecedents on Firm Performance

The total effects were calculated from the path diagram below, that shows only the direct relationships between the independent variables and the dependent variable. The path diagram is shown in Fig5.3.

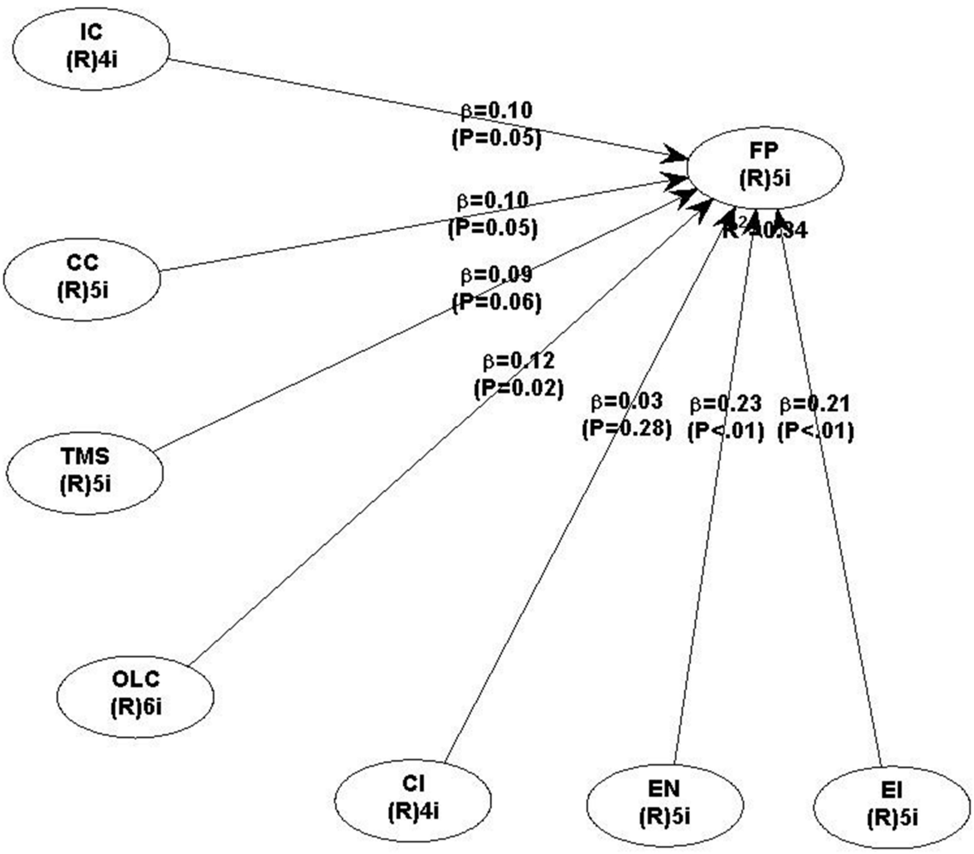


Fig. 5.3: Direct Path between Antecedents and Dependent variable

The path coefficients and path significance are also shown in tabular format on Table 5.6. As can be seen, all paths are significant, except TMS and CI.

Table 5.6: Path Coefficients for direct relationship between Antecedent variable and the dependent variable

Direct Relationship to FP	Path Coeff.	p-value
IC --> FP	0.097*	0.047
CC --> FP	0.096*	0.049
TMS --> FP	0.09 (n.s)	0.061
OLC --> FP	0.122*	0.018
CI --> FP	0.034 (n.s)	0.281
EN --> FP	0.233***	<0.001
EI --> FP	0.205***	<0.001

5.2.2 Step 2: Mediation Effect of Product Innovation

The structural model after introducing Product Innovation as the mediating variable between Antecedent variables and Firm Performance is shown in Fig 5.4.

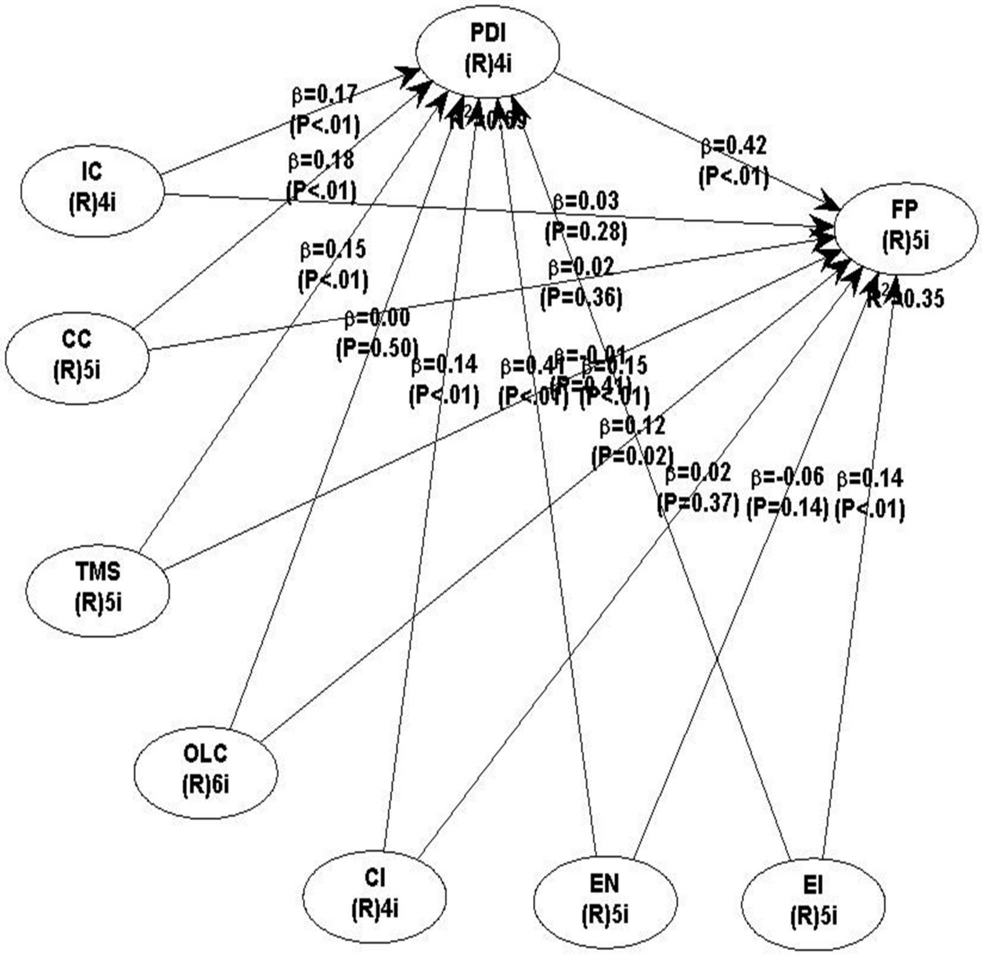


Fig. 5.4: Structural Model with Product Innovation as the mediating variable

Table 5.7 shows the path coefficients and significance values of the paths.

Table 5.7: Direct and Indirect path coefficients for the model with Product Innovation as the mediating variable

Relationship	Path Coefficient	p-value
IC --> PDI	0.173**	0.002
CC --> PDI	0.18**	0.001
TMS --> PDI	0.15**	0.005
OLC --> PDI	0 (n.s)	0.499
CI --> PDI	0.14**	0.008
EN --> PDI	0.406***	<0.001
EI --> PDI	0.154**	0.004
PDI --> FP	0.425***	<0.001
IC --> FP	0.034 (n.s)	0.277
CC --> FP	0.021 (n.s)	0.358
TMS --> FP	-0.014 (n.s)	0.406
OLC --> FP	0.118**	0.021
CI --> FP	0.019 (n.s)	0.373
EN --> FP	-0.062 (n.s)	0.144
EI --> FP	0.142**	0.007

The Sobel Statistic for the relationships are shown in Table 5.8. Except in the case of Organization Learning Capital, the statistic is valid (above the cut off of 1.96) and significant statistically.

Table 5.8: Sobel statistic for the model with Product Innovation as the mediating variable

Relationship	Sobel Statistic	p-value
IC --> PDI --> FP	2.762**	0.006
CC --> PDI --> FP	2.858**	0.004
TMS --> PDI --> FP	2.439*	0.015
OLC --> PDI --> FP	0 (n.s)	1
CI --> PDI --> FP	2.293*	0.022
EN --> PDI --> FP	5.061***	0
EI --> PDI --> FP	2.496*	0.013

Introduction of Product Innovation as the mediator results in the following:

- PDI has a significant relationship with FP
- IC, CC, and EN no longer have a significant path with FP, indicating the fully mediating effect of PDI. Sobel statistic is significant for all the three indirect relationships
- TMS, which did not have a direct relationship with FP in Step 1, shows a significant indirect relationship with FP, mediated by PDI. Sobel statistic is significant for this relationship
- OLC has no significant path with PDI, and hence no indirect effect on FP. However, as in Step 1, it continues to have a direct, significant relationship on FP
- CI has a positive, significant relationship with PDI, and hence an indirect relationship with FP. The Sobel's test is also significant. However, as was the case in Step 1, it has no direct relationship with FP

- EI continues to have a direct, albeit reduced path & significance with FP. EI has a significant path to PDI, and a strong indirect effect confirmed by Sobel statistic

5.2.3 Step 3: Mediation Effect of Process Innovation

The structural model after introducing Process Innovation as the mediating variable between Antecedent variables and Firm Performance is shown in Fig 5.5.

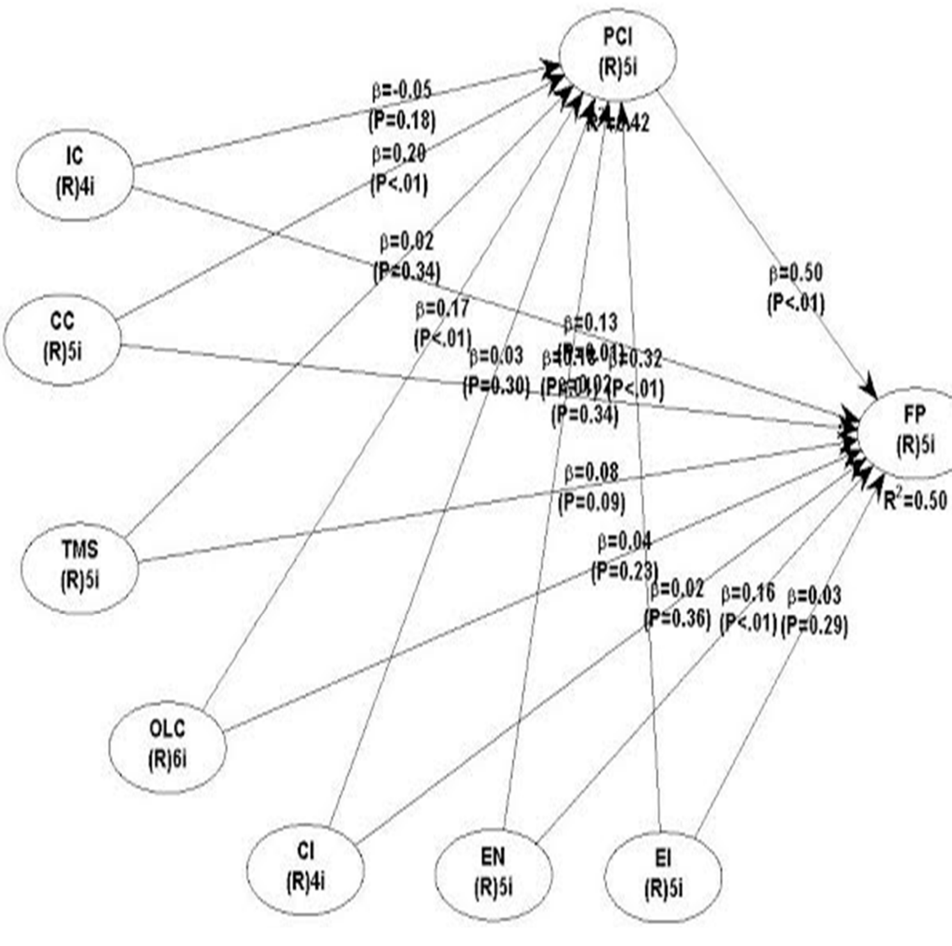


Fig. 5.5: Structural Model with Process Innovation as the mediating variable

Table 5.9 shows the path coefficients and significance values of the paths.

Table 5.9: Direct and Indirect path coefficients for the model with Process Innovation as the mediating variable

Relationship	Path Coefficient	p-value
IC --> PCI	-0.052 (n.s)	0.184
CC --> PCI	0.204***	<0.001
TMS --> PCI	0.024 (n.s)	0.338
OLC --> PCI	0.168**	0.002
CI --> PCI	0.03 (n.s)	0.301
EN --> PCI	0.179**	0.001
EI --> PCI	0.316***	<0.001
PCI --> FP	0.498***	<0.001
IC --> FP	0.126**	0.015
CC --> FP	0.024 (n.s)	0.341
TMS --> FP	0.076 (n.s)	0.095
OLC --> FP	0.042 (n.s)	0.234
CI --> FP	0.021 (n.s)	0.361
EN --> FP	0.156**	0.004
EI --> FP	0.032 (n.s)	0.292

The Sobel Statistic for the relationships are shown in Table 5.10. The statistic is valid (above the cut off of 1.96) and significant statistically in the cases of Creative Capability, Organization Learning Capability, Employee Involvement and External Networking.

Table 5.10: Sobel statistic for the model with Process Innovation as the mediating variable

Relationship	Sobel Statistic	p-value
IC --> PCI --> FP	0.892 (n.s)	0.373
CC --> PCI --> FP	3.255**	0.001
TMS --> PCI --> FP	0.413 (n.s)	0.679
OLC --> PCI --> FP	2.745**	0.006
CI --> PCI --> FP	0.516 (n.s)	0.606
EN --> PCI --> FP	2.904**	0.004
EI --> PCI --> FP	4.6***	0

Introduction of Process Innovation as the mediator results in the following:

- PCI has a significant relationship with FP
- IC has no path significance with PCI; it continues to have a direct, significant relationship with FP, as was the case with Step 1
- CC has a significant path with PDI, and a significant indirect relationship with FP confirmed by Sobel statistic. CC, which had a direct relationship with FP in Step 1, does not have a direct relationship with FP in the mediated model, implying that it has been fully mediated by PCI
- TMS has no path significance with PCI; neither does it have a direct relationship with FP
- OLC has a significant path with PCI, and a significant indirect relationship with FP confirmed by Sobel statistic. OLC, which had a direct relationship with FP in Step 1, does not have a direct

relationship with FP in the mediated model, implying that it has been fully mediated by PCI

- CI does not have a significant path with PCI. It does not have a direct relationship with FP. Hence, PCI does not have a mediating relationship with CI
- EN has a significant path with PCI. The indirect effect is significant, and confirmed by Sobel statistic. The direct effect on FP has been reduced slightly compared to Step 1. Hence PCI partly mediates the relationship between EN and FP
- EI continues to have a direct, albeit reduced path & significance with FP. EI has a significant path to PDI, and a strong indirect effect confirmed by Sobel statistic
- EN has a substantial indirect relationship with FP via PCI, evident from the strong path & Sobel statistic significance. Additionally, the strong, direct relationship it had with FP in Step 1 has become insignificant, indicating the strong, fully mediating impact of PCI

5.2.4 Step 4: Integrated Mediation Effect of Product and Process Innovation

The structural model after introducing both Product Innovation and Process Innovation as the mediating variable between Antecedent variables and Firm Performance is shown in Fig. 5.6.

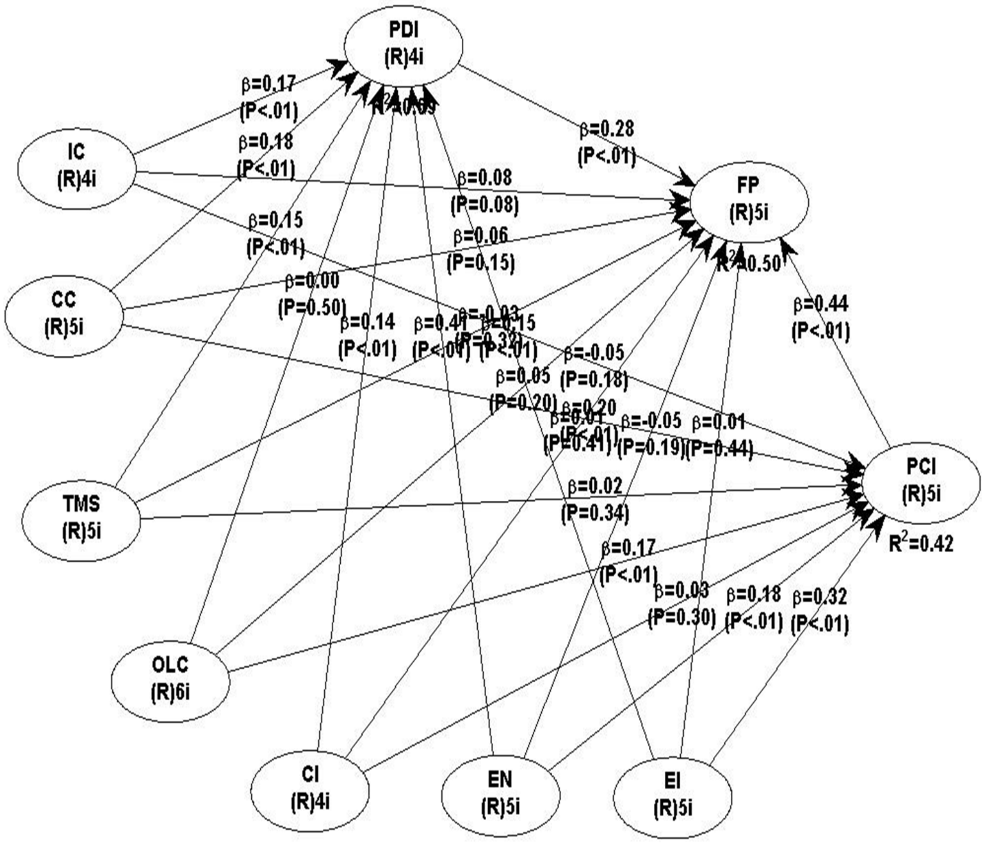


Fig. 5.6: Structural Model for the Integrated Model

Fig 5.6 shows the path diagram for the integrated model with direct and indirect paths. The Path Coefficients and p-values are reproduced in Table 5.11.

Table 5.11: Direct and Indirect path coefficients for the integrated Model

Relationship	Path Coefficient	p-value
IC --> PDI	0.173**	0.002
CC --> PDI	0.18**	0.001
TMS --> PDI	0.15**	0.005
OLC --> PDI	0 (n.s)	0.499
CI --> PDI	0.14**	0.008
EN --> PDI	0.406***	<0.001
EI --> PDI	0.154**	0.004
IC --> PCI	-0.052 (n.s)	0.184
CC --> PCI	0.204***	<0.001
TMS --> PCI	0.024 (n.s)	0.338
OLC --> PCI	0.168**	0.002
CI --> PCI	0.03 (n.s)	0.301
EN --> PCI	0.179**	0.001
EI --> PCI	0.316***	<0.001
PDI --> FP	0.283***	<0.001
PCI --> FP	0.443***	<0.001
IC --> FP	0.081 (n.s)	0.08
CC --> FP	0.06 (n.s)	0.149
TMS --> FP	-0.027 (n.s)	0.321
OLC --> FP	0.048 (n.s)	0.203
CI --> FP	0.013 (n.s)	0.412
EN --> FP	-0.05 (n.s)	0.193
EI --> FP	0.009 (n.s)	0.439

As can be seen in the Table 5.11, none of the direct paths between the 7 independent variables and the dependent variable (FP) are significant.

Introduction of both Product Innovation and Process Innovation as mediating variables results in interesting findings. None of the 7 independent variables has a significant direct path with FP anymore. Apart from TMS and CI, the other 5 variables had significant paths with FP in Step 1 (direct model without any mediators), and they have all been fully mediated by PDI and/or PCI.

TMS & CI, both of which had no direct path with FP, have indirect path relationship with FP via PDI, as also confirmed by the Sobel Statistic for both indirect paths.

5.2.5 Summary of analysis of Mediation

Table 5.12 explains the impact of introducing PDI and PCI as mediating variables, on each of the antecedent variable's relationship with FP.

Table 5.12: Summary of Analysis of Mediation

	Direct Relationship with FP without Mediators	Only PDI as Mediator with FP	Only PCI as Mediator with FP	Both PDI & PCI as mediators with FP (Integrated Model)
IC	YES	Fully Mediates	No effect	Fully Mediated by PDI
CC	YES	Fully Mediates	Fully Mediates	Fully Mediated by PDI/PCI
TMS	NO	Indirect effect via PDI	No effect	Indirect effect via PDI
OLC	YES	No effect	Fully Mediates	Fully Mediated by PCI
CI	NO	Indirect effect via PDI	No effect	Indirect effect via PDI
EN	YES	Fully Mediates	Partly Mediates	Fully Mediated by PDI/PCI
EI	YES	Partly Mediates	Fully Mediates	Fully Mediated by PDI/PCI

5.3 Impact of Innovation Antecedents on Firm Performance

Analysis of mediation showed that the direct relationship between innovation antecedents and Firm Performance is insignificant. The seven antecedent variables, however, impact Firm Performance indirectly, via Product Innovation and Process Innovation. The total indirect effect of each of the variables on Firm Performance is calculated and shown in Table 5.13.

Table 5.13: Impact of Innovation Antecedents on Firm Performance

Variable	Path with PDI	Path with PCI	Total effect on FP
IC	0.173	n.s*	0.048959
CC	0.18	0.204	0.141312
TMS	0.15	n.s	0.04245
OLC	n.s	0.168	0.074424
CI	0.14	n.s	0.03962
EN	0.406	0.179	0.194195
EI	0.154	0.316	0.18357

**n.s = not significant*

As can be seen, External Networking, Employee Involvement and Creative Capability are (in that order) the strongest impact on Firm Performance.

Comparing the path coefficients of Product Innovation of Firm Performance (0.283) and Process Innovation on Firm Performance (0.443), Process Innovation is found to have a stronger impact on Firm Performance.

.....ꙮ.....

Chapter 6

VARIATION IN INNOVATION ADOPTION AND IMPACT ON FIRM PERFORMANCE

Contents

One of the main objectives of this study is to understand the variation in adoption of innovation among the firms. This Chapter addresses the line of enquiry to investigate the extent of variation in product innovation and process innovation among the firms, the impact that such variation may have on the Firm Performance, and to establish the drivers of such variation.

6.1 Testing for variation of Innovation based on firm location

Before proceeding with the investigation into variation in adoption of innovation, a test was conducted to assess if the variation could be attributed to the geographic location of the firm. The sample was classified into 5 groups based on the firm location (1-Bangalore, 2-Chennai, 3-Hyderabad, 4-Kochi and 5-Thiruvananthapuram). The result of ANOVA test conducted is shown in Table 6.1. As can be seen, the difference in levels of innovation is not significant based on the location of the firm.

Table 6.1: Test of significance of innovation variation based on location

		Sum of Squares	df	Mean Square	F	Sig.
Product Inn	Between Groups	3.127	4	.782	1.222	.303
	Within Groups	127.247	199	.639		
	Total	130.374	203			
Process Inn	Between Groups	2.236	4	.559	1.341	.256
	Within Groups	82.912	199	.417		
	Total	85.147	203			

6.2 Classification of Firms based on adoption of Product & Process Innovation

To start with, the 205 firms were initially classified into four categories based on their respective scores for Product Innovation and Process Innovation. The following approach was used for this categorization:

Step 1: Calculate the average score of Product Innovation for the sample (205 firms). This was calculated as **3.69**

Step 2: Calculate the average score of Process Innovation for the sample (205 firms). This was calculated as **3.83**

Step 3: For a given firm in the sample, compare its Product Innovation score with the average score. If PDI for the firm > 3.69, then the firm has 'HIGH' value on PDI, else it has 'LOW' value on PDI

Step 4: For a given firm in the sample, compare its Process Innovation score with the average score. If PDI for the firm > 3.83, then the firm has 'HIGH' value on PCI, else it has 'LOW' value on PCI

Step 5: All the 205 firms were classified into one of the four categories based on their PDI and PCI scores, as shown in Fig 6.1.

Those firms with 'High' value for both Product & Process Innovation have been termed as 'Balanced Innovators'. 37% of firms in the sample fell into this category. Those companies with 'High' value for Product Innovation and 'Low' value for Process Innovation have been termed as 'Product Innovators' (15% firms). Those companies with 'High' value for Process Innovation and 'Low' value for Product Innovation have been termed as 'Process Innovators' (13% firms). Those companies with 'Low' value for both Product Innovation and Process Innovation have been termed as 'Innovation Aspirants' (35% of firms).

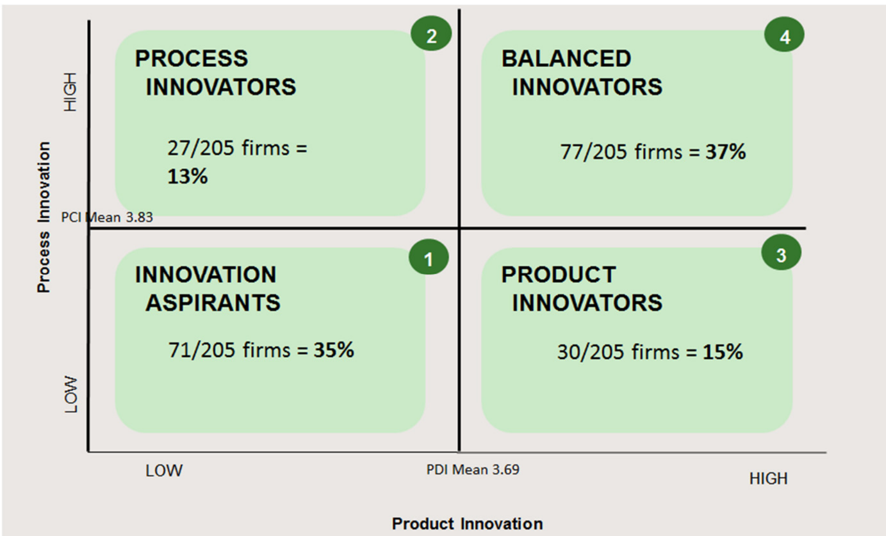


Fig. 6.1: Classification of Firms based on Product & Process Innovation

It needs to be noted that the nomenclature for the four categories (Balanced Innovators, Product Innovators, Process Innovators and Innovation Aspirants) has been adopted by the researcher for purposes of convenience and discussion.

6.3 Variation in Firm Performance

Having segmented the sample into four categories based on the scores for Product Innovation & Process Innovation, the next step is to ascertain if these four categories have significantly different Firm Performance levels.

6.3.1 Test for significance of Firm Performance variation

ANOVA test was done to ascertain if there exists a significant difference in Firm Performance between these four categories.

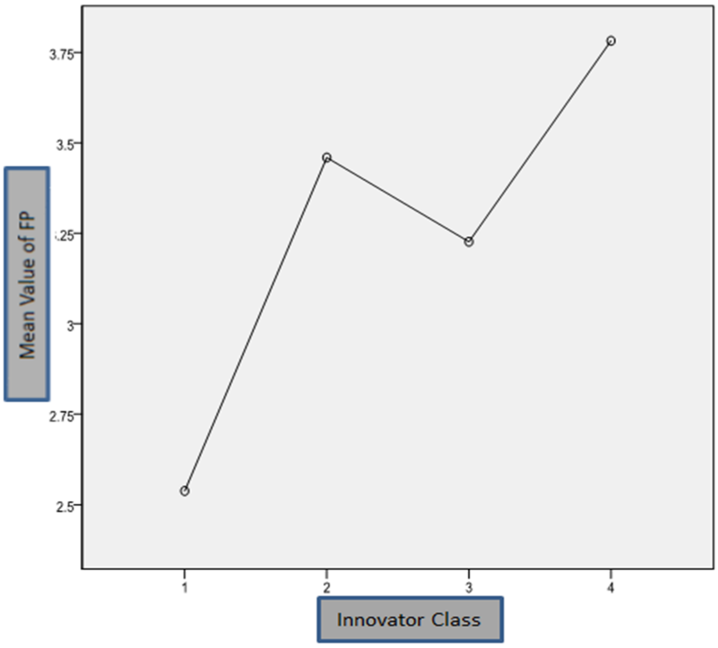


Fig. 6.2: Variation of Firm Performance with extent of Product & Process Innovation

Fig 6.2 shows the mean values of FP for Innovation Aspirants (represented as 1), Process Innovators (represented as 2), Product Innovators (represented as 3), and Balanced Innovators (represented as 4).

Balanced Innovators were found to have the highest level of Firm performance, followed by Process Innovators, Product Innovators and Innovation Aspirants.

The difference in Firm Performance between the four groups was also found to be significant in the ANOVA test, as shown in Table 6.2.

Table 6.2: Test of Significance of Firm Performance Variation

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	58.861	3	19.620	43.806	.000
Within Groups	90.026	201	.448		
Total	148.887	204			

While the significance of the overall difference across the four groups has been established, further analysis has been done to assess the significance of difference between individual pairs of groups. The result of post-hoc test based on the LSD method on SPSS is shown in Table 6.3.

Table 6.3: Post-Hoc test for Multiple Comparisons

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-.921*	.151	.000	-1.22	-.62
	3	-.689*	.146	.000	-.98	-.40
	4	-1.244*	.110	.000	-1.46	-1.03
2	1	.921*	.151	.000	.62	1.22
	3	.233	.178	.192	-.12	.58
	4	-.323*	.150	.032	-.62	-.03
3	1	.689*	.146	.000	.40	.98
	2	-.233	.178	.192	-.58	.12
	4	-.555*	.144	.000	-.84	-.27
4	1	1.244*	.110	.000	1.03	1.46
	2	.323*	.150	.032	.03	.62
	3	.555*	.144	.000	.27	.84

*. The mean difference is significant at the 0.05 level.

As can be seen, the pairwise differences in Firm Performance are significant for all pairs, except for groups 2 and 3. This implies that product innovators and process innovators have more or less similar levels of Firm Performance.

6.4 Reasons for Firm Performance variation

Having established that the four groups had significant difference in their Firm Performance, further analysis was done to ascertain the key antecedent variables that determine the classification into the 4 groups of innovators. Multiple Discriminant Analysis was done using SPSS17 to achieve this. Discriminant Analysis is a statistical technique employedto classify the dependent variable into multiple categories, based on a set of independent variables that are continuous in nature. A linear equation is extracted, where the dependent variable is expressed as a linear combination of the independent variables. Step-wise Discriminant Analysis was done to identify the most critical variables contributing to the classification.

6.4.1 Tests for significance of the Discriminant Function

Wilks' Lambda is the part of total variance in the discriminant score that is not explained by the group differences. Hence, a lower value of Wilks' Lambda is preferred. As can be seen in Table 6.4, Wilks' Lambda in this case is 0.416 (or 41.6%), which translates to a Chi-Square of 175.877 with 9 degrees of freedom, which is significant at the 0.05 level.

Clearly, among the 3 functions extracted (refer to 'Eigenvalues' in Table 6.4), Function 1 is the discriminating function, as it explains the variance in the relationship to the extent of more than 97%. Additionally, the Canonical Correlation associated with this Function is 0.754, which indicates the significance of the function (vis-à-vis 0.186 and 0.013 for the other two functions extracted).

Table 6.4: Test of Significance of Discriminant Function

Variables in the Analysis

Step		Tolerance	F to Remove	Wilks' Lambda
1	CC	1.000	35.957	
2	CC	1.000	24.507	.651
	EN	1.000	24.498	.651
3	CC	.896	9.026	.473
	EN	.999	22.468	.557
	EI	.895	9.558	.476

Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 3	.416	175.877	9	.000
2 through 3	.965	7.111	4	.130
3	1.000	.032	1	.859

Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	1.320[a]	97.3	97.3	.754
2	.036[a]	2.6	100.0	.186
3	.000[a]	.0	100.0	.013

a. First 3 canonical discriminant functions were used in the analysis.

6.4.2 The Discriminant Function and its Predictive Validity

The Discriminant function has been extracted as follows. Table 6.5 has the Canonical Discriminant Function Coefficients (unstandardized values).

Table 6.5: Canonical Discriminant Function Coefficients

Canonical Discriminant Function Coefficients

	Function		
	1	2	3
CC	1.158	.536	-2.197
EN	1.023	-1.198	.261
EI	.918	1.021	1.487
(Constant)	-11.416	-2.530	2.402

Unstandardized coefficients

Hence, the Discriminant Score shall be written as:

D = -11.416 + (1.158*Creative Capability) + (1.023*External Networking) + (0.918*Employee Involvement)

Thus, Step-wise Discriminant Analysis identified Creative Capability (CC), External Networking (EN) and Employee Involvement (EI) as the significant predictor variables for the classification of the firms.

The Centroids of the 4 different groups are shown in Fig 6.3.

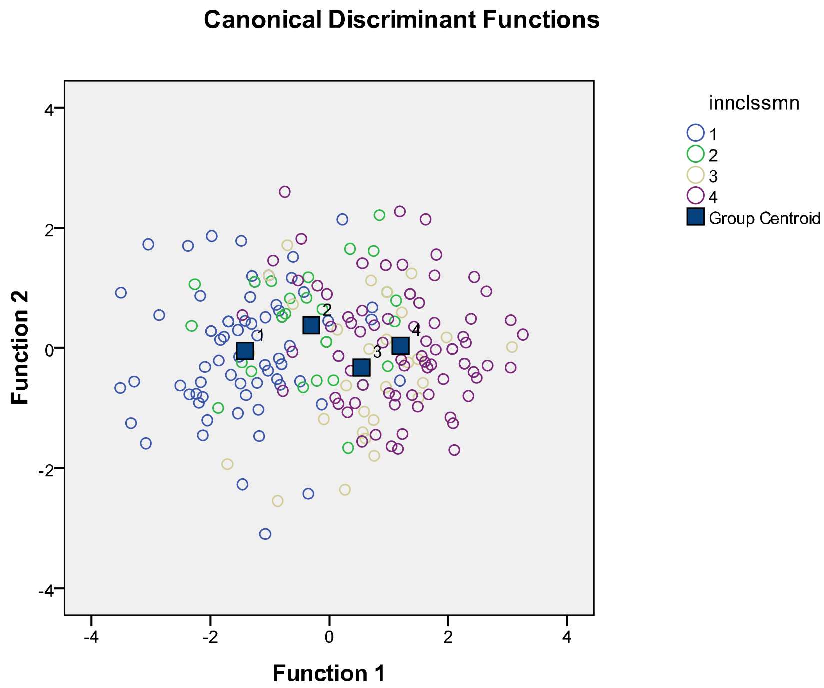


Fig. 6.3: Centroids of the Canonical Discriminant Functions

The value of the Discriminant Function at the centroids are deemed as the threshold values for the 4 different classes, as shown in Table 6.6.

Table 6.6: Function Value at Group Centroids

Functions at Group Centroids

Group	Function		
	1	2	3
1	-1.418	-.047	-.006
2	-.301	.375	.020
3	.541	-.325	.020
4	1.203	.039	-.009

Unstandardized canonical discriminant functions evaluated at group means

The predictive validity of the discriminant function is determined by interpreting the Classification Results shown in Table 6.7.

Table 6.7: Classification Results

Classification Results[a]

		Group	Predicted Group Membership				Total
			1	2	3	4	
Original	Count	1	54	11	3	3	71
		2	6	12	5	4	27
		3	3	5	11	11	30
		4	2	11	17	47	77
	%	1	76.1	15.5	4.2	4.2	100.0
		2	22.2	44.4	18.5	14.8	100.0
		3	10.0	16.7	36.7	36.7	100.0
		4	2.6	14.3	22.1	61.0	100.0

a. 60.5% of original grouped cases correctly classified.

Since there were four groups involved, correct classification by chance would have a probability of 25%. An improvement of 25% over the chance probability of correct classification is usually the acceptable benchmark for the validity of the model(Malhotra & Dash, 2011). Acceptable value for correct grouping would, therefore, be 25% higher than this, which is 31.25% (which is 1.25 times 25%). The model achieved 60.5%, which is significantly higher than this value. Hence the predictive validity of the model is considered good.

Press' Q statistic for predictive validity of the Discriminant Function was calculated as follows:

$$\textbf{Press' Q} = [N - (n*K)]^{\wedge}2/N*(K - 1)$$

{N= sample size; n= number of correct classifications; K= number of groups}

Considering the values of 205, 124 and 4 for Sample Size (N), Correct Classification (n) and the Number of Groups (K) respectively, this translates to a value of 137.69, which is higher than the cut-off value of 6.63(Uddin, Meah, & Hossain, 2013).

Hence it may be concluded that the discriminant function is both significant and valid.

.....ꕥ.....

Chapter 7

FINDINGS AND DISCUSSION

Contents

The main objectives of this study were to understand the antecedents of innovation in small IT firms, and to understand the performance implications of innovation. The model for empirical testing was developed based on literature review of relevant theoretical frameworks. Data was collected from 205 small firms from 5 cities in India, on which statistical analysis was done to generate insights.

Fig 7.1 illustrates the significant relationships identified as a result of the analysis, which shall be discussed in detail. The key findings vis-à-vis the specific Research Questions are summarized at the end of this Chapter.

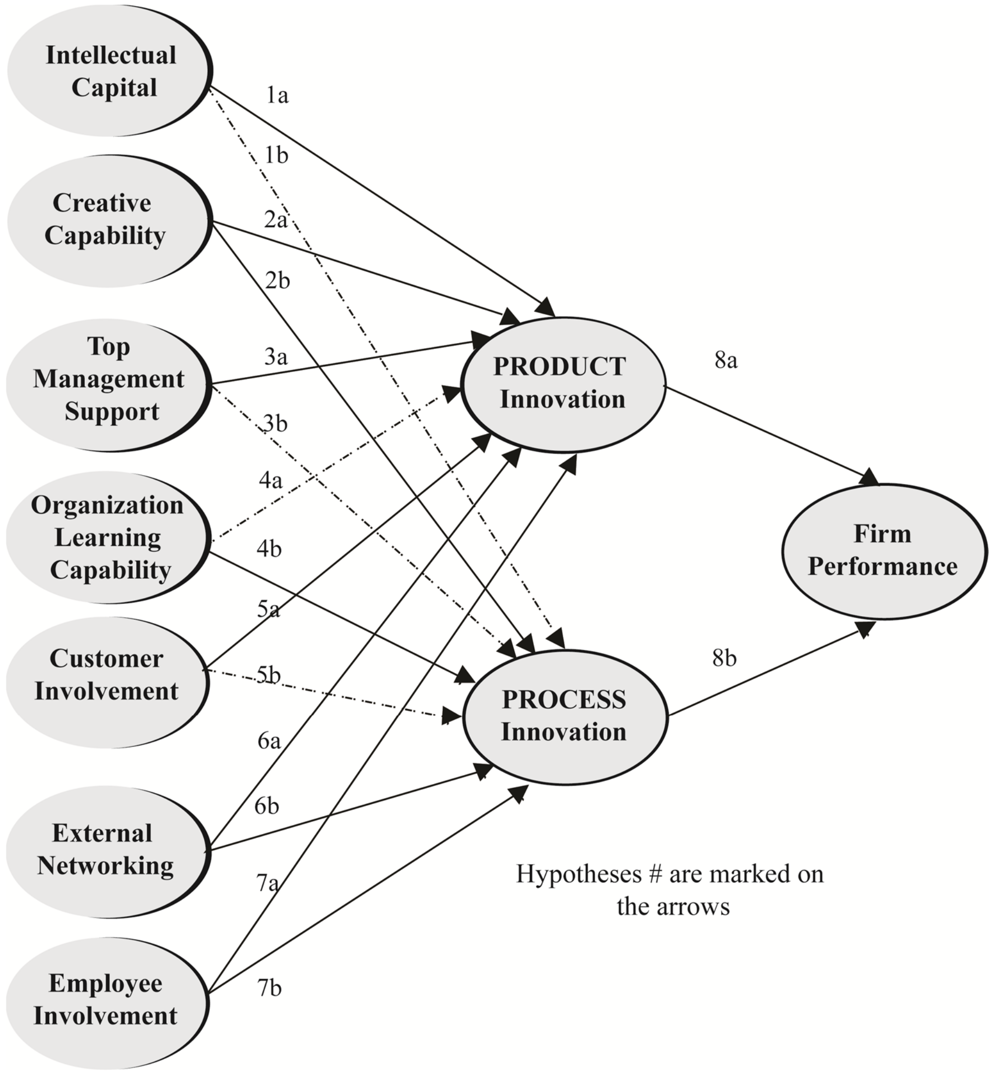


Fig. 7.1: Significant Paths in the Integrated Model

7.1 Antecedents of Innovation

7.1.1 Intellectual Capital and Innovation

The analysis shows a positive relationship between Intellectual Capital and Product Innovation, while there was no impact of Intellectual Capital on Process Innovation. Existing literature has highlighted Intellectual Capital as an antecedent to both Product and Process Innovation (Ngah & Ibrahim, 2009; Zerenler, Hasiloglu, & Sezgin, 2008). Intellectual Capital has been found to be a key driver of New Product Development (Ahmadi, Jalilian, Salamzadeh, Saeidpour, & Daraei, 2012), and Pioneering Innovations (Chen & Wang, 2014).

Intellectual Capital was not found to have a significant relationship with Process Innovation in this study. Examples of process innovations in IT companies surveyed included (a) delivery process improvements (b) automation of manual tasks (c) streamlining of workflow activities (d) standardization of tasks such as documentation (e) productivity improvement plans (f) innovations in specific functional areas such as recruitment processes & pricing etc. Most of these are incremental process innovations that are seemingly not intellectually intensive activities. This specific nature of process innovations in IT firms may explain the absence of a relationship between Intellectual Capital and Process Innovation. A similar pattern was observed in a Brazil-based study, where it was seen that product innovation was more knowledge intensive than process innovation, and hence required higher levels of human capital(Goedhuys & Veugelers, 2012).

Existing literature is also vague, when it comes to the impact of Intellectual Capital on Firm Performance (Ahmad & Mushraf, 2011). Some researchers have highlighted the direct impact of Intellectual Capital on business performance (Meihami, Varmaghani, & Meihami, 2014), while others have pointed out the mediating role of Innovation (Wu & Sivalogathasan, 2013). This study aligns to the latter school of thought.

A study of Information Technology (IT) firms done in Taiwan considered multiple dimensions of Intellectual Capital; Human Capital, a key dimension, was found to have a relationship with Firm Performance mediated by Innovation Capacity (Wang & Chang, 2005). This study partly agrees with the results of that study. The findings of this study also reinforce the importance of Human Capital for Indian IT firms. For instance, previous studies have indicatedthe role that availability of engineering talent has played in determining those geographical locations in the country where IT industry has flourished (Arora & Bagde, 2010).

14 out of 205 companies (about 7%) surveyed had at least one granted patent at the time, but on the positive side, 39 firms (19%) had filed for patents but yet to be granted one. 36 firms (17.5% of the sample) had full time, dedicated employees working on R&D, and an additional 21 firms (10%) mentioned that they conduct R&D very frequently in their organizations. Previous researchers have drawn attention to the proposition that R&D in small firms is more likely to be informal and sporadic, as opposed to formal and continuous (Bougrain & Haudeville, 2002).

7.1.2 Creative Capability and Innovation

Creative Capability has a significant relationship with both Product and Process Innovation. Literature on innovation sometimes considers creativity and innovation synonymously. Creative Capability is rather a pre-condition for innovation. While it is necessary for innovation, it does not guarantee innovation (Im & Workman, 2004; Gumusluoglu & Ilsev, 2009). Results of this study support the argument of Creative Capability being an antecedent of innovation (Hassan, Malik, Hasnain, Faiz, & Abbas, 2013), and is in line with the proposition that creativity helps generate good ideas, and innovation is about implementation of those ideas (Scott & Bruce, 1994). However, the resultsdiffer with some of the earlier work that have shown a positive relationship with Product Innovation, but an absence of relationship between Creative Capability and Process Innovation (Ar & Baki, 2011; Çokpekin & Knudsen, 2012).

The strength of path significance with both Product Innovation and Process Innovation is noteworthy, along with the fact that its effect on Firm Performance is fully mediated by either Product Innovation or Process Innovation in isolation.

The impact of Creative Capability on product innovation seems obvious. It is not only about generating ideas for new products & services, but also about developing differentiated products & services that can lead to competitive advantage(Im & Workman, 2004; Sethi, Smith, & Park, 2001).

7.1.3 Top Management Support and Innovation

Top Management Support has a significant relationship with Product Innovation, but not with Process Innovation. The impact on Product Innovation concurs with existing literature that discusses the importance of role played by senior management and founders in small firms (Bougrain & Haudeville, 2002; Palmer & Wright, 2010; Yap & Souder, 1994), and vision setting and motivation by senior management (Mazzarol, 2002; Agbor, 2008). Researchers have also pointed out the relevance of Top Management Support in New Product Development (Richtner & Ahlstrom, 2010), particularly in scenarios where market and technology uncertainties are high (Islam, Doshi, Mahtab, & Ahmad, 2009). Product Development in IT companies requires a confluence of diverse skills, often categorized as ‘technical’ and ‘non-technical’ skills (Goles, Hawk, & Kaiser, 2008). Senior Management has to decide upon and mobilize the optimum mix of skills needed within the firm. Software product development also can be expensive in many cases (Kaur & Kumar, 2014), although recent times have seen the proliferation and widespread adoption of Open Source communities (Piva, Rentocchini, & Rossi-Lamastra, 2012), platforms and technologies. The top management of the firm can be a positive influence by (a) providing strategic direction and supervisory oversight to the various activities involved in product development (b) allocating or pulling out financial and material resources at the right time(Richtner & Ahlstrom, 2010) (c) and facilitating a collaborative culture in the organization for innovation(Soken & Barnes, 2014).

Since it involves ‘new or significantly improved processes’ top management support was expected to be a key driver of Process Innovation. However, a similar, unexpected, finding was reported in a previous empirical study that involved examining the antecedents of product and process innovation, based on high-technology Turkish SMEs (Ar & Baki, 2011). The researchers reported an absence of impact of Top Management Support on Process Innovation.

7.1.4 Organization Learning Capability and Innovation

Organization Learning Capability has a positive relationship with Process Innovation. No relationship has been observed with Product Innovation. The mediating role of innovation between Organizational Learningand Firm Performance has been empirically substantiated before (Kocoglu, Imamoglu, & Ince, 2011). Organizational Learning has been found to have a stronger influence on Innovation than on firm performance (Therin, 2003).

While some studies have shown that Organizational Learning Capability influences both product and process innovation, there is no consensus in the literature. Salim and Sulaiman (2011) conducted an empirical study on Malaysian SMEs in ICT industry, and established the connection between organizational learning capacity and technological (product and process) innovation, and between innovation and firm performance. The results of this studyalign with a Turkish study of high-technology firms, where it was found that Organization Learning Capacity influences process innovation and not product innovation (Ar & Baki, 2011).

Unique characteristics of the small Indian IT firms may explain the lack of influence on product innovation. These firms compete in markets such as SMAC(Social, Mobility, Analytics, and Cloud), where technology evolves at a rapid pace(Bhargava, Verma, & Satinder, 2015). Hence agility, flexibility, ‘failing fast’, and time to market become critical for small firms. Organizational learning capability involves building up of tacit and explicit knowledge through individual and collective learning. Despite the steep learning curve involved in the initial stages, it takes time before the knowledge builds up to a level where it can be exploited. Organizational learning involves knowledge accumulation, communication and exploitation, which is facilitated by Knowledge Management systems(Therin, 2003). This is a long drawn process. This could be the reason for the fundamental dichotomy between product innovation and organizational learning among the small IT firms. Small firms prefer fast time-to-market, experimental approach, and are willing to fail fast in the process.

The dynamics in large firms can be different. Larger firms typically have scale-based products and service offerings, in which they make long-term investments. Organizational learning can benefit such scenarios, in terms of continuously improving their products/services.

The study substantiated that organization learning capacity impacts process innovation.The processes involved in software development and project management do not change that rapidly. Standard project management processes creates stability and efficiencies. This is the ideal scenario for Organizational Learning benefits to kick in.

7.1.5 Customer Involvement and Innovation

Customer Involvement has a positive relationship with Product Innovation, and does not have a significant relationship with Process Innovation. The results are in line with the stream of literature that focuses on user/customer involvement in innovation (Hippel E. v., 1988; Franke & Shah, 2003). Customer involvement has been associated with new product development (Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010)and new product success (Gruner & Homburg, 2000). While there is extensive literature and general consensus on the impact of customer involvement on product innovation, the impact on process innovation seems to be less clear. Opinion is divided, as some researchers have highlighted a positive relationship (Wang, Chang, & Chiu, 2013), others have pointed to absence of relationship (Ar & Baki, 2011).

On an average, about 70% of small firms involved customers in their innovation process. 68% firms involved customers in their New Product Development process, 72% firms validated new ideas with their customers and 73% firms considered their customers as a key source of technology.

The unique business model of Indian IT industry may explain the absence of positive relationship between Customer Involvement and Process Innovation. One of the key pillars on which the Indian IT industry is superior processes in software development, quality assurance, documentation, people management processes & practices, and overall project management & governance. Indian IT companies accounted for more than 70% of the top, CMM level-5 certification (a well-known Quality certification in IT) globally(The Economic Times, 2007). This reduces their dependency on clients for process innovation. The emphasis on processes and project management starts at early stages in Indian IT firms.Appendix-6 depicts a collation of various examples of process innovation collected during the survey. Noticeably, many of these are internally generated, resulting from ‘learning by doing’, and hence aligned to Organization Learning Capability.

7.1.6 External Networking and Innovation

External Networking has very strong and significant relationship with Product Innovation, and moderately strong and significant relationship with Process Innovation. The direct effect on Firm Performance is fully mediated by the innovation variables. In broader terms the findings with respect to external networking agree with extant literature on Open Innovation (Inauen & Schenker-Wicki, 2011), where networking/collaborations with external partners can enhance product and process innovation. A study done 6 years back concluded that the adoption of Open Innovation practices was on the rise among SMEs in Netherlands (Vrande, Jong, Vanhaverbeke, & Rochemont, 2009). Yet another study made a similar conclusion, with evidence of increasing Open Innovation adoption among Taiwanese electronics companies (Hung & Chiang, 2010). This study provides additional evidence from a developing country perspective.

32% of firms surveyed had network relationships with universities and research institutions, 43% with start-up firms, 26% with competitors, 41% with consultants and 49% with technology companies.

The positive relationship between external networking and product innovation can be explained as follows:

- Small firms are inherently constrained by resources. They can share risks by jointly undertaking product development with trusted partners in the network(Wallin & Krog, 2010; Coras & Tantau, 2014)

- Small firms seldom have end-to-end capabilities to build scalable products. Complementary assets can be accessed through partnerships. Some researchers have pointed out that smaller firms stand to gain more from open innovation vis-à-vis larger firms, owing to less bureaucratic structures, willingness to take risks and their inherent agility(Hutter, Hautz, Repke, & Matzler, 2013).
- Universities and Start-up companies can provide valuable knowledge on emerging technologies and market trends
- Technology is highly compartmentalized in most of the areas in IT. By collaborating with other technology/platform providers, joint go-to-market strategies could be leveraged.

The reasons for impact on process innovation are more intangible. Consulting firms, and Subject Matter Experts hired from outside can provide guidance and advice to improve internal processes. Similarly, technology partnerships can bring in new (and often cost-effective) technologies that, when embedded into the company's operations & processes, create value. One of the reasons small entrepreneurial firms engage in technology collaboration is to leverage a plethora of Open Source System Communities that exist today. Collaboration with these communities has been found to augment innovation (Piva, Rentocchini, & Rossi-Lamastra, 2012). A culture of external networking creates an environment where employees are constantly encouraged to 'look outside' the firm for best industry practices. Employees attend seminars and conferences, and build networks around them. Tacit knowledge residing outside the firm is brought into the firm through these network interactions.

7.1.7 Employee Involvement and Innovation

Employee Involvement has moderate relationship with product innovation, and strong relationship with process innovation. The relationship of Employee Involvement with Firm Performance is partly mediated by product innovation, and fully mediated by process innovation. The results are aligned to recent literature on employee involvement. The traditional top-down or upper-echelon view of innovation has been challenged in recent times, with growing recognition of innovation as being more inclusive in nature (Andries & Czarnitzki, 2014). Extant literature of Employee Driven Innovation (EDI) is based on the simple premise that all employees are capable of creative thinking (Amundsen, Aasen, Gressgård, & Hansen, 2014). 'Involvement of frontline employees' has been empirically associated with product innovation, based on large sample sets (Jong & Vermeulen, 2006). Studies have shown that employee involvement leads to better quality (Jones & Kato, 2005), productivity and improved processes, and substantiated the linkages with product and process innovation (Andries & Czarnitzki, 2014).

The levels of EI was found to be fairly high for the sample firms (average value of EI for 205 firms was 3.83). This is expected, as small firms have organic & fluid structures (Palmer & Wright, 2010)that allow employees to forge personal, informal relationships and hence the level of involvement and interpersonal interactions is expected to be high. IT projects require formation of project teams, where people have to work closely. Additionally, leaders of IT firms recognize the importance of group dynamics, and hence actively encourage communication between employees. In 144 firms out of 205 (70% of the sample), the senior executive responded that the firm actively encourages employee communication.

The variables Customer Involvement, External Networking and Employee Involvement are elements of Open Innovation. Customer Involvement and External networking signify ‘technology exploration’, and Employee Involvement signifies ‘Technology exploitation’ (Vrande, Jong, Vanhaverbeke, & Rochemont, 2009). All the three variables were found to have significant impact in innovation, which is in line with a previous study done in Netherlands on 605 SMEs, which indicated that Customer Involvement, External Networking and Employee Involvement were the three most commonly adopted Open Innovation practices (Vrande, Jong, Vanhaverbeke, & Rochemont, 2009).

7.2 Impact of Innovation on Firm Performance

Product Innovation & Process Innovation individually mediate some of the independent variables’ relationships with the dependent variable (Firm Performance), but not all. But jointly they mediate all the relationships, indicating a possible complementary relationship between the two. Both Product Innovation and Process Innovation show strong, significant impact on firm performance. This is in agreement with numerous studies that have linked innovation and business/financial performance (Siguaw, Simpson, & Enz, 2006; Hadjimanolis, 2000; Vazquez, Santos, & Alvarez, 2001; Kalkan, Bozkurt, & Arman, 2014; Ruiz-Jime´nez & Fuentes-Fuentes, 2013). Researchers have differentiated the benefits of Product Innovation and Process Innovation that lead to better performance. Product Innovation helps manage technology & Market uncertainties (Han, Kim, & Srivastava, 1998), create differentiated offerings (Koellinger, 2008; Hashi & Stojcic, 2013) , provide opportunities for new market entry & revenue opportunities (Hashi & Stojcic, 2013), respond effectively to changing customer requirements (Camisón & Villar-López, 2014), and even generate monopoly profits for a short while (Artz, Norman, Hatfield, & Cardinal, 2010). While Product Innovation is often associated with topline-enhancing opportunities, Process Innovation is linked more towards cost cutting initiatives. Benefits ascribed to Process Innovation include cost reduction, better productivity & profitability (Goedhuys & Veugelers, 2012; Koellinger, 2008; Gunday, Ulusoy, Kilic, & Alpkan, 2011; Rochina-Barrachina, Mañez, & Sanchis-Llopis, 2010), and operational efficiencies (Camisón & Villar-López, 2014).

Empirical data analysis has shown that the explanatory power of the model is good (R-Squared for PDI = 0.689; R-Squared for PCI = 0.418; R-Squared for FP = 0.494). Additionally, the Stone-Geisser Q-Squared values (0.693, 0.458, 0.495 respectively) indicative good predictive validity of the model.

It was noted that Process Innovation had a slightly stronger impact on Firm Performance compared to Product Innovation, on comparison of the path coefficients. However, ANOVA test showed that this difference is not statistically significant.

7.3 Variation among firms in adoption of Innovation

Firms were classified into four categories, based on the magnitude of Product Innovation and Process Innovation (Balanced Innovators, Product Innovators, Process Innovators and Innovation Aspirants). The four classes had varying impact on Firm Performance, which was significant statistically (as confirmed by ANOVA test). Firms having high degree of both Product Innovation and Process Innovation were found to have the highest levels of Firm Performance. This is consistent with existing literature on the cumulative, synergistic effect of product and process innovation (Reichstein & Salter, 2006; Ballot, Fakhfakh, Galia, & Salter, 2015).Other researchers have demonstrated the mutually reinforcing effects of product innovation and process innovation by statistically testing the ‘complementarity’ between the two (Miravete & Perinas, 2006). A recent study done by Goedhuys & Veugelers (2012) found that while Product Innovation boosted sales growth performance, the impact was enhanced in the presence of Process Innovation. The key factors that determine this classification have been identified as Creative Capability, External Networking, and Employee Involvement. Hence, the findings have been broadly in agreement with existing literature on product innovation, process innovation and firm performance.

It was found that firms that had high levels of both product and process innovation (balanced innovators) had the highest levels of firm performance, followed by process innovators, product innovators and firms that had low levels of both product and process innovation (innovation aspirants). A similar pattern was observed in an earlier study, where Product

& Process innovators were reported to have the highest sales growth (6.6%), followed by process innovators (4.3%), product innovators (4.1%), and companies that did not have product & process innovations (2.5%) (Goedhuys & Veugelers, 2012).

The firms in the sample have shown more or less equal propensity for Product Innovation & Process Innovation. The average score for Product Innovation is 3.69, and that for Process Innovation is 3.83. This concurs with the proposition that while small firms are expected to undertake product innovation, process innovations are equally important for growth (Hoffman, Parejo, Bessant, & Perren, 1998). Additionally, life cycle theories of Innovation suggest that during the initial growth stages of an industry, firms focus more on product innovation, whereas as the industry matures, the emphasis slowly shifts to Process Innovation (Abernathy & Utterback, 1978). The fact that small IT firms in India adopt an equal measure of Product and Process Innovation (on an average) may be indicative of the maturing of the industry.

7.4 Summary of Findings Relating to Specific Research Questions

The analysis done addressed the key objectives defined earlier. The summary of the findings based on hypothesis testing and analysis are shown in Table 7.1.

Table 7.1: Findings related to Specific Research Questions

Objective	Findings
What are the drivers of product innovation in small IT firms?	The significant drivers have been identified as: Intellectual Capital Creative Capability Top Management Support Customer Involvement External Networking Employee Involvement External Networking had the strongest impact on Product Innovation
What are the drivers of process innovation in small IT firms?	The significant drivers have been identified as: Creative Capability Organization Learning Capability External Networking Employee Involvement Employee Innovation had the strongest impact on Process Innovation.
What is the impact of product innovation on the performance of small IT firms?	Product Innovation has a significant, positive impact on Firm Performance
What is the impact of process innovation one the performance of small IT firms?	Process Innovation has a significant, positive impact on Firm Performance. Process Innovation had a stronger impact on Firm Performance compared to Product Innovation
How is the combined impact of product and process innovation on firm performance different from individual impact?	Firms with higher product and process innovation are found to have the highest firm performance. 'Balanced Innovators' have significantly higher firm performance than both product innovators and process innovators
To classify the firms based on the extent of product and process innovation	Firms have been classified into four categories (Balanced Innovators, Product Innovators, Process Innovators and Innovation Aspirants), based on the magnitude of product innovation and process innovation. This classification was found to be statistically significant, with the different categories having significantly different impact on firm performance
To understand the key drivers of the variation in innovation among the firms	The key variables that determine this classification are Creative Capability, External Networking and Employee Involvement

.....ꙮ.....

Chapter 8

CONCLUSION

Contents

This study is about firm-level innovation. Three main research questions were addressed by this study. Firstly, what are the drivers of innovation in small companies? Secondly, how does innovation impact overall firm performance? And thirdly, what is the variation in the adoption of innovation among firms?

Previous studies on firm-level innovation have looked at innovation from multiple theoretical lenses: entrepreneurial theories of the firm, Resource-Based-View of the firm, Knowledge-Based-View of the firm, Theories on creativity & innovation, organization culture/structure based view of innovation, life cycle theory of innovation and the theory of open innovation. Several types of innovation have also been defined in both academic and practice-based literature. The main challenge of an innovation researcher is to contextualize the factors that drive innovation in firms. In this study this was achieved through extensive, rigorous literature review, and expert surveys.

Firm-level innovation studies can be conducted (a) within an industry or (b) across industries. Industry specific studies on firm-level innovation are more insightful compared to multi-industry studies(Jong & Vermeulen, 2006). The study has been contextualized and operationalized within Indian IT industry. Small firms were chosen as the subject of investigation, owing to their growing importance in the Indian IT ecosystem, and limited understanding of their innovation process. Data was collected from 205 small firms. Rigorous statistical testing was conducted to do the analysis, and several novel insights were generated.

The significant antecedents of product innovation and process innovation were found to be different. The antecedents represented both firm's external exploration capabilities, and internal, exploitation capabilities. The study reconfirmed the influence of innovation on firm performance. The model derived broadly confirms with the existing theory.

8.1 Managerial Implications

The study has several managerial implications.

8.1.1 Organizing the Human and Intellectual Assets for Innovation

An examination of the antecedents found to impact innovation shows the importance of employees in innovation. Human Capital (as an element of Intellectual Capital), Creative Capability, Organization Learning Capability and Employee Involvement have individual employee as the basic building block. A holistic perspective is, therefore, needed in the context of linking employees and innovation. The practical significance of different elements of this study is illustrated in Fig 8.1.

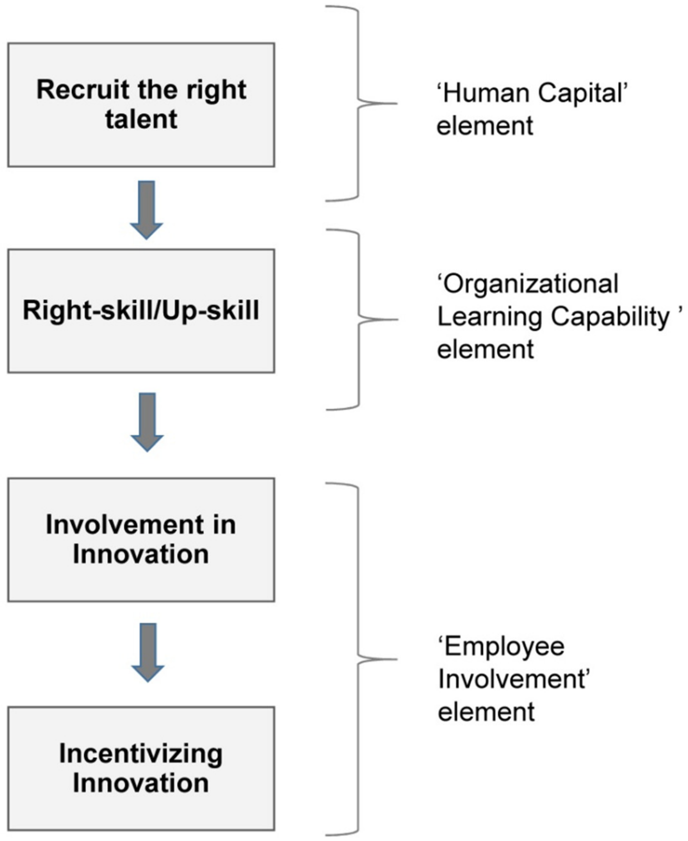


Fig. 8.1: Importance of Employees in Innovation

Importance of employees in innovation involves: (a) having the right employees with the required technical knowledge, intellectual caliber, and creativity (b) the firm possessing the right culture of collaborative learning and (c) existence of an incentive structure that is perceived as fair by the employees (for them to actively participate in innovation initiatives).

Human Capital is important for technology adoption and diffusion (Nelson & Phelps, 1966), and to create a market-favorable image of the company, which helps attract even better talent. The skill levels and diversity of talent at disposal is critical to software companies (Koc, 2007). Globally, there is a shortage of high quality talent in emerging technology areas such as Big Data and Enterprise Mobility (Kaplan, Khan, & Roberts, 2012). Only about one-third of the respondents agreed that they have human resource talent at their disposal better than the industry standards. This is a challenge that small IT firms face, as the social acceptance in the Indian society is higher for young engineers to work in larger, established firms. Working with start-ups and smalls companies has not been the preferred employment, but this has been changing in recent times. A recent survey done by HR experts in India predicted that start-up employment in India is will grow from 2014 levels of 50000-60000 to 250000-300000 by 2020, and there is an increasing trend of job seekers preferring to work with start-ups (The Economic Times, 2015).

Organization Learning Capability can be enhanced through training, learning and development programs. This puts the onus on the HR system, right from recruitment of the right talent, to continuous skill development, and incentivization of innovation (monetarily or otherwise).

Employees can add value throughout the product development lifecycle, in terms of generation, validation and implementation of ideas. Client-facing employees enhance the overall quality of customer service & customer experience. The firms that took the survey had high levels of employee involvement (average score of 3.83 on 5). This indicates the recognition of importance of employees' participation in innovation in IT firms. 156 firms (76% of the sample) actively involved employees from multiple functions in their innovation initiatives. The results are similar to those reported in a cross-sectoral study done in Europe with a large sample of 1250 firms, where 69% firms had high levels of frontline employee involvement on innovation (Jong & Vermeulen, 2006).

In the context of Open Innovation, it is important for the firm to have ‘external idea seekers’. 60% of the firms surveyed mentioned that they had such idea seekers. Incentivizing such behavior may be needed, to ingrain it into the culture of innovation in the company (IFM Management Technology Policy, 2009). 71% of the firms surveyed agreed that they reward their employees for seeking ideas from external sources.

Over the last few years, while the larger Indian IT companies have upped the ante in terms of R&D intensity and patenting (Mukundan & Thomas, 2013; KPMG, 2012),the smaller companies seem to have some catching-up to do. Some responding companies did not have R&D and patenting as an integral part of their strategy. The reasons cited included the nature of their offerings (which did not warrant IP protection), expenses involved in filing for IP, and the long lead-time of the IP filing process. Most of the small companies do not have the resource & time bandwidth to aggressively pursue IP-based strategies. However, this may also be indicative of the fact that most of the innovations coming out of these companies are applied innovations that are not based on new scientific breakthroughs.

8.1.2 Management Support for Innovation

An important finding of this study is that Management has an important, participatory & supportive role to play in Product Innovation, while it may be better for Management to adopt a hands-off approach to

Process Innovation. Specific characteristics of Indian IT firms may explain this result. Several examples of process innovation were collated based on the open ended question, as summarized in Appendix-6. All of these (apart from stock options) are cost-saving and/or investment-neutral initiatives, and hence do not require senior management approval. Employees proactively generate these innovations and bring them up to senior management for creating visibility rather than seeking approvals and budget. Hence, these innovations can happen independent of Top Management Support for innovation. In contrast, product innovations are investment-intensive, and require senior management support in terms of tolerance for risk & failure. Participative leadership, tolerance for failure, and Autonomy & freedom are often associated with individual level creativity that leads to product innovation; at the same time, too much of rigidity & formalization can stifle it(Pandey & Sharma, 2009).

Management has a crucial role to play in 'organizing the right culture of innovation'. Managers can 'shape' the culture of an organization and align it to the requirements of innovation (Hurley & Hult, 1998). Challenging jobs, autonomy at work place, multi-skilled work groups, can all impact creative capability of the individuals (and hence the organization) positively (Adams, 2005). Previous empirical studies have point out the importance of time & resources provided to employees to pursue creative ideas (Çokpekin & Knudsen, 2012). 65 out of 205 respondents in this study (a little less than one-third) mentioned that their organization provides time & resources for employees' creative pursuits. Too much of formalization of innovation, particularly in small firms, can generate adverse impacts. However, setting up value-enhancing processes for idea generation and evaluation is something that managers can consider. While 67 respondents (about one-third of the sample) agreed that they have a process to assess creative ideas, most of them mentioned that it was rather informal. Small firms, in general, do not have well-structured procedures for innovation, and adopt a rather informal approach to innovation initiatives (Santarelli & Sterlacchini, 1990).

Group dynamics are particularly important in industries like IT, where most of the projects/tasks are executed by teams of individuals. Management can play an active role in facilitating & fostering the group dynamics. Several, proven techniques may be employed to achieve this. Some well-known group level methods are brainstorming, creative problem solving, and De Bono’s Six Thinking Hats (Sousa, Pellissier, & Monteiro, 2012).

8.1.3 Leveraging Customers for Innovation

The IT business operations involve significant amount of customer interaction. The ‘intensity’ and ‘breadth’ of end-user and external collaborations are considered important to innovation (Ashok, Narula, & Martinez□Noya, 2014). While administering the surveys, the extent of collaboration with customers was investigated into (Questions 18-21 of Part-A of the Questionnaire), based on which the following types of collaboration strategies were arrived at:

a) ***Customer Centric firms:*** Firms that are truly driven by their customers, closely involve their customers in new product development, validate ideas with customers, and invest time & resources in forging long term relationships.

b) ***Selective Collaborators:*** Firms that rely on one or a few of their top priority customers. In many cases, the reliance is more with one of the initial customers. This is because the solution built for an initial customer often becomes the core platform/solution for the firm.

c) ***Transactional Collaborators:*** The relationship with customers is more or less limited to transactional & operational activities. Customers rarely get involved in new product development.

Fig 8.2 depicts this categorization:

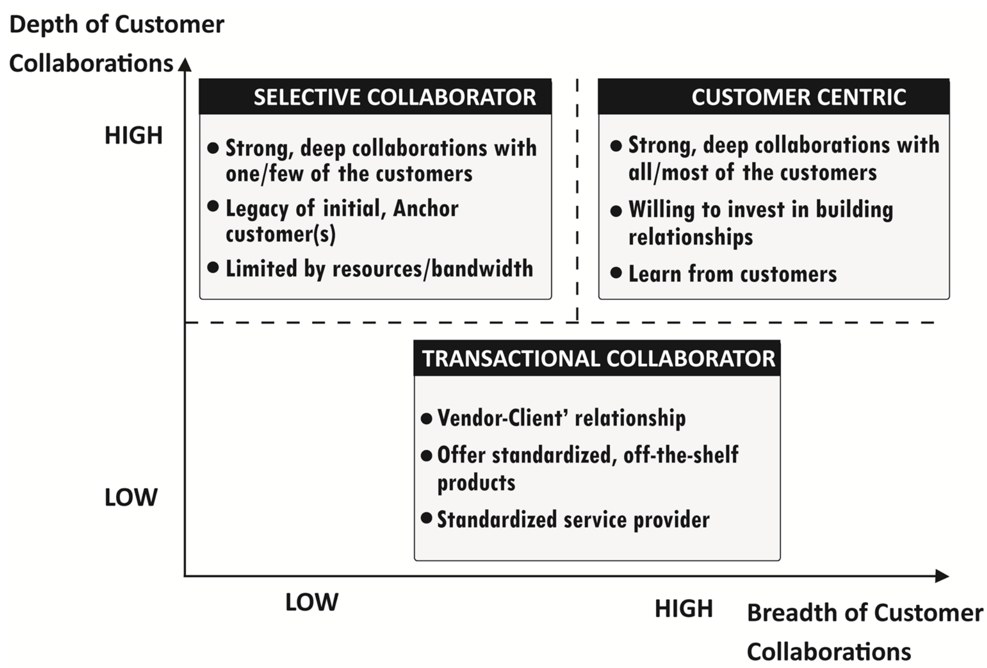


Fig. 8.2: Breadth and Depth of Customer Collaborations

About 70% of the firms surveyed actively engage their customers in the process of ideation and validation. The challenge for firms, however, is to supplement the client interactions with an ability to harness domain knowledge and technology to build new capabilities, products and services. In this context, absorptive capacity of the firm becomes crucial(Cohen & Levinthal, 1990), which is dependent upon human capital and R&D. Approximately one-third of the firms surveyed mentioned that they had high quality talent at their disposal. About 40% of the firms had R&D as part of their strategy.

On the positive side, the Indian IT firms seem to be doing well in terms of forging beneficial relationships with their customers. To fully benefit from these relationships, firms need to complement the client interactions with their human capital base, and R&D focus.

8.1.4 Organizing for Open Innovation

A key finding of this study is the increasing relevance of Open Innovation for small IT firms. Customer Involvement, External Networking and Employee Involvement are key elements of Open Innovation.

One of the suggested shortcomings of the Indian IT sector has been its inability to match the Silicon Valley counterparts in large scale, breakthrough innovations. To a large extent, the success of the Silicon Valley model has been attributed to the network linkages associated with it.

The Indian IT firms traditionally followed a semi-closed model of innovation. They relied heavily on clients for technology & directional inputs. Innovations were reactive, based on customer requirements. One of the key findings of this study is that Indian companies are now moving towards Open Innovation. 32% of firms surveyed had network relationships with universities and research institutions, 43% with start-up firms, 26 firms with competitors, 41% with consultants and 49% with technology companies.

Earlier studies had shown that collaboration with universities and public research institutions, joint research and patenting have been low, and had advocated stronger ties (D'costa, 2006). Though this study is not a longitudinal one, there are enough indications that industry-academia collaborations are on the rise. IT companies collaborate extensively with universities in terms of talent building, training programs, internships etc. These collaborations are strengthening into areas such as sponsored research and IP creation. Start-up companies are being looked at as important source of technology trends. Studies have touched upon the relatively lower levels of inter-firm linkages (Prashantham, 2004). One of the reasons cited is the highly competitive nature of the fragmented industry, where firms wanted to maintain confidentiality (D'costa, 2006). A more recent study concluded that MNCs partner predominantly with the larger IT players, and the larger domestic players themselves have only 'sub-contracting' relationships with the smaller players (Ilavarasan & Parthasarathy, 2012). This study concurs with the earlier studies. Only about one-fourth of the firms were found to engage in inter-firm collaborations. Expectedly, about half of the companies indicated that they have strategic ties with leading technology companies. However, the nature and extent of technology transfer was not clear, as it was not within the scope of this study to delve deep into aspects of technology transfer.

'Organizing for open innovation' requires a fundamental shift in the mindset of Indian companies. Employees are usually immersed in internal work, and hence should be encouraged (and possibly incentivized) to constantly look outside the firm for ideas, knowledge & technology. Membership and active participation in industry forums, attending conferences and seminars, and involvement in start-up events are a few ways in which meaningful networking can be achieved. Limiting university-partnerships to student internships alone is turning a blind eye to valuable science & technology capabilities that many universities have to offer. The benefits of open innovation are largely intangible, and hence traditional ROI measures should not be used to measure its success.

8.1.5 Organizing for Product and Process Innovation

This study provides a practical framework for managers to 'organize the firm for innovation'. Organizing for innovation requires a holistic approach towards the significant antecedents of innovation. For instance, benefits from customer involvement are enhanced by better intellectual capital & learning capability. Self-examination of strengths and weaknesses will help identify the nature of interventions needed. Managers also need to ascertain the balance between the types of innovation (product vs process) they need to pursue. While this study suggests a synergistic approach to product innovation and process innovation, the right balance of the two will also depend upon the nature & stage of business(Abernathy & Utterback, 1978).

An innovative firm needs the right mix of both product and process innovation, to fully translate the innovation antecedents into firm performance.

The results importantly showed that firms occupying quadrant-4 in Fig 8.3 had the highest level of firm performance.

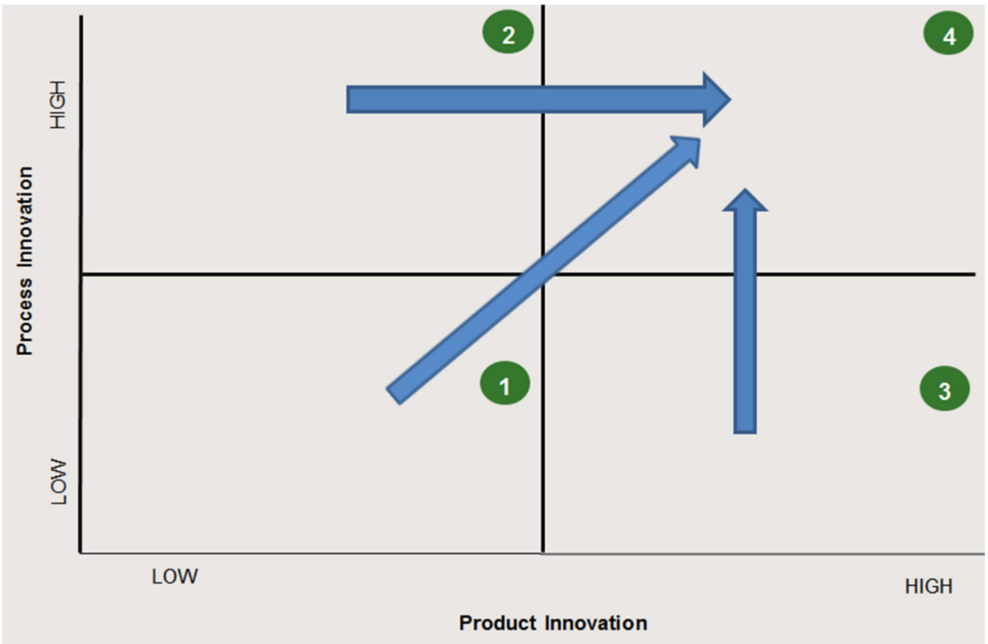


Fig. 8.3: Firm's focus on Product Innovation and Process Innovation

The task for senior management, therefore, would be to steer their innovation efforts to eventually maximize the firm performance by following the paths (illustrative) shown in the figure above. It was not the objective of this study to understand the various path possibilities on innovation strategies. However, the following points are pertinent:

- Start-up firms are likely to concentrate their efforts on technology and product innovation. In software business, it has been noted that, many firms start off as product companies, but eventually start generating substantial revenues from services (such as after sales service), thereby reducing the financial dependence on products (Cusumano, 2008). Hence, as the firm moves from early stages to growth stages, the challenge is to balance process innovation with product innovation. This may, at times, require fundamental shift in mind set.

- Some firms adopt a conscious focus on product innovation, often myopic to process innovation possibilities. The challenge for such firms is to evaluate the process innovation possibilities, and incorporate the same into their innovation strategies.
- Firms may also consciously adopt a pure process innovation focus. However, process innovation in itself may not be able to sustain growth rates for prolonged periods of time (Goedhuys & Veugelers, 2012). These firms can evaluate the feasibility of product innovation and accordingly incorporate it into their innovation roadmap.

The instrument developed for this survey can be used by practitioners to assess their internal innovation status. Such as exercise can reveal the innovation drivers where the firm is doing well, and those drivers where more efforts are needed. It can also help the firm assess the extent of both product innovation and process innovation, and fine tune their strategic direction accordingly.

There are implications for policy makers as well. Strong, grass-root level policies are needed to improve the quality of graduate engineers, to address the well-documented 'skill deficit' facing the industry. Inter-firm linkages continue to be low, as highlighted in previous studies too (Ilavarasan & Parthasarathy, 2012). Small firms will benefit immensely by partnering with larger domestic firms and MNCs. Policy incentives to make this happen should be considered.

8.2 Theoretical Implications

The unique theoretical contributions of this study are as follows:

- Through extensive literature & theoretical review, a multi-dimensional framework for assessing innovation in small firms was constructed. This was validated empirically by statistically analyzing the data collected from 205 small-sized IT companies in India.
- Common and specific Antecedents of Product and Process Innovation were identified, that represented both exploration and exploitation capabilities of the firm.
- The mediating role of Product Innovation and Process Innovation between the independent variables and Firm Performance was proven statistically.
- Indian IT industry has key significance in the overall growth of the economy. While innovation in the IT industry has been of keen interest, there are very few empirical studies done on the topic. Existing literature is dominated by reports from analysts and consulting firms, drawing from firm-level case studies. To the best knowledge of the author, this is the first empirical study (in India) of innovation antecedents, based on a large sample, and extends the existing literature of small firm innovation to Indian IT context.

- The study also establishes that firms need to engage in both product innovation and process innovation, for superior performance. Reliance on one type of innovation can limit the advantages derived from innovation.
- Further, less significantly, the impact of innovation in firm performance has been reinforced, in line with existing literature.
- Importantly, this study establishes the importance of Open Innovation in small IT firms.

8.3 Scope for Future Research

Entrepreneurial theories argue that CEO/founder characteristics can influence innovation in small firms (Hadjimanolis, 2000; Lidow, 2014). On the contrary, recent research has hinted at an inclusive model of innovation role of inn where 'partnering' between managers and employees is important (Mazzarol, 2002).Future studies can consider managerial characteristics as a moderator variable. Additionally, the model can also be controlled for firm's age, and size.

Research can also be conducted on specific types of companies, such as product companies, pure services companies, ITES (IT Enabled Services) etc., to understand any differences among these.

While this study focuses on product and process innovation, future studies can look at other types of innovation, such as marketing innovation & organizational innovation. Yet another classification to be considered is radical & incremental innovations, based on the magnitude.The antecedents relating to Open Innovation considered in this study pertain to in-bound open innovation. Open Innovation literature talks about out-bound open innovation, which could be a subject of analysis.

This scopecan also be extended from small companies to medium sized companies, to understand the variations that happen as companies evolve. For large firms, analysis can be conducted at business unit or project levels.

The results showed the importance of both product and process innovation. Future studies can look at the complementarity between product innovation and process innovation statistically.

The elements of Open Innovation considered as antecedents of innovation in this study, namely, Customer Involvement, Employee Involvement and External Networking, were found to be significant factors for innovation. Other elements of Open Innovation can be brought in, to investigate the singular impact of Open Innovation elements on product and/or process innovation.

Variables relating to the theories on Lean Start-up, based on concepts such as MVP (Minimum Viable Product), 'pivoting', etc. can be investigated as antecedents of product innovation in small firms.

.....ཞཎ.....

References

[1] A.C.Baum, J., Calabrese, T., & Silverman, B. S. (2000). Don't go it alone: Alliance Network Composition and Startups' performance in Canadian Biotechnology. *Strategic Management Journal 21*, 267-294.

[2] Abernathy, W. J., & Utterback, J. M. (1978). Patters on Industrial Innovation. *Technology Review Vol.80, No.7*, 40-47.

[3] Acs, Z. J., & Audretsch, D. B. (1988). Innovation in Large and Small firms: An empirical analysis. *The American Economic Review Vol. 78, No. 4*, 678-690.

[4] Adams, K. (2005). *The Sources of Innovation and Creativity.* National Center on Education and the Economy (NCEE). Retrieved June 7, 2015, from http://www.ncee.org/wp-content/uploads/2010/04/Sources-of-Innovation-Creativity.pdf

[5] Afthanorhan, W. M. (2013). A Comparison Of Partial Least Square Structural Equation Modeling (PLS-SEM) and Covariance Based Structural Equation Modeling (CB-SEM) for Confirmatory Factor Analysis. *International Journal of Engineering Science and Innovative Technology (IJESIT) Vol.2, Iss.5*, 198-205.

[6] Agarwal, R. (2009). Knowledge Process Outsourcing: India's Emergence as a Global Leader. *Asian Social Science Vol.5, No.1*, 82-92.

[7] Agbor, E. (2008). Creativity and Innovation: The Leadership Dynamics. *Journal of Strategic Leadership, Vol. 1 Iss. 1*, 39-45.

[8] Aggarwal, S. N. (2013). *Government Bytes: Industrial Policy in the Indian Software Industry.* California: Berkeley APEC Study Center Working Papers Series. Retrieved June 8, 2015, from http://basc. berkeley.edu/pdf/Working_Papers/BWP13-02.pdf

[9] Agrawal, S., Goswami, K., & Chatterjee, B. (2011). Challenges of ITES Companies in India. *International Journal of Humanities and Social Science Vol. 1 No. 2*, 218-226.

[10] Ahmad, S. b., & Mushraf, A. M. (2011). The Relationship between Intellectual capital and Business Performance: An empirical study in Iraqi industry. *International Conference on Management and Artificial Intelligence IPEDR vol.6* (pp. 104-109). Bali, Indonesia : IACSIT Press.

[11] Ahmadi, S. A., Jalilian, H., Salamzadeh, Y., Saeidpour, B., & Daraei, M. (2012). Intellectual Capital and New Product Development Performance in Production Firms: A Case Study of Kermanshah Production Firms. *Global Business and Management Research: An International Journal Vol.4, No.1*, 15-27.

[12] Ahuja, G. (2000). The Duality of Collaboration: Inducements and Opportunities in the formation of inter-firm linkages. *Strategic Management Journal, Vol. 21, No. 3*, 317-343.

[13] AICTE. (2015, June 5). Retrieved from All India Council of Technical Education: http://www.aicte-india.org/downloads/Growth_Technical_ Institutions_310514.pdf#toolbar=0

[14] Akter, S., D'Ambra, J., & Ray, P. (2011). An evaluation of PLS based complex models: the roles of power analysis, predictive relevance and GoF index. *x. Proceedings of the 17th Americas Conference on Information Systems*, (pp. 1-7). Detroit, USA.

[15] Allocca, M. A., & Kessler, E. H. (2006). Innovation Speed in Small and Medium-Sized Enterprises. *Creativity and Innovation Management Vol 15, No. 3*, 279-295.

[16] Almeida, R., & Fernandes, A. M. (2008). Openness and Technological Innovations in Developing Countries: Evidence from Firm-Level Surveys. *The Journal of Development Studies Vol.44, No.5*, 701-727.

[17] Al-Mubaraki, H., & Busler, M. (2012). University Technology Transfer Through Innovation Incubator: A Case Study. *World Journal of Social Sciences Vol. 2. No. 2*, 128-134.

[18] Amabile, T. M. (1997). Motivating Creativity in Organizations: On doing what you love, and loving what you do. *California Management Review Vol.40, No.1*, 39-58.

[19] Amit, R., & J.H.Schoemaker. (1993). Strategic Assets and Organizational Rent. *Strategic Management Journal Vol.14*, 33-46.

[20] Amit, R., & Zott, C. (2010). *Business Model Innovation: Creating Value in Changing times.* Barcelona, Spain: IESE Business School - University of Navarra. Retrieved from http://www.iese.edu/research/pdfs/di-0870-e.pdf

[21] Amundsen, O., Aasen, T. M., Gressgård, L. J., & Hansen, K. (2014). Preparing organisations for employee-driven open innovation. *Int. Journal of Business Science and Applied Management, Volume 9, Issue 1*, 25-35.

[22] Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. *Psychological Bulletin Vol. 103, No. 3*, 411-423.

[23] Andries, P., & Czarnitzki, D. (2014). Small firm innovation performance and employee involvement. *Small Business Economics 43*, 21-38.

[24] Angel, R. (2006). Putting an innovation culture into practice. *Ivey Business Journal*.

[25] Anthony, S., Johnson, M., Sinfield, J., & Altman, E. (2008). *The Innovator's Guide to Growth: Putting Disruptive Innovation to Work.* Harvard University Press.

[26] Ar, I. M., & Baki, B. (2011). Antecedents and performance impacts of product versus process innovation. *European Journal of Innovation Management Vol.14, No.2*, 172-206.

[27] Armbrustera, H., Bikfalvi, A., Kinkel, S., & Lay, G. (2008). Organizational innovation: The challenge of measuring non-technical innovation in large-scale surveys. *Technovation 28*, 644-657.

[28] Arora, A., & Bagde, S. K. (2010, July). *Human Capital and the Indian Software Industry.* Retrieved from National Bureau of Economic Research: http://www.nber.org/papers/w16167.pdf

[29] Arora, A., Arunachalam, V., Asundi, J., & Fernandes, R. (2001). The Indian software services industry. *Research Policy 30*, 1267-1287.

[30] Artz, K. W., Norman, P. M., Hatfield, D. E., & Cardinal, L. B. (2010). A Longitudinal Study of the Impact of R&D, Patents, and Product Innovation on Firm Performance. *Journal of Product Innovation Management 27*, 725-740.

[31] Ashok, M., Narula, R., & Martinez□Noya, A. (2014). *End□user collaboration for process innovation in services: The role of internal resources* . United Nations University. Retrieved June 7, 2015, from www.merit.unu.edu/publications/wppdf/2014/wp2014-019.pdf

[32] Atalay, M., Anafarta, N., & Sarvan, F. (2013). The relationship between innovation and firm performance: An empirical evidence from Turkish automotive supplier industry. *Procedia - Social and Behavioral Sciences 75*, 226-235.

[33] Audretsch, D. B., & Sanders, M. (2011). Technological Innovation, Entrepreneurship and Development. In A. Szirmai, W. Naudé, & M. Goedhuys, *Entrepreneurship, Innovation, and Economic Development.* Oxford University Press.

[34] Avlonitis, G. J., Kouremenos, A., & Tzokas, N. (1994). Assessing the Innovativeness of Organizations and its Antecedents: Project Innovstrat. *European Journal of Marketing Vol. 28 No. 11*, 5-28.

[35] Baer, M., & Frese, M. (2003). Innovation Is Not Enough: Climates for Initiative and Psychological Safety, Process Innovations, and Firm Performance. *Journal of Organizational Behavior, Vol. 24, No. 1*, 45-68.

[36] Baker, W. E., & Sinkula, J. M. (2005). Market Orientation and the New Product Paradox. *The Journal of Product Innovation Management*, 483-502.

[37] Balakrishnan, P. (2006). Benign Neglect or Strategic Intent? Contested Lineage of Indian Software Industry. *Economic and Political Weekly*, 3865-3872.

[38] Ballot, G., Fakhfakh, F., Galia, F., & Salter, A. (2015). The fateful triangle: Complementarities in performance between product, process and organizational innovation in France and the UK. *Research Policy Vol. 44, Iss.1*, 217-232.

[39] Banbury, C. M., & Mitchell, W. (1995). The Effect of Introducing Important Incremental Innovations on Market Share and Business Survival. *Strategic Management Journal, Vol. 16*, 161-182.

[40] Barker, M., & Neailey, K. (1999). From individual learning to project team learning and innovation: a structured approach. *Journal of Workplace Learning, Vol. 11 Iss: 2*, 60-67.

[41] Barker, M., & Neailey, K. (1999). From individual learning to project team learning and innovation: a structured approach. *Journal of Workplace Learning Vol.11, No.2*, 60-67.

[42] Barney, J. B. (1986). Strategic Factor Markets: Expectations, Luck and Business Strategy. *Management Science Vol.32, No.10*, 1231-1241.

[43] Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Pe~nality and Social Psychology Vol. 51, No. 6*, 1173-1182.

[44] Becker, G. S. (1962). Investment in Human Capital: A Theoretical Analysis. *The Journal of Political Economy Vol.70, Iss.5*, 9-49.

[45] Benhabib, J., Perla, J., & Tonetti, C. (2014). Catch-up and fall-back through innovation and imitation. *Journal of Economic Growth 19*, 1-35.

[46] Bhargava, A., Verma, A., & Satinder. (2015). Social Mobility Analytics Cloud (SMAC): An overview and its impacts on Society. *International Journal of Advance Research In Science And Engineering Vol.4, Special Iss.1*, 417-422.

[47] Bhatnagar, S. (2006). *'India's Software Industry', Technology, Adaptation, and Exports: How Some Developing Countries Got It Right.* Vandana Chandra (Ed.), World Bank. Retrieved from http://www.iimahd.ernet.in/~subhash/pdfs/Indian%20software%20industry.pdf

[48] Bhattacharya, M., & Bloch, H. (2004). Determinants of Innovation. *Small Business Economics 22*, 155-162.

[49] Blank, S. G. (2006). *The Four Steps to the Epiphany: Successful Strategies for Products that Win.* Lulu.com.

[50] Bontis, N. (1998). Intellectual capital: an exploratory study that develops measures and models. *Management Decision 36/2*, 63-76.

[51] Boone, J. (2000). Competitive Pressure: The Effects on Investments in Product and Process Innovation. *The RAND Journal of Economics, Vol. 31, No. 3*, 549-569.

[52] Bougrain, F., & Haudeville, B. (2002). Innovation, collaboration and SMEs internal research capacities. *Research Policy 31*, 735-747.

[53] Bougrain, F., & Haudeville, B. (2002). Innovation, collaboration and SMEs internal research capacities. *Research Policy 31*, 735-747.

[54] Bound, K., & Thornton, I. (2012). *Our Frugal Future: Lessons from India's Innovation System.* UK: NESTA. Retrieved June 8, 2015, from https://www.nesta.org.uk/sites/default/files/our_frugal_future.pdf

[55] Brinkkemper, S., & Jansen, S. (2012). *Collaboration in Outsourcing: A Journey to Quality.* Palgrave Macmillan.

[56] Brockman, B. K., & Morgan, R. M. (2003). The Role of Existing Knowledge in New Product Innovativeness and Performance. *Decision Sciences 34(2)*, 385-419.

[57] Burcharth, A. L., Knudsen, M. P., & Søndergaard, H. A. (2012). Profiting from Openess? The importance of intra-organizational activities and partnering experience. *Conference on "Open Innovation: New Insights and Evidence"*, (pp. 1-41). Imperial College, London, UK.

[58] Burcharth, A. L., Knudsen, M. P., & Søndergaard, H. A. (2012). What doed it take to benefit from Open Innovation? The role of external relations and internal activities for innovation performance. *ISBN 978-90-77360-15-6*, 163-177.

[59] Camisón, C., & Villar-López, A. (2014). Organizational innovation as an enabler of technological innovation capabilities and firm performance. *Journal of Business Research 67*, 2891-2902.

[60] Capaldo, G., Iandoli, L., Raffa, M., & Zollo, G. (2003). The Evaluation of Innovation Capabilities in Small Software Firms: A Methodological Approach. *Small Business Economics 21*, 343-354.

[61] Carmel, E. (2003). The new Software Exporting Nations: Success Factors. *The Electronic Journal on Information Systems in Developing Countries Vol.13, No.4*, 1-12.

[62] Carmines, E. G., & Zeller, R. A. (1979). *Reliability and Validity Assessment.* Sage University Papers.

[63] Chadee, D., & Roxas, B. (2013). Institutional environment, innovation capacity and firm performance in Russia. *Critical perspectives on international business, Vol. 9 Iss 1/2*, 19-39.

[64] Chang, S.-J., Witteloostuijn, A. v., & Eden, L. (2010). From the Editors: Common method variance in international business research. *Journal of International Business Studies 41*, 178–184.

[65] Chaturvedi, A., & Sachitanand, R. (2013, June 18). *A million engineers in India struggling to get placed in an extremely challenging market*. Retrieved from economictimes.com: http://articles. economictimes.indiatimes.com/2013-06-18/news/40049243 _1_engineers -iit-bombay-batch-size

[66] Chaudhuri, S. (2011). Knowledge Management in Indian IT Industries. *3rd International Conference on Information and Financial Engineering IPEDR vol.12* (pp. 251-258). Singapore: IACSIT Press.

[67] Chen, K.-L., & Wang, C.-H. (2014). Who Pioneers and Who Follows: The Role of Intellectual Capital. *Journal of Business Studies Quarterly Vol.6, No.1*, 232-247.

[68] Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press.

[69] Chetty, S. K., & Stangl, L. M. (2010). Internationalization and Innovation in a network relationship context. *European Journal of Marketing Vol. 44 Iss:11*, 1725-1743.

[70] Choi, B. K., Moon, H. K., & Ko, W. (2013). An organization's ethical climate, innovation, and performance: Effects of support for innovation and performance evaluation. *Management Decision, Vol. 51 Iss 6*, 1250-1275.

[71] Christensen, C. M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to fail.* Boston: Harvard Business School Press.

[72] Christensen, C. M., & Overdorf, M. (2000, March). Meeting the Challenge of Disruptive Change. *Harvard Business Review.* Retrieved Dec 23, 2014, from https://hbr.org/2000/03/meeting-the-challenge-of-disruptive-change

[73] Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A new Perspective on Learning and Innovation. *Administrative Science Quarterly, Vol.35 No.1*, 128-152.

[74] Çokpekin, Ö., & Knudsen, M. P. (2012). Does Organizing for Creativity Really Lead to Innovation? *Creativity and Innovation Management, Vol.21, Iss.3*, 304-314. doi:10.1111/j.1467-8691.2012.00649.x

[75] Combs, J. G., & Ketchen, J. D. (1999). Explaining Interfirm cooperation and performance: Toward a reconciliation of predictions from the resource-based view and organizational economics. *Strategic Management Journal*, 867-888.

[76] Coras, E. L., & Tantau, A. D. (2014). Open Innovation - The Good, The Bad, The Uncertainties. *The USV Annals of Economics and Public Administration Vol.14, Iss. 1(19)*, 38-47.

[77] Cusumano, M. (2008). *The Changing Software Business: From Products to Services and Other New Business Models.* The MIT Center for Digital Business - Paper 236. Retrieved Jun 8, 2015, from http://ebusiness.mit.edu/research/papers/236_Cusumano_Changing_Software_Business.pdf

[78] Cusumano, M. A. (1988, Oct 15). Manufacturing Innovation: Lessons from the Japanese Auto Industry. *MIT Sloan Management Review.* Retrieved Jun 29, 2015, from http://sloanreview.mit.edu/article/manufacturing-innovation-lessons-from-the-japanese-auto-industry/

[79] Dahlander, L., & Gann, D. M. (2010). How open is innovation? *Research Policy 39*, 699-709.

[80] DCMSME. (2015, Jan 24). *Development Commissioner MSME*. Retrieved from http://www.dcmsme.gov.in/ssiindia/defination_msme.htm

[81] D'costa, A. P. (2006). Exports, University-Industry Linkages, and Innovation challenges in Bangalore, India. *Working Paper 3887, World Bank Policy Research*.

[82] Desrochers, P. (2001). Geographical Proximity and the Transmission of Tacit Knowledge. *The Review of Austrian Economics, 14:1*, 25-46.

[83] Donate, M. J., & Guadamillas, F. (2011). Organizational factors to support knowledge management and innovation. *Journal of Knowledge Management Vol.15, No.6*, 890-914.

[84] Dosi, G. (1988). Sources, Procedures and Microeconomic effects of Innovation. *Journal of Economic Literature Vol.26 No.3*, 1120-1171.

[85] DST. (2010, March 10). *Department of Science and Technology*. Retrieved from http://www.dst.gov.in/whats_new/press-release10/pib_10-3-2010.htm

[86] Duarte, P. A., & Raposo, M. L. (2010). Chapter 20: A PLS Model to Study Brand Preference: An Application to the Mobile Phone Market. In *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 449-485). Springer.

[87] Dushnitsky, G., & Klueter, T. (2011). Is There an eBay for Ideas? Insights from Online Knowledge Marketplaces. *European Management Review, Vol. 8*, 17-32.

[88] Dyer, J. H., & Singh, H. (1998). The Relational view: co-operative strategy and sources of interorganizational competitive advantage. *The Academy of Management Review Vol.23, No.4*, 660-679.

[89] Dyer, J. H., Gregersen, H. B., & Christensen, C. M. (2009, December). *The Innovator's DNA*. Retrieved June 3, 2015, from Harvard Business Review: https://hbr.org/2009/12/the-innovators-dna

[90] EC. (2005). *The new SME Definition: User Guide and model declaration.*

[91] Economictimes. (2011, March 12). *India Must Encourage an R&D culture*. Retrieved from http://articles.economictimes.indiatimes.com/2011-03-12/news/28683860_1_india-s-r-d-r-d-spenders-r-d-front

[92] Economist. (2010, April 15). *First break all the rules: The charms of frugal innovation.* Retrieved from The Economist: http://www.economist.com/node/15879359

[93] Enkel, E. (2011). Open Innovation Maturity Framework. *International Journal of Innovation Management Vol. 15, No. 6*, 1161-1189.

[94] F.Suarez, F., & Utterback, J. M. (1995). Dominant Designs and the Survival of Firms. *Strategic Management Jornal Vol.16*, 415-430.

[95] Fan, P. (2006). Catching up through developing innovation capability: evidence from China's telecom-equipment industry. *Technovation 26*, 359-368.

[96] Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable variables and Measurement Error. *Journal of Marketing Research Vol.18, No.1*, 39-50.

[97] Franke, N., & Shah, S. (2003). How Communities Support Innovative Activities: An Exploration of Assistance and Sharing Among End-Users. *Research Policy, 32 (1)*, 157-178.

[98] Freel, M. S. (2003). Sectoral patterns of small firm innovation, networking and proximity. *Research Policy 32*, 751-770.

[99] Gandhi, M. (2014). Industry-academia collaboration in India: Recent initiatives, issues, challenges, opportunities and strategies. *The Business & Management Review, Volume 5 Number 2* , 45-67.

[100] Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The future of open innovation. *R&D Management Vol.40, Iss.3*, 213-221.

[101] Gemunden, H. G., Ritter, T., & Heydebreck, P. (1996). Network Configuration and Innovation Success - An Empirical Analysis in German High-Tech Industries. *International Journal of Research in Marketing, 13 (5)*, 449-462.

[102] Geroski, P., Machin, S., & Reenen, J. V. (1993). The Profitability of Innovating Firms. *The RAND Journal of Economics, Vol. 24, No. 2*, 198-211.

[103] Gilbert, J. T. (1996). Managing Innovation: The role of the General Manager. *Review of Business, Vol.17, No.3*, 12-17.

[104] Goedhuys, M., & Veugelers, R. (2012). Innovation strategies, process and product innovations and growth: Firm-level evidence from Brazil. *Structural Change and Economic Dynamics 23*, 516-529.

[105] Goles, T., Hawk, S., & Kaiser, K. M. (2008). Information technology workforce skills: The software and IT services provider perspective. *Information Systems Frontiers 10*, 179-194.

[106] Golovko, E., & Valentini, G. (2011). Exploring the complementarity between innovation and export for SMEs' growth. *Journal of International Business Studies, Vol. 42, No. 3*, 362-380.

[107] Govindarajan, V., & Timble, C. (2010). *The Other side of Innovation: Solving the Execution challenge.* Harvard Business Review Press.

[108] Gruner, K. E., & Homburg, C. (2000). Does Customer Interaction Enhance New Product Success? *Journal of Business Research 49*, 70-82.

[109] Gulati, M. (2014, Aug 26). *Indian SMEs suffer from a management deficit.* Retrieved from VCCIRCLE: http://www.vccircle.com/byinvitation/2014/08/26/indian-smes-suffer-management-deficit

[110] Gumusluoglu, L., & Ilsev, A. (2009). Transformational leadership, creativity, and organizational innovation. *Journal of Business Research Vol.62, Iss.4*, 461-473.

[111] Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics 133*, 662-676.

[112] Hadjimanolis, A. (2000). An investigation of Innovation antecedents in small firms in the context of a small developing country. *R&D Management 30(3)*, 235-245.

[113] Haenlein, M., & Kaplan, A. M. (2004). A Beginner's Guide to Partial Least Squares Analysis. *Understanding Statistics, 3(4)*, 283-297.

[114] Hamel, G., Doz, Y. L., & Prahalad, C. (1989). Collaborate with your competitors - and win. *Harvard Business Review*, 133-139.

[115] Han, J. K., Kim, N., & Srivastava, R. K. (1998). Market Orientation and Organizational Performance: Is Innovation a Missing Link? *ournal of Marketing, Vol. 62, No. 4* , 30-45.

[116] Harrison, S., & Sullivan, P. H. (2000). Profiting from Intellectual Capital: Learning from Leading Companies. *Journal of Intellectual Capital Vol.1, No.1*, 33-46.

[117] Harvey, M., Kiessling, T., & Moeller, M. (2010). A view of entrepreneurship and innovation from the economist "for all seasons" Joseph S. Schumpeter. *Journal of Management History Vol. 16 No. 4*, 527-531.

[118] Hashi, I., & Stojcic, N. (2013). The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4. *Research Policy 42*, 353-366.

[119] Hassan, M. U., Malik, A. A., Hasnain, A., Faiz, M. F., & Abbas, J. (2013). Measuring Employee Creativity and its Impact on Organization Innovation Capability and Performance in the Banking Sector of Pakistan. *World Applied Sciences Journal 24 (7)*, 949-959.

[120] Henderson, R. M., & Clark, K. B. (1990). Architectural Innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly Vol.35, No.1*, 9-30.

[121] Henkin, A. B., & Davis, J. H. (1991). Perceived Organizational Support for Innovation in the High Technology Sector. *International Review of Modern Sociology, Vol. 21, No. 1*, 73-91.

[122] Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Comput Stat 28*, 565-580.

[123] Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of Partial Least Squares Path Modeling in International Marketing. *Advances in International Marketing, Volume 20*, 277-319.

[124] Herrmann, A., Gassmann, O., & Eisert, U. (2007). An empirical study of the antecedents for radical product innovations and capabilities for transformation. *Journal of Engineering and Technology Management Vol.24, Iss.1-2*, 92-120.

[125] Hippel, E. v. (1988). *The Sources of Innovation.* New York: Oxford University Press.

[126] Hippel, E. v. (2005). In *Democratizing Innovation* (pp. 93-106). MIT Press.

[127] Hobday, M. (2005). Firm-level Innovation Models: Perspectives on Research in Developed and Developing Countries. *Technology Analysis & Strategic Management Vol. 17, No. 2*, 121-146.

[128] Hoffman, K., Parejo, M., Bessant, J., & Perren, L. (1998). Small firms, R&D, technology and innovation in the UK: a literature review. *Technovation, 18(1)*, 39-55.

[129] Howells, J. (2006). Intermediation and the role of intermediaries in innovation. *Research Policy 35*, 715-728.

[130] Hoyer, W. D., Chandy, R., Dorotic, M., Krafft, M., & Singh, S. S. (2010). Consumer Cocreation in New Product Development. *Journal of Service Research 13(3)*, 283-296.

[131] Hung, K.-P., & Chiang, Y.-H. (2010). Open innovation proclivity, entrepreneurial orientation, and perceived firm performance. *International Journal of Technology Management Vol.52, No.3/4*, 257-274.

[132] Hurley, R. F., & Hult, G. T. (1998). Innovation, Market Orientation and Organizational Learning: An integration and Empirical Examination. *Journal of Marketing Vol.62, Iss.3*, 42-54.

[133] Huston, L., & Sakkab, N. (2006). Connect and Develop: Inside Procter & Gamble's New Model for Innovation. *Harvard Business Review 84(3)*, 58-66.

[134] Hutter, K., Hautz, J., Repke, K., & Matzler, K. (2013). Open innovation in small and micro enterprises. *Problems and Perspectives in Management, Vol. 11, Iss. 1*, 12-22.

[135] IFM Management Technology Policy. (2009). *Creating an environment for open innovation.* Cambridge, UK: IfM Briefing: Vol 1 No 4. Retrieved June 8, 2015, from http://www.ifm.eng.cam.ac.uk/uploads/Resources/Briefings/v1n4_ifm_briefing.pdf

[136] Ilavarasan, V. P., & Parthasarathy, B. (2012). Limited growth opportunities amidst opportunities for growth: an empirical study of the inter-firm linkages of small software firms in India. *Journal of Innovation and Entrepreneurship 1:4*.

[137] Illiyan, A. (2008). Performance, Challenges and Opportunities of Indian Software Export. *Journal of Theoretical and Applied Information Technology* , 1088-1106.

[138] Im, S., & Workman, J. P. (2004). Market Orientation, Creativity, and New Product Performance in High-Technology Firms. *Journal of Marketing Vol. 68*, 114-132.

[139] Inauen, M., & Schenker-Wicki, A. (2011). The impact of outside-in open innovation on innovation performance. *European Journal of Innovation Management Vol.14, Iss.4*, 496-520.

[140] Inauen, M., & Schenker-Wicki, A. (2012). Fostering radical innovations with open innovation. *European Journal of Innovation Management Vol.15, Iss.2*, 212-231.

[141] Infosys.com. (2013, Dec 9). *Infosys Unveils TradeEdge to Help Global Brands Accelerate Profitable Growth in the Emerging Markets*. Retrieved Jan 3, 2015, from http://www.infosys.com/newsroom/press-releases/Pages/demand-chain-distributor-retailers.aspx

[142] Islam, M. Z., Doshi, J. A., Mahtab, H., & Ahmad, Z. A. (2009). Team learning, top management support and new product development success. *International Journal of Managing Projects in Business Vol.2, Iss.2*, 238-260.

[143] Jen, C. T. (2014). Social Ties, Knowledge Diversity and Individual Creativity. *Journal of Business Studies Quarterly Vol. 6, No.2*, 110-124.

[144] Jhamb, R. K. (2011). Contribution of software industry in the growth of Indian economy in the last decade. *International Journal of Business Economics & Management Research Vol.11, Iss.3*, 97-111.

[145] Joesph, M. (2014, May 15). *Why is there no Indian equivalent of Microsoft or Google?* Retrieved Dec 25, 2014, from The Hindu: http://www.thehindu.com/sci-tech/technology/why-is-there-no-indian-equivalent-of-microsoft-or-google/article6009274.ece

[146] Johnston, R., & Lawrence, P. R. (July 1988). Beyond Vertical Integration—The Rise of the Value-Adding Partnership. *Harvard Business Review 66(4)*, 94-101.

[147] Jones, D. C., & Kato, T. (2005). The Effects of Employee Involvement on Firm Performance: Evidence from an Econometric Case Study. *William Davidson Institute Working Paper No. 612*. Retrieved Feb 5, 2015, from http://www.iza.org/conference_files/TAM2005/kato_t2130.pdf

[148] Jong, J. P., & Vermeulen, P. A. (2006). Determinants of product innovation n small firms: A Comparison Across Industries. *International Small Business Journal Vol.24 No.6*, 587-609.

[149] Kalkan, A., Bozkurt, Ö. Ç., & Arman, M. (2014). The impacts of intellectual capital, innovation and organizational strategy on firm performance. *Procedia - Social and Behavioral Sciences 150*, 700-707.

[150] Kanter, R. M. (1988). When a Thosand Flowers Bloom: Structural, collective and social conditions for innovation in organizations. *Research in Organizational Behavior, Vol. l0*, 169-211.

[151] Kaplan, J., Khan, N., & Roberts, R. (2012, May). *Winning the battle for technology talent*. Retrieved June 7, 2015, from McKinsey & Company Insights and Publications: http://www.mckinsey.com/insights/ business_ technology/winning_the_battle_for_technology_talent

[152] Kaur, M., & Kumar, P. (2014). Systematic Review on Software Product Line Engineering (SPLE). *International Journal of Advanced Research in Computer Science and Software Engineering Vol.4, Iss.1*, 1096-1101.

[153] Kim, L. (1997). *Imitation to Innovation: The Dynamics of Korea's Technological Learning*. Harvard Business School Press.

[154] Koc, T. (2007). Organizational determinants of innovation capacity in software companies. *Computers & Industrial Engineering 53*, 373-385.

[155] Kock, N. (2014). Advanced mediating effects tests, multi-group analyses, and measurement model assessments in PLS-based SEM. *International Journal of e-Collaboration, 10(1)*, 1-13.

[156] Kocoglu, I., Imamoglu, S. Z., & Ince, H. (2011). The relationship between organizational learning and firm performance: The mediating roles of Innovation and TQM. *Journal of Global Strategic Management 9*, 72-88.

[157] Koellinger, P. (2008). The relationship between technology, innovation, and firm performance—Empirical evidence from e-business in Europe. *Research Policy 37*, 1317-1328.

[158] KPMG. (2008). *The Indian ICT industry: Enabling Global Competitiveness and Driving Innovation with Equitable Growth*. Retrieved June 5, 2015, from http://digitalknowledgecentre.in/files/2012/02/KPMG_indian-ICT-Industry.pdf

[159] KPMG. (2012). *Non-linear models: Driving the next phase of growth for the Indian IT Industry.*

[160] KPMG. (2014). *Innovation transforming the growth landscape: Capitalising IP in Indian IT-BPM.* KPMG and NASSCOM.

[161] KPMG. (2014). *Innovation transforming the growth landscape: Capitalizing IP in the Indian IT-BPM.* KPMG & NASSCOM.

[162] KSIDC. (2014). *KSIDC update on Industry and Investment promotion Vol.1, Iss.2.* Retrieved Jan 24, 2015, from http://www.ksidc.org/KSIDC-update/KSIDC-update-eng-vol1-issue2-dec2014.pdf

[163] Kumar, N. A. (2011). Impact of Global Recession on Indian IT Industry and Effectiveness of E-Business in the Era of Recession. *Global Journal of Business Management and Information Technology Vol.1, No.1*, 9-25.

[164] Lakshmi, T. C., & Balasingh, I. (2013). Financial Crisis and its Impact on Seleced IT Industries in India. *Indian Journal of Applied Research Vol.3, Iss.12*, 257-260.

[165] Lau, C.-M., & Ngo, H.-Y. (2004). The HR system, organizational culture, and product innovation. *International Business Review Vol.13, Iss.6*, 685-703.

[166] Laursen, K., & Salter, A. (2006). Open for Innovation: The role of openness in explaining innovation performance among U.K. Manufacturing firms. *Strategic Management Journal 27*, 131-150.

[167] Lazzarotti, V., Manzini, R., & Pellegrini, L. (2010). Open innovation models adopted in practice: an extensive study in Italy. *Measuring Business Excellence Vol.14, No.4*, 11-23.

[168] Leclerc, E. (2008). India Recentred: The Role of IndianDiaspora in the Globalisation Process. *No.2, IMDS Working Paper Series*, 21-29.

[169] Lee, K., Rho, S., Kim, S., & Jun, G. J. (2007). Creativity-Innovation Cycle for Organisational Exploration and Exploitation: Lessons from Neowiz - a Korean Internet Company. *Long Range Planning 40*, 505-523.

[170] Lee, S., Park, G., Yoon, B., & Park, J. (2010). Open innovation in SMEs—An intermediated network model. *Research Policy 39*, 290-300.

[171] Leonard-Barton, D. (1992). Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development. *Strategic Management Journal Vol.13*, 111-125.

[172] Li, H., & Atuahene-Gima, K. (2001). Product Innovation Strategy and the Performance of New Technology Ventures in China. *The Academy of Management Journal, Vol. 44, No. 6*, 1123-1134.

[173] Lichtenthaler, U. (2008). Opening up strategic technology planning: extended roadmaps and functional markets. *Management Decision Vol.46, No.1*, 77-91.

[174] Lidow, D. (2014). *Startup Ledership: How savvy entrepreneurs turn their ideas into successful enterprises.* Jossey-Bass.

[175] Lugoboni, L. F., Zittei, M. V., Moraes, C. F., & Kaveski, I. D. (2014). Creative Economy as applied to Information Technology (IT) Companies. *Future Studies Research Journal ISSN 2175-5825 Vol.6, No.1*, 154-173.

[176] Malerba, F. (2006). Innovation and the evolution of industries. *Journal of Evolutionary Economics vol. 16(1)*, 3-23.

[177] Malhotra, N. K., & Dash, S. (2011). *Marketing Research: An Applied Orientation 6th Edition.* Dorling Kindersley (India) Pvt. Ltd.

[178] Martins, G. S., Lopes, D. P., & Barbos, A. C. (2012). Organizational Innovation:A Comparative Analysis Between Brazil and Portugal. *European Journal of Business and Social Sciences, Vol. 1, No. 5*, 23-40.

[179] Mazzarol, T. (2002). Innovativeness in Small Firms: An Exploratory Study of the Perspectives of Growth Oriented Owner-Managers. *International Journal of Innovation Management, Policy & Practice, 4(1-3)*, 30-40.

[180] McLean, L. D. (2005). Organizational Culture's Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development. *Advances in Developing Human Resources Vol. 7, No. 2*, 226-246.

[181] Meihami, B., Varmaghani, Z., & Meihami, H. (2014). Role of Intellectual Capital on Firm Performance: Evidence from Iranian Companies. *International Letters of Social and Humanistic Sciences Vol. 12*, 43-50.

[182] Miravete, E. J., & Perinas, J. C. (2006). Innovation complementarity and scale of production. *The Journal of Industrial Economics Vol.54, Iss.1*, 1-29.

[183] Moore, G., & Davis, K. (2001). *Learning the Silicon Valley Way.* Stanford, CA: Stanford Institute for Economic Policy Research.

[184] Morgan Stanley. (2011). *Global IT Services: "Per-employee" Metrics are Key to Quality of Growth.* Morgan Stanley Research Asia Pacific.

[185] Mowery, D. C., Oxley, J. E., & Silverman, B. S. (1996). Strategic Alliances and Interfirm Knowledge Transfer. *Strategic Management Journal Vol.17*, 77-91.

[186] Mukundan, R., & Thomas, S. (2013). Indian IT Industry: Moving towards an active Innovation Strategy. *IFIP Advances in Information and Communication Technology Vol. 402* (pp. 611-618). Springer.

[187] NASSCOM. (2014, December 22). *India IT-BPM Overview*. Retrieved from http://www.nasscom.in

[188] NASSCOM. (2014). *NASSCOM Annual HR Survey.*

[189] Nelson, R. R., & Phelps, E. S. (1966). Investment in Humans, Technological Diffusion, and Economic Growth. *The American Economic Review, Vol. 56, No. 1/2*, 69-75.

[190] Ngah, R., & Ibrahim, A. R. (2009). The Relationship of Intellectual Capital, Innovation and Organizational Performance: a Preliminary Study in Malaysian SMEs. *International Journal of Management Innovation Systems Vol.1, No.1*, 1-13.

[191] NSTEDB.com. (2015, Jan 6). *Technology Business Incubators (TBI)*. Retrieved from http://www.nstedb.com/institutional/tbi-center.htm

[192] OECD. (2005). *Oslo Manual: Guidelines for collecting and interpreting Innovation Data, Third Edition.* OECD and Eurostat.

[193] Ogunleye, J., & Tankeh, A. (2006). Creativity and Innovation in IT Indstry: An Assessment of Trends in Research and Development Expenditures and Fnding with particular reference to IBM, HP, Dell, Sun, Fujitsu and Oracle Vol.9, No.14. *Journal of Current Research in Global Business Vol.9, No.14*, 75-85.

[194] Oldham, G. R., & Cummings, A. (1996). Employee Creativity: Personal and Contextual Factors at Work. *The Academy of Management Journal, Vol. 39, No. 3*, 607-634.

[195] Overvest, B. M., & Veldman, J. (2008). Managerial Incentives for Process Innovation. *Managerial and Decision Economics 29*, 539-545.

[196] Palmer, J. C., & Wright, R. E. (2010). Product Innovation in Small Firms: An Empirical Assessment. *Journal of Applied Business and Economics vol.11(3)*, 33-38.

[197] Pandey, S., & Sharma, R. (2009). Organizational Factors for Exploration and Exploitation. *Journal of Technology Management and Innovation Vol.4, Iss.1*, 48-58.

[198] Parjanen, S. (2012). Experiencing Creativity in the Organization: From Individual Creativity to Collective Creativity. *Interdisciplinary Journal of Information, Knowledge, and Management Volume 7*, 109-128.

[199] Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of Operations Management 30*, 467-480.

[200] Pertuze, J. A., Calder, E. S., Greitzer, E. M., & Lucas, W. A. (2010). Best practices for industry-university collaboration. *MITSloan Management Review Vol.51, No.4*, 83-90.

[201] Pinto, V. S. (2014, Aug 25). *MNCs like their senior Indian managers*. Retrieved from Business Standard: http://www.business-standard.com/article/companies/mncs-like-their-senior-indian-managers-114082500037_1.html

[202] Piva, E., Rentocchini, F., & Rossi-Lamastra, C. (2012). Is Open Source software about innovation? Collaborations with the Open Source community and innovation performance of software entrepreneurial ventures. *Journal of Small Business Management, 50 (2)*, 340-364.

[203] Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology Vol.88, No.5*, 879-903.

[204] Porter, M. E. (1980). *Competitive Strategy: Techniques for analyzing industries and competitors.* New York: The Free Press.

[205] Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly 41*, 116-145.

[206] Prashantham, S. (2004). Local Network Relationships and the Internationalization of Small Knowledge-Intensive Firms. *The Copenhagen Journal of Asian Studies 19*, 5-26.

[207] Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers 36(4)*, 717-731.

[208] Qiao, P.-h., Ju, X.-f., & Fung, H.-G. (2014). Industry association networks, innovations, and firm performance in Chinese small and medium-sized enterprises. *China Economic Review 29*, 213-228.

[209] Rangus, K. (2014). *Proclivity for Open Innovation: Construct Development, Determinants and Outcomes.* University of Ljubljana. Retrieved June 5, 2015, from http://www.cek.ef.uni-lj.si/doktor/rangus.pdf

[210] Rangus, K., Drnovsek, M., & Minin, A. D. (2013). Proclivity for Open Innovation: Construct Conceptualization and Empirical Validation. *ACAD MANAGE Proceeding, Academy of Management Journal*, (pp. 1-40).

[211] Reichstein, T., & Salter, A. (2006). Investigating the sources of process innovation among UK manufacturing firms. *Industrial and Corporate Change, 15(4)*, 653 - 682.

[212] Richtner, A., & Ahlstrom, P. (2010). Top management control and knowledge creation in new product development. *International Journal of Operations & Production Management, Vol. 30 Iss 10*, 1006-1031.

[213] Ries, E. (2011). *The Lean Startup: How today's entrepreneurs use continuous innovation to create radically successful businesses.* New York: Crown Business.

[214] Robertson, P. L., Casali, G., & Jacobson, D. (2012). Managing open incremental process innovation: Absorptive Capacity and distributed learning. *Research Policy 41*, 822-832.

[215] Robinson, W. T. (1990). Product Innovation and Start-up business market share performance. *Management Science, Vol. 36, No. 10*, 1279-1289.

[216] Rochina-Barrachina, M. E., Mañez, J. A., & Sanchis-Llopis, J. A. (2010). Process Innovations and Firm Productivity Growth. *Small Business Economics, Vol. 34, No. 2*, 147-166.

[217] Romijn, H., & Albaladejo, M. (2002). Determinants of innovation capability in small electronics and software firms in southeast England. *Research Policy 31*, 1053-1067.

[218] Romin, H., & Albu, M. (2002). Innovation, Networking and Proximity: Lessons from Small High Technology Firms in the UK . *Regional Studies, 36 (1)*, 81-86.

[219] Roni, S. M. (2014). *Introduction to SPSS.* SOAR Center, Graduate Research School, Edith Cowan University Joondalup, Australia.

[220] Roper, S. (1997). Product Innovation and Small Business Growth: A Comparison of the Strategies of German, U.K. and Irish Companies. *Small Business Economics 9*, 523-537.

[221] Rothaermel, F. T. (2002). Technological Discontinuities and Interfirm Cooperation: What Determines a Startup's Attractiveness as Alliance Partner? *IEEE Transactions on Engineering Management, Vol. 49, No. 4*, 388-397.

[222] Rothaermel, F. T., & Deeds, D. L. (2006). Alliance type, alliance experience and alliance management capability in high-technology ventures. *Journal of Business Venturing 21*, 429-460.

[223] Ruiz-Jime´nez, J. M., & Fuentes-Fuentes, M. d. (2013). Knowledge combination, innovation, organizational performance in technology firms. *Industrial Management & Data Systems, Vol. 113 Iss 4*, 523-540.

[224] Salim, I. M., & Sulaiman, M. (2011). Organizational Learning, Innovation and Performance: A Study of Malaysian Small and Medium Sized Enterprises . *International Journal of Business and Management Vol. 6, No. 12*, 118-125.

[225] Santarelli, E., & Sterlacchini, A. (1990). Innovation, Formal vs. Informal R&D, and Firm Size: Some Evidence from Italian Manufacturing Firms. *Small Business Economics 2*, 223-228.

[226] Sarros, J. C., Cooper, B. K., & Santora, J. C. (2008). Building a Climate for Innovation Through Transformational Leadership and Organizational Culture. *Journal of Leadership & Organizational Studies Vol 15. No.2*, 145-158.

[227] Saxenian, A. (1995). BOOK NOTE: Regional Advantage: Culture and Competition in Silicon Valley and Route 128. *Harvard Journal of Law & Technology Vol.8 No.2*, 521-528.

[228] Schneider, L., Günther, J., & Brandenburg, B. (2010). Innovation and skills from a sectoral perspective: a linked employer–employee analysis. *Economics of Innovation and New Technology Vol. 19, No. 2*, 185-202.

[229] Schroeder, D. M. (1990). A Dynamic perspective on the Impact of Process Innovation upon Competitive Strategies. *Strategic Management Journal, Vol. 11*, 25-41.

[230] Schroll, A., & Mild, A. (2011). Open innovation modes and the role of internal R&D: An empirical study on open innovation adoption in Europe. *European Journal of Innovation Management Vol.14, No.4*, 475-495.

[231] Scott, S. G., & Bruce, R. A. (1994). Determinants of Innovative Behavior: A Path Model of Individual Innovation in the Workplace. *The Academy of Management Journal, Vol. 37, No. 3* , 580-607.

[232] Seleim, A., & Ashour, A. (2004). Intellectual capital in Egyptian Software Firms. *The Learning Organization Vol. 11 No. 4/5*, 332-346.

[233] Sérgio Kannebley, J. V., & Araújo, B. C. (2010). Economic performance of Brazilian manufacturing firms: a counterfactual analysis of innovation impacts. *Small Business Economics, Vol. 34, No. 3*, 339-353.

[234] Sethi, R., Smith, D. C., & Park, C. (2001). Cross-Functional Product Development Teams, Creativity, and the Innovativeness of New Consumer Products. *Journal of Marketing Research Vol. XXXVIII*, 73-85.

[235] Sharma, M., Kumar, U., & Lalande, L. (2006). Role of University Technology Transfer Offices in University Technology Commercialization: Case Study of the Carleton University Foundry Program. *Journal of Services Research, Volume 6, Special Issue*, 109-139.

[236] Siguaw, J. A., Simpson, P. M., & Enz, C. A. (2006). Conceptualizing Innovation Orientation: A Framework for Study and Integration of Innovation Research. *The Journal of Product Innovation Management Vol.23, Iss.6*, 556-574.

[237] Smith, K. G., Collins, C. J., & Clark, K. D. (2005). Existing Knowledge, Knowledge Creation Capability, and the Rate of New Product Introduction in High-Technology Firms. *Academy of Management Journal Vol. 48, No. 2*, 346-357.

[238] Soken, N. H., & Barnes, B. K. (2014). What kills innovation? Your role as a leader in supporting an innovative culture. *Industrial and Commercial Training, Vol. 46 Iss 1*, 7-15.

[239] Soliman, F. (2013). Does Innovation Drive Sustainable Competitive Advantages? *Journal of Modern Accounting and Auditing, ISSN 1548-6583 Vol. 9, No. 1*, 130-143.

[240] Song, J. (2000). *Technological Catching-Up of Korea and Taiwan in the Global Semiconductor Industry: A Study of Modes of Technology Sourcing.* Discussion Paper Series, APEC Study Center, Columbia Business School. Retrieved Jun 29, 2015, from http://www8.gsb.columbia.edu/apec/sites/apec/files/files/discussion/song2.PDF

[241] Sousa, F. C., Pellissier, R., & Monteiro, I. P. (2012). Creativity, Innovation and Collaborative Organizations. *The International Journal of Organizational Innovation Vol. 5 No. 1*, 1-39.

[242] Srholec, M. (2011). *A Multilevel Analysis of Innovation in Developing Countries.* Prague: Working Paper Series (ISSN 1211-3298), CERGE-EI.

[243] Ståhlbröst, A., & Bergvall-Kåreborn, B. (2011). Exploring users motivation in innovation communities. *International Journal of Entrepreneurship and Innovation Management, Vol. 14, No. 4*, 298-312.

[244] Stam, E., & Stel, A. V. (2011). Types of Entrepreneurship and Economic Growth. In A. Szirmai, W. Naudé, & M. Goedhuys, *Entrepreneurship, Innovation, and Economic Development.* Oxford University Press.

[245] Stata, R. (1989). Organizational Learning — The Key to Management Innovation. *Sloan Management Review.*

[246] Streukens, S., MartinWetzels, Daryanto, A., & Ruyter, K. d. (2010). Chapter 24: Analyzing Factorial Data Using PLS: Application in an Online Complaining Context. In *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 567-587). Springer.

[247] Suman, Y., Nishy, & Gupta, V. K. (2009). Trends in IT patents filed from India: An Analysis. *Jouran of Intellectual Property Rights Vol.14*, 149-152.

[248] Szirmai, A., Naude, W., & Goedhuys, M. (2011). Entrepreneurship, Innovation, and Economic Development, Chapter 1. Oxford University Press.

[249] Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Long Range Planning 43*, 172-194.

[250] Teece, D., & Pisano, G. (1994). The Dynamic capabilities of Firms: An Introduction. *Industrial and Corporate Change Vol.3, No. 3*, 537-556.

[251] The Economic Times. (2007, Jan 12). To India Inc, it's seduction by certification. (D. Ganguly, Ed.) Retrieved Feb 5, 2015, from http://articles.economictimes.indiatimes.com/2007-01-12/news/28479939 _ 1_certification-capability-maturity-model-bill-curtis

[252] The Economic Times. (2015, Feb 22). *Startups to create 3 lakh new jobs by 2020*. Retrieved Jun 7, 2015, from http://articles.economictimes. indiatimes.com/2015-02-22/news/59386596_1_indian-start-ups-start-ups-start-up-ecosystem

[253] The Hindu. (2015, April 27). *The cloud opens up*. Retrieved June 5, 2015, from http://www.thehindu.com/business/Industry/indian-it-industry-the-cloud-opens-up/article7141568.ece

[254] The New Indian Express. (2014, Sep 26). *Hyderabad Pips Chennai, Pune in Software Exports*. Retrieved Jan 24, 2015, from http://www.newindianexpress.com/cities/hyderabad/Hyderabad-Pips-Chennai-Pune-in-Software-Exports/2014/09/26/article2449874.ece

[255] The Times of India. (2014, July 15). *Only 18% engineering grads are employable, says survey*. Retrieved June 5, 2015, from http://timesofindia. indiatimes.com/city/mumbai/Only-18-engineering-grads-are-employable-says-survey/articleshow/38438996.cms

[256] Therin, F. (2003). Learning Organization and Innovation Performance in High-Tech Small Firms. *Working paper serie RMT (WPS 03-06) HAL Id: hal-00451466*, 1-22. Retrieved Feb 5, 2015, from https://hal.archives-ouvertes.fr/hal-00451466/document

[257] Tidd, J., & Bessant, J. (2005). *Managing Innovation: Integrating Technological, Market and Organizational Change, Third Edition.* John Wiley & Sons, Ltd.

[258] Tienne, D. D., & Mallette, P. (2012). Antecedents and Outcomes of Innovation-Oriented Cultures. *International Journal of Business and Management; Vol. 7, No. 18*.

[259] Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Service Quarterly Vol.31, No.3*, 439-465.

[260] Tushman, M. L., & Anderson, P. (1990). Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change. *Administrative Science Quarterly 35*, 604-633.

[261] Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change. *California Management Review Vol.38 No.4*, 8-30.

[262] Uddin, N., Meah, M. S., & Hossain, R. (2013). Discriminant Analysis as an Aid to Human Resource Selection and Human Resource Turnover Minimization Decisions. *International Journal of Business and Management; Vol. 8, No. 17*, 153-169.

[263] Uden, A. v., Knoben, J., & Vermeulen, P. (2014). *Human Capital and Innovation in Developing Countries: A firm level study*. Working Paper STRAT14-01.

[264] Ulrich, F., & Mengiste, S. A. (2014). The Challenges of Creativity in Software Organizations. *IFIP Advances in Information and Communication Technology: Creating Value for All Through IT Vol.429*, 16-34.

[265] Vanhaverbeke, W., Vrande, V. V., & Chesbrough, H. (2008). Understanding the Advantages of Open Innovation Practices in Corporate Venturing in Terms of Real Options. *Creativity and innovation management, 17*, 251-258.

[266] Vazquez, R., Santos, M. L., & Alvarez, L. I. (2001). Market orientation, innovation and competitive strategies in industrial Žrms. *Journal of Strategic Marketing 9*, 69-90.

[267] Ven, A. H. (1986). Central Problems in the Management of Innovation. *Management Science, Vol. 32, No. 5*, 590-607.

[268] Venkatesan, R. (2013, Oct 7). India's IT companies have become complacent: Ravi Venkatesan. (P. Mishra, Interviewer) Retrieved from http://www.livemint.com/Companies/7itrAEtPLyKri3RQ7uATVI/Fantastic-growth-fat-margins-have-made-many-firms-quite-com.html

[269] Verma, A. (2015, Feb 4). *A Journey Through India's IT Landscape*. Retrieved Aug 18, 2015, from Financial Express: http://computer.financialexpress.com/magazine/footprints-on-the-sands-of-time-a-journey-through-indias-it-landscape/8697/

[270] Vrande, V. v., Jong, J. P., Vanhaverbeke, W., & Rochemont, M. d. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation 29*, 423-437.

[271] Vrande, V. v., Jong, J. P., Vanhaverbeke, W., & Rochemont, M. d. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation 29*, 423-437.

[272] Wallin, M. W., & Krog, G. V. (2010). Focus on the Integration of Knowledge. *Organizational Dynamics, Vol. 39, No. 2*, 145-154.

[273] Wang, C. L., & Ahmed, P. K. (2004). The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *EuropeanJournal of Innovation Management, 7(4)*, 303-313.

[274] Wang, J.-H., Chang, Y.-C., & Chiu, W.-H. (2013). Customer involvement in the process innovation: Antecedents, mediation and performance. *35th DRUID Celebration Conference June 17-19* (pp. 1-32). Barcelona, Spain: DRUID. Retrieved from http://druid8.sit.aau.dk /acc_papers/ey2p8gkgekfnq0dmctlxgtyc7iyh.pdf

[275] Wang, W.-Y., & Chang, C. (2005). Intellectual capital and performance in causal models: Evidence from the information technology industry in Taiwan. *Journal of Intellectual Capital Vol.6, No.2*, 222-236.

[276] Wang, Y., Vanhaverbeke, W., & Roijakkers, N. (2012). Exploring the impact of open innovation on national systems of innovation — A theoretical analysis. *Technological Forecasting & Social Change 79*, 419-428.

[277] Wang, Z., & Wang, N. (2012). Knowledge sharing, innovation and firm performance. *Expert Systems with Applications 39*, 8899-8908.

[278] Wernerfelt, B. (1984). A Resource-based View of the Firm. *Strategic .Management Journal, Vol.5*, 171-180.

[279] Westwood, R., & Low, D. R. (2003). The Multicultural Muse Culture, Creativity and Innovation. *International Journal of Cross Cultural Management vol. 3 no. 2*, 235-259.

[280] Wilson, B. (2010). Chapter 27: Using PLS to Investigate Interaction Effects Between Higher Order Branding Constructs. In *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 621-652). Springer.

[281] Wong, K. K.-K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin, 24, Technical Note 1*, 1-32.

[282] Woodman, R. w., Sawyer, J. E., & Griffin, R. W. (1993). Toward a Theory of Organizational Creativity. *Academy of Management Review Vol.18, No.2*, 293-321.

[283] Wu, X., & Sivalogathasan, V. (2013). Intellectual Capital for Innovation Capability: A Conceptual Model for Innovation. *International Journal of Trade, Economics and Finance, Vol. 4, No. 3*, 139-144.

[284] Yap, C. M., & Souder, W. E. (1994). Factors Influencing New Product Success and Failure in Small Entrepreneurial High-Technology Electronics Firms. *Journal of Product Innovation Management 11* , 418-432.

[285] Zairi, M., & Al-Mashari, M. (2005). Developing a Sustainable Culture of Innovation Management: A Prescriptive Approach. *Knowledge and Process Management Vol. 12 NO. 3*, 190-202.

[286] Zerenler, M., Hasiloglu, S. B., & Sezgin, M. (2008). Intellectual Capital and Innovation Performance: Empirical Evidence in the Turkish Automotive Supplier. *Journal of Technology Management and Innovation Vol.3, Iss.4*, 31-40.

.....ꙮ.....

Appendices

Appendix 1

Questionnaire for Senior Management

PART A – QUESTIONNAIRE TO BE FILLED IN BY SENIOR MANAGEMENT

1. Firm Name: Head-quartered in:
2. Year when your firm was set up:
3. How many employees do you have?
    a. Today (2014):
    b. 1 year back (2013):
    c. 2 years back (2012):
4. Are you registered with NASSCOM?
5. Your main business line is
    a. IT/software products (if yes, please specify what type of products)
    b. IT services (please specify the main service line)
    c. BPO
    d. Knowledge services/KPO
    e. Others (please specify):
6. Percentage (%) of revenues you generate from:
    a. India:
    b. Overseas:

7. How is your management team organized?
    a. We have brought in external management professionals who manage the company completely
    b. We have a mix of original founders and external professionals who comprise our senior management
    c. We have Private Equity/Venture Capital investors who work closely with the founders in managing the firm
    d. Founders of our company manage the firm themselves, with part time involvement of external experts
    e. Founders of our company manage the firm themselves

8. What % of your technical employees have graduate technical background (Btech/BE/MCA/BCA)?

9. The Work experience and professional background of our senior management is directly related to (and hence very useful in) our business
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

10. What is/are the source(s) of your financial resources? (tick ***ALL*** options that are applicable)
    a. own funds
    b. bank loans
    c. angel investors
    d. Venture capital
    e. Public capital (listed company)

11. Our company has strong internal finances to fund our growth plans
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
12. Our company has good access to bank loans and institutional funding
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
13. Our company has good access to venture capital/private equity funding
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
14. What is your strategy on Patents?
    a. We own at least one Patent
    b. We have filed for patent, but it is yet to be approved
    c. We undertake organized R&D with a stated intention to file for patent
    d. We do not undertake organized R&D with the intention of filing for patent, however, if any of our initiatives result in a unique discovery, we will file for patent
    e. We do not have an intention to file for patent

15. Which of the statements best represents the R&D activity of your firm?
    a. We have full-time, dedicated employees for R&D who conduct R&D on a continuous basis
    b. We conduct R&D very frequently at our organization
    c. We undertake R&D somewhat frequently at our organization
    d. We rarely undertake R&D at our organization
    e. We do not undertake R&D at our organization
16. We assess the innovative ideas of our personnel
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
17. We encourage our personnel to consider new solutions and original attitudes
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
18. Clients/end users are involved in the process of new product/service development in our company
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

19. Our products/services are usually developed considering customer wishes and suggestions
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

20. In order to acquire new knowhow/technology we cooperate with our customers
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

21. Our customers/end users are involved in the process of testing new products/services
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

22. We actively encourage communication among unrelated groups of employees in the company.
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

23. It is a common practice in our company that the employees rotate between different tasks.
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

24. Members of our staff include idea seekers who look for knowhow/ technologies outside the firm
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

25. We inform our employees about the importance of innovation to our business.
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

26. We reward employees who bring external knowhow/technology that improve our products/services
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

27. When developing new ideas we often consider the suggestions of employees from various functional groups of the organization
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
28. In order to acquire new knowhow/technology we cooperate with knowledge institutions such as universities and Research institutions
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
29. In order to acquire new knowhow/technology we cooperate with high-tech start-up companies
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
30. In order to acquire new knowhow/technology we cooperate with our competitors
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

31. In order to acquire new knowhow/technology we cooperate with consultancy companies
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

32. We have strong, formal collaborations with leading, global technology vendors
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

33. Our new products and services are often perceived as very novel by customers
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

34. In comparison with our competitors, our company has a lower success rate in new products and services launch
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

35. In the last 3 years, we have introduced products and services that are new to our industry
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
36. In the last 3 years, we have introduced products and services that are new to our firm
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
37. In the last 3 years, we have adopted new or significantly improved production and/or service delivery process for the company
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
38. Our new processes are often perceived as very novel by customers
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

39. We are constantly improving our business processes.
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
40. During the past 3 years, our company has developed many new management approaches
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
41. When we cannot solve a problem using conventional methods, we improvise on new methods
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
42. How would you rate your revenue growth in the last 3 years?
    a. Exceptionally higher compared to internal estimates
    b. Higher compared to internal estimates
    c. As estimated
    d. Slightly below expectations
    e. Significantly below expectations

43. How would you rate your profitability in the last 3 years?
    a. Exceptionally higher compared to internal estimates
    b. Higher compared to internal estimates
    c. As estimated
    d. Slightly below expectations
    e. Significantly below expectations
44. How would you rate your customer acquisition growth in the last 3 years?
    a. Exceptionally higher compared to internal estimates
    b. Higher compared to internal estimates
    c. As estimated
    d. Slightly below expectations
    e. Significantly below expectations
45. What has been your annual employee growth in the last 2 years?
    a. >50%
    b. 21-50%
    c. 11-20%
    d. 0-10%
    e. Reduction in number of employees
46. How will you rate your overall performance in the last 3 years compared to your COMPETITION
    a. Significantly better than competitors
    b. Slightly better than our competitors
    c. On par with our competitors
    d. Slightly below that of our competitors
    e. Significantly below our competitors

47. Which of the following statements best fits your business strategy (one or more of the statements may apply to you, but choose the one that is most appropriate)?
    a. To introduce entirely new-to-the-world or new-to-the-industry products/services
    b. To introduce products/services those are improvements to existing products/services offered by other competitors
    c. To introduce products/services those are similar to existing products/services in the market, but to offer them at lower prices
    d. To target unexplored markets/customer segments/niche segments

Please provide any examples of Product and Process Innovation in your firm.

Appendix 2

Questionnaire for Staff Member

PART-B – QUESTIONNAIRE TO BE FILLED IN BY STAFF REPRESENTATIVE

1. Our employee selection process (GDs, written tests, interviews etc.) is:
    a. One of the toughest to get through in our industry
    b. Slightly more tougher than the selection process of our competitors
    c. Equally tough compared to our competitors
    d. Slightly easier compared to our competitors
    e. Significantly easier to get through, compared to our competitors
2. Only the best and brightest talent in the industry work for our company
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
3. We have state-of-the art hardware systems (that is required for our operations) for employees in our company
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

4. We have state-of-the art software systems (that is required for our operations) for employees in our company
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree
5. We have state-of-the art Communication systems (such as bandwidth, connectivity, telephony etc. required for our operations) for employees in our company
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree
6. Top management of our firm researches the new technologies, products and process ideas
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree
7. Top management actively seeks innovative ideas
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

8. Top management encourages innovation activities
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree
9. Top management promotes the advantages of new solutions and ideas enthusiastically
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree
10. Mistakes regarding creative and innovative efforts of individuals are tolerated by top management
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree
11. There is a comprehensive program for employee learning in our company
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

12. We have an organization-wide training and development process, including career path planning, for all our employees
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
13. Employee learning is a topic that is discussed intensively by our top management
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
14. The attitude prevails here is that employee learning in an investment, not an expense
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
15. We always upgrade employees' knowledge and skills profiles
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

16. Our managers agree that our organization's ability to learn is the key to our competitive advantage
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
17. Our firm provides time and resources for employees to generate, share/exchange and experiment with innovative ideas/solutions
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
18. Employees are working in diversely skilled work groups where there is free and open communication among the group members
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
19. Employees are recognized and rewarded for their creativity and innovation ideas
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

20. In our company stories of exemplary innovation-oriented behavior of executives (e.g., founders, chief executives, managers) are circulating
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
21. In our company attractive meeting and discussion areas (e.g., cafeterias or intranet) exist where information regarding innovations can be exchanged informally
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
22. In our company we regularly organize events for customers or cooperation partners in the context of new product innovations
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

Appendix 3

Item to Questionnaire Reference Mapping

Item code	Brief Description	Questionnaire Cross-Ref
Intellectual Capital		
IC1	Experience and professional background of senior management	A9
IC2	Strategy on Patenting	A14
IC3	R&D Activity of the firm	A15
IC4	Employee selection process	B1
IC5	Quality of talent	B2
Creative Capability		
CC1	Firm provides time/resources for employees on innovative ideas	B17
CC2	Employees work in diversely skilled work groups with open communication	B18
CC3	Employees are recognized for creative and innovative ideas	B18
CC4	Assess innovative ideas of our personnel	A16
CC5	Encourage personnel to consider new solutions and original ideas	A17
Top Management Support		
TMS1	Top Management researches new technologies, products, processes	B6
TMS2	Top Management actively seeks innovative ideas	B7
TMS3	Top Management encourages innovation activities	B8
TMS4	Top Management promotes new solutions enthusiastically	B9
TMS5	Top Management tolerates mistakes in creative/innovative efforts	B10

Organization Learning Capability		
OLC1	Comprehensive program for learning in the company	B11
OLC2	Training& Development, and career path planning	B12
OLC3	Employee learning is a topic that is intensively discussed	B13
OLC4	Consideration of learning as an investment, not an expense	B14
OLC5	Up-gradation of employee knowledge and skills	B15
OLC6	Organizations ability to learn as a competitive advantage	B16
Customer Involvement		
CI1	Customer involvement in new product development	A18
CI2	New products and services are developed considering customer wishes	A19
CI3	Co-operation with customers for acquisition of new knowhow/technology	A20
CI4	Customer involvement in testing new products/services	A21
External Networking		
EN2	Co-operation with universities & research institutions for new knowhow	A28
EN2	Co-operation with start-up firms for new technology/knowhow	A29
EN3	Co-operation with competitors for new technology/knowhow	A30
EN4	Co-operation with consultancy companies for new technology/knowhow	A31
EN5	Strong, formal collaborations with leading technology vendors	A32

Employee Involvement		
EI1	Encouragement of active communication among diverse groups	A22
EI2	Rotation of employees between different tasks	A23
EI3	Presence of idea seekers who look for knowledge externally	A24
EI4	Informing employees about importance of innovation to the business	A25
EI5	Reward for employees who bring external knowhow/technology	A26
EI6	Involvement of employees from various functional groups	A27
Product Innovation		
PDI1	New products/services are perceived as novel by customers	A33
PDI2	Success rate in new products vis-à-vis competitors (REVERSE CODED))	A34
PDI3	Introduction of new to the world products/services in last 3 years	A35
PDI4	Introduction of new to the company products/services in last 3 years	A36
Process Innovation		
PCI1	Adoption of significantly improved production/delivery processes	A37
PCI2	New processes are often perceived as very novel by customers	A38
PCI3	Constantly improving the business processes	A39
PCI4	Development of many new management approaches in last 3 years	A40
PCI5	Improvisation of new methods as opposed to conventional methods	A41

Firm Performance		
FP1	Revenue growth in last 3 years	A42
FP2	Profitability growth in last 3 years	A43
FP3	Customer acquisition growth in last 3 years	A44
FP4	Employee growth in last 3 years	A45
FP5	Performance in comparison with competitors in last 3 years	A46

Appendix 4

Factor Analysis for Testing Common Method Variance

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.689	28.518	28.518	13.689	28.518	28.518
2	3.371	7.023	35.541			
3	2.857	5.953	41.494			
4	2.495	5.199	46.693			
5	2.107	4.389	51.082			
6	1.725	3.594	54.675			
7	1.589	3.311	57.986			
8	1.454	3.029	61.016			
9	1.188	2.475	63.491			
10	1.167	2.431	65.922			
11	1.005	2.095	68.017			
12	.943	1.964	69.980			
13	.888	1.850	71.830			
14	.842	1.754	73.584			
15	.774	1.613	75.197			
16	.754	1.571	76.768			
17	.712	1.484	78.252			
18	.659	1.373	79.625			
19	.608	1.266	80.891			
20	.577	1.202	82.094			
21	.556	1.158	83.251			

22	.534	1.113	84.365			
23	.525	1.095	85.459			
24	.499	1.039	86.499			
25	.485	1.011	87.510			
26	.458	.954	88.463			
27	.422	.878	89.341			
28	.390	.813	90.154			
29	.375	.781	90.936			
30	.366	.763	91.699			
31	.350	.730	92.429			
32	.327	.682	93.111			
33	.324	.675	93.785			
34	.304	.632	94.418			
35	.299	.622	95.040			
36	.272	.568	95.608			
37	.252	.525	96.133			
38	.234	.487	96.619			
39	.225	.469	97.088			
40	.208	.434	97.522			
41	.205	.427	97.949			
42	.185	.386	98.335			
43	.162	.337	98.672			
44	.155	.322	98.994			
45	.150	.313	99.307			
46	.125	.260	99.568			
47	.117	.243	99.811			
48	.091	.189	100.000			
Extraction Method: Principal Component Analysis.						

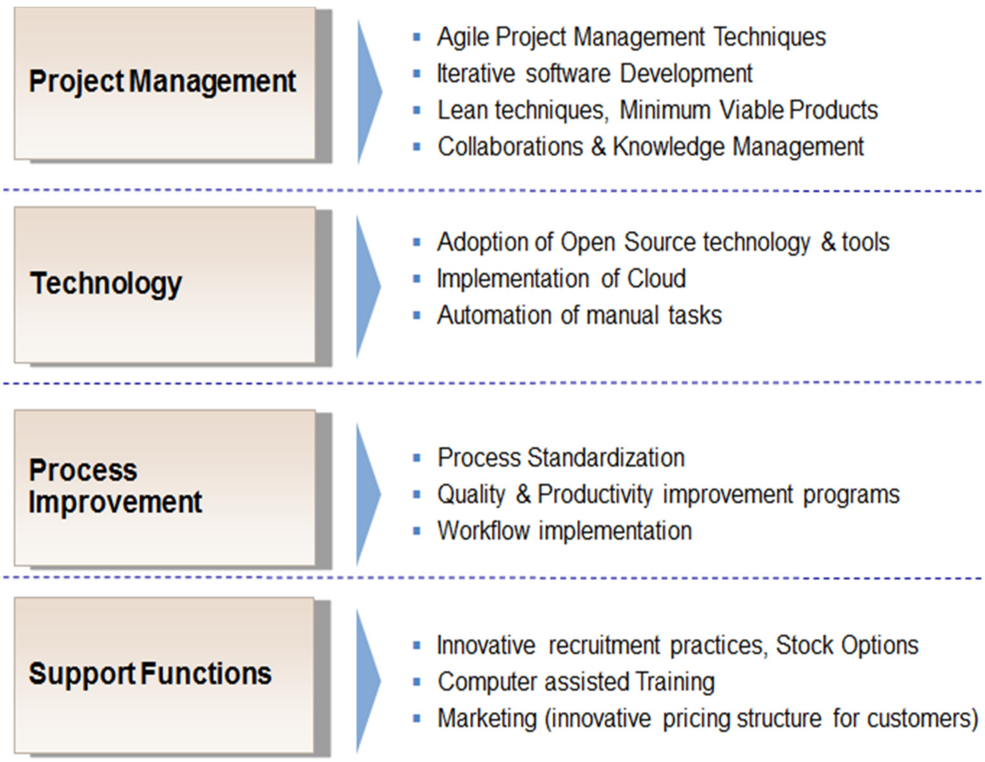
Appendix 5

Item-to-Construct Loading for Testing Convergent Validity

	IC	CC	TMS	OLC	CI	EN	EI	PDI	PCI	FP	Type		P-value
IC2	0.778	-0.058	-0.019	-0.058	0.042	-0.05	0.007	0.054	0.022	-0.044	Reflective	0.058	<0.001
IC3	0.768	-0.008	-0.035	-0.001	-0.013	-0.128	0.046	0.356	-0.003	-0.11	Reflective	0.058	<0.001
IC4	0.819	0.024	0.028	-0.025	0.048	0.038	-0.008	-0.146	-0.034	0.035	Reflective	0.058	<0.001
IC5	0.844	0.037	0.023	0.079	-0.074	0.125	-0.04	-0.232	0.016	0.106	Reflective	0.058	<0.001
CC1	-0.086	0.697	0.184	0.101	0.011	0.079	-0.04	-0.121	-0.196	0	Reflective	0.058	<0.001
CC2	0.044	0.647	-0.111	0.028	-0.019	0.168	0.015	-0.265	-0.105	0.177	Reflective	0.058	<0.001
CC3	-0.117	0.707	0.086	0.034	-0.056	-0.266	-0.031	0.258	0.134	-0.121	Reflective	0.058	<0.001
CC4	0.05	0.763	-0.141	-0.05	-0.069	0.064	0.044	0.055	0.089	-0.026	Reflective	0.058	<0.001
CC5	0.096	0.799	-0.012	-0.092	0.121	-0.031	0.008	0.038	0.053	-0.012	Reflective	0.058	<0.001
TMS1	0.07	-0.285	0.718	-0.067	-0.063	-0.014	-0.155	0.258	0.28	-0.091	Reflective	0.058	<0.001
TMS2	-0.07	0.126	0.863	-0.032	-0.03	0.081	0.073	-0.192	0.027	-0.062	Reflective	0.058	<0.001
TMS3	-0.026	0.154	0.849	0.049	-0.014	0.025	0.01	-0.164	0.006	-0.016	Reflective	0.058	<0.001
TMS4	-0.056	-0.052	0.819	0.11	-0.065	-0.036	0.032	0.078	-0.179	0.121	Reflective	0.058	<0.001
TMS5	0.13	0.014	0.597	-0.093	0.228	-0.085	0.022	0.093	-0.139	0.056	Reflective	0.058	<0.001
OLC1	-0.003	-0.05	-0.122	0.806	0.001	-0.093	0.06	0.08	-0.091	0.187	Reflective	0.058	<0.001
OLC2	0.133	-0.181	-0.037	0.732	0.01	0.042	-0.143	-0.147	0.004	0.279	Reflective	0.058	<0.001
OLC3	-0.003	-0.063	-0.03	0.855	-0.025	0.034	0.09	-0.132	-0.008	0.023	Reflective	0.058	<0.001
OLC4	-0.017	0.029	0.122	0.83	0.006	-0.095	0.019	0.096	0.034	-0.194	Reflective	0.058	<0.001
OLC5	-0.075	0.211	0.018	0.827	0.031	0.183	-0.049	-0.094	0.006	-0.075	Reflective	0.058	<0.001
OLC6	-0.02	0.034	0.042	0.805	-0.022	-0.071	0.004	0.19	0.057	-0.189	Reflective	0.058	<0.001
CI1	0.004	-0.103	0.072	-0.001	0.851	-0.119	0.03	0.12	-0.086	0.067	Reflective	0.058	<0.001
CI2	0.038	0.074	0.076	-0.086	0.77	0.023	-0.22	-0.085	0.234	-0.105	Reflective	0.058	<0.001
CI3	-0.105	0.059	-0.165	0.012	0.809	-0.029	0.076	0.112	0.017	-0.134	Reflective	0.058	<0.001
CI4	0.07	-0.024	0.018	0.077	0.743	0.144	0.111	-0.171	-0.163	0.178	Reflective	0.058	<0.001
EN1	0.081	0.026	0.094	-0.014	-0.071	0.704	-0.038	0.192	-0.124	-0.049	Reflective	0.058	<0.001
EN2	-0.098	0.141	-0.04	-0.019	0.1	0.648	-0.006	-0.477	0.012	0.156	Reflective	0.058	<0.001
EN3	-0.108	0.17	-0.071	0.03	-0.038	0.737	-0.174	-0.025	-0.03	0.032	Reflective	0.058	<0.001
EN4	0.059	-0.189	0.048	0.041	0	0.738	0.048	0.032	0.14	-0.115	Reflective	0.058	<0.001
EN5	0.062	-0.139	-0.033	-0.045	0.018	0.691	0.179	0.244	-0.003	-0.007	Reflective	0.058	<0.001
EI1	0.007	0.009	-0.049	0.048	0.012	0.239	0.71	-0.387	-0.128	0.257	Reflective	0.058	<0.001
EI3	-0.005	0.114	0.05	0.01	0.03	0.149	0.724	-0.152	-0.27	0.151	Reflective	0.058	<0.001
EI4	0.074	0.034	0.102	-0.043	0.073	0.025	0.862	-0.137	0.104	-0.04	Reflective	0.058	<0.001
EI5	-0.172	-0.099	-0.056	0	-0.07	-0.284	0.774	0.415	0.122	-0.057	Reflective	0.058	<0.001
EI6	0.085	-0.053	-0.058	-0.006	-0.05	-0.1	0.792	0.23	0.13	-0.27	Reflective	0.058	<0.001
PDI1	0.109	-0.062	0.098	0.015	0.071	0.068	-0.001	0.872	0.03	-0.098	Reflective	0.058	<0.001
PDI2	-0.036	0.118	-0.061	0.002	0.041	0.012	-0.019	0.782	-0.029	0.298	Reflective	0.058	<0.001
PDI3	-0.026	0.073	-0.011	-0.064	-0.045	-0.017	0.011	0.884	-0.096	-0.078	Reflective	0.058	<0.001
PDI4	-0.055	-0.129	-0.036	0.053	-0.068	-0.067	0.008	0.799	0.101	-0.099	Reflective	0.058	<0.001
PCI1	0.045	-0.097	-0.054	-0.011	-0.065	-0.036	0.042	-0.065	0.814	-0.072	Reflective	0.058	<0.001
PCI2	0.051	0.081	-0.089	-0.003	-0.088	0.141	0.045	0.095	0.686	-0.019	Reflective	0.058	<0.001
PCI3	-0.016	-0.03	0.071	-0.084	0.082	-0.072	-0.047	-0.046	0.839	-0.035	Reflective	0.058	<0.001
PCI4	-0.087	-0.017	0.005	0.14	0.034	0.042	-0.067	-0.005	0.727	0.145	Reflective	0.058	<0.001
PCI5	0.007	0.08	0.054	-0.026	0.026	-0.049	0.03	0.039	0.769	-0.005	Reflective	0.058	<0.001
FP1	-0.049	-0.032	-0.091	0.025	0.019	-0.016	0.033	-0.027	-0.032	0.904	Reflective	0.058	<0.001
FP2	-0.065	0.08	-0.02	-0.015	-0.033	0.066	0.02	-0.06	-0.028	0.864	Reflective	0.058	<0.001
FP3	-0.03	0.044	-0.006	0.018	-0.058	0.1	0.081	-0.096	-0.073	0.856	Reflective	0.058	<0.001
FP4	0.146	-0.124	0.052	0.011	0.151	0.046	-0.039	-0.065	0.069	0.681	Reflective	0.058	<0.001
FP5	0.031	0.009	0.083	-0.039	-0.05	-0.19	-0.107	0.242	0.083	0.838	Reflective	0.058	<0.001

Appendix 6

Process Innovation Examples from the Survey



.....ᘓᘐ.....

List of Publications

Journal Publications

[1] *'Discriminating Entrepreneurship Intentions: Empirical study of young Indian IT professionals',* Rajeev Mukundan and Sam Thomas, International Journal of Entrepreneurship and Innovation Management [review completed and accepted for publication in August 2015].

[2] *'Collaborative and open innovation: supply chain planning as an effective source',* Rajeev Mukundan and Sam Thomas, International Journal of Indian Culture and Business Management [review completed and accepted for publication in March 2015].

[3] *'Indian IT Industry Firms: Moving towards an Active Innovation Strategy',* Rajeev Mukundan and Sam Thomas, IFIP Advances in Information and Communication Technology Volume 402, 2013, pp 611-618.

[4] *'Business Analytics as a source of Firm Innovation*', Rajeev Mukundan, Rajagiri Management Journal, Vol.7, No.1, 2013 pp 43-49.

Conference Participation

[1] Participated at the IFIP Working Group 8.6 Doctoral Consortium at Mysore, and presented paper at the IFIP Working Group 8.6 Conference at IIM Bangalore in June 2013.

[2] Presented paper titled '*Adoption of Lean Start-up techniques in the Indian IT industry'* at the PMI National Conference, NCR-New Delhi, in September 2013.

[3] *International Conference 'Paradigm Shift in Innovative Business Management',* Nov 2012, SNGCE, Kolenchery, Kerala. Paper published in conference proceedings as:

[4] *'Innovation Strategies of Large Indian IT Companies: A study based on the Industry Life Cycle Theory, Paradigm Shift in Innovative Business Management'*, Rajeev Mukundan and Sam Thomas, 2012 pp 621-631 ISBN: 978-93-80430-14-0.

.....ഊഌ.....