CHAPTER 1
INTRODUCTION

This chapter presents an overview of the topic and its significance in the context of modern management practices.

1.1 INNOVATION AS AN ENABLER

Quest for improvement of quality of life continuously propelled transition of mankind from stone ages to modern day civilisation. Process of this transition witnessed several inventions even during agrarian economy and such inventions eventually became standardised offerings through organised production efforts. The shift from agrarian economy to industrial economy resulted in emergence of several path breaking inventions through accelerated development. This process was supported and complimented by advances in ‘Science’ and associated technological developments. Many of these inventions found their utility throughout 20th century as innovative products. The world has witnessed many profound technological transformations over the past century. According to a report published by ‘The Organisation for Economic Co-operation and Development - (OECD 1998), ‘economists interested in long-term trends often identify different periods of the 19th and 20th centuries during which clusters of innovations were introduced on a massive scale’. It addition, it mentions that these innovations were developed in specific geographical areas with distinct socio-cultural and economic characteristics (mainly in Western Europe and the United States), and were later diffused progressively and selectively to the rest of the world.
In today’s knowledge economy, rapid advancements in science and technology have resulted in exponential growth of innovations in all spheres of life. It may be noted that all adaptations whether they occur in an evolutionary manner or in a revolutionary way require innovation in the backdrop. Innovation is often viewed as the core of entrepreneurship as it provides a blueprint leading to performance and growth of enterprises.

Innovation is now accepted as an organised endeavor and not one of serendipity. These organising efforts saw the transition from individual innovators taking their inventions to market place through entrepreneurial efforts. Transfer of knowledge to other entrepreneurial firms was found to be an alternate way of moving innovations to markets.

As industries grew over a period of time, innovation has essentially become an important factor to maintain competitive edge. Most firms had to set up their own Research and Development (R & D) units in order to innovate and to introduce new technologies and new products. Ultimately, basic research has become part of the R & D activity of industries. These firms started heavily investing on in-house basic research activities. This was done as the required building blocks of inventive steps (starting from basic scientific research) were not readily available to support the core innovation. Hence, innovation has become an organised systematic activity. Success of firms was heavily associated with their ability to invent new products and services on a continuum. Number of patents held by successful organisations has become a yardstick to this effect.

In most industries, this model of innovation of doing everything in house entirely was prevalent till 20 years ago. This is depicted as ‘Closed innovation model’ (Figure 1.1).
‘R’ indicates ‘Research’ phase and ‘D’ indicates ‘Development’ phase. This approach of entirely carrying out both basic research and applied product development started causing strain within most firms. Heavy investments were needed to maintain leadership in innovations and in the markets. Such investments were deployed in upgrading research infrastructure, hiring and retaining of the best scientific and engineering talents. Cost of innovation had to be optimised using product-market strategy iterations. Consequently, many innovative ideas produced by the research groups had to be shelved without further funding as they did not align with core product-market fit requirements. Innovation management tools evolved over a period of time for optimising use of resources and to evaluate innovation-product-market fit. Large firms eventually had to adopt such a structured approach. Tools such as ‘Stage-gate processes’ have come into play for managing transition of ideas from its conception stage to introduction of the products in the market.
1.2 IMPLICATIONS OF STAGE GATE PROCESS

A number of attempts have been made by researchers to develop a ‘New Product Development (NPD)’ model that captures the relevant stages of the NPD process. The best known among them is the Booz, Allen and Hamilton model, shown in Figure 1.2. This model is quite comprehensive and incorporates basic stages of models found in the literature (Bhuiyan 2011).

Figure 1.2 Stages of new product development-Booz, Allen & Hamilton 1982

For every seven new product ideas, about four enter development, one and a half are launched, and only one succeeds (Booz Allen & Hamilton Inc. 1982).

The stage gate process supported certain ideas that looked very promising in the initial scrutiny but did not succeed in the market (false positive decisions) and on other situations rejected ideas that would have eventually become a roaring success in the market (false negative decisions). Often, personnel from research groups who were affected by the false negative decisions became frustrated and left these firms either to start their own ventures or to join other start-up firms. This coincided with the
development of venture ecosystem in places such as ‘Silicon valley’, in USA where risk funding through venture capital firms was available to bet on such ideas.

On many occasions, ideas that were shelved by large corporates have become successful entities in the market. Many such ideas were developed into products by new start-ups and were amply supported by private venture capital firms. While market leaders were watching these developments, such firms eventually grew bigger and even eliminated some of those leaders.

Early stage technology based firms face an unique set of challenges. Financially, they often fall between the cracks of traditional funding sources. As well, they are often limited in their managerial expertise, which tends to focus on technological rather than general business concerns. While their technologies are often innovative, the firms do not always have the necessary production capabilities to leverage them to the fullest potential. Furthermore, the innovative nature of their products often means that large, readily accessible markets have not yet been established, and the firm may need to seek out a number of smaller market niches if it wants to be successful and recoup its investment (Miles et al 1999).

Entrepreneurial small companies with growth-oriented management can adapt faster to change, create new products and bring them to market swiftly, trim overheads, and supply the large corporations with low-cost and high-value services and goods (Lalkaka 2006).

A few large firms started acquiring these start-ups in order to grow their innovation portfolio. This strategic acquisition was to avoid developing every product through in house R & D route. Seeing this new trend of innovation management, a number of large corporate firms followed suit to
bring in ideas from outside their firms. Smarter among them have seen opportunities to monetise ideas that were dormant through external partnerships and licensing them.

A new approach labelled as ‘Open Innovation (OI)’ was thus born.

1.3 OPEN INNOVATION - A NEW AGE INNOVATION MANAGEMENT APPROACH

Proliferation of internet has resulted in exponential increase in spread of knowledge in the last 20 years. Knowledge networks built by public scientific databases, online availability of patent information, online journals, ease and reduced cost of access to internet, new forms of structured and social media tools for collaboration have all reshaped spread of knowledge. Knowledge and information are no more heavily guarded assets.

The fundamental rationale behind OI manifests that not all good ideas come from within the firm. This disrupts the very assumption of the 20\textsuperscript{th} century innovation leaders’ assertion of doing the entire R & D in-house. Once the intent to receive ideas from outside of the firms sets in, it opens up wider possibilities of connecting with external talent. Mechanisms to deal with such inflow of ideas and ability to absorb and integrate such ideas with in-house technology / products have come into play. Primarily characterised as ‘in-bound open innovation’, this provides unlimited possibilities for firms to open up and strengthen their innovation portfolio through external partnerships.

In this process, firms have found an opportunity to commercialise technologies which otherwise would have remained dormant on their shelves. These technologies were the outcome of exploratory development activities undertaken by the in-house research groups. As they lacked strategic fit with
the firm’s core business, they were either shelved or kept dormant without any follow-on allocation of resources to take them to market. As firms opened up to receive ideas from external sources, they saw reciprocal opportunities to take unutilised / dormant ideas to market through external partnerships. This approach has been characterised as ‘out-bound open innovation’.

For in-bound innovations the sources of supply are academic researchers, individual innovators, start-up firms and other corporate firms. The out-bound activities are initiated through technology licensing or transfer offices of the firms. ‘Figure 1.3’ captures the essence of the OI model (Chesbrough 2003a).

The role of Intellectual Property Rights (IPR) is very important as the firms are vested with legal ownership of their inventions by the respective governments. The holder of IPR gains significant advantages on the negotiation table. Beyond basic IPR, the transfer of knowhow and offering support in downstream developments are also monetised.

![Figure 1.3 Open innovation model (Chesbrough 2003a)]
Both in-bound and out-bound OI approaches warrant specialised skills in defining the requirements, scoping, identifying potential sources, evaluating ideas, valuing, negotiating and closing deals. Furthermore, there is a need to have champions within the firm to propel integration between in house R & D with innovation partners, addressing challenges in absorption, adoption and adaptation of the external ideas.

Need for such specialised skills saw an emergence of innovation intermediaries, who started taking over a few or many of the above mentioned activities and offering them as solutions. While some of the intermediaries provide such services in the form of consulting, physical alliance formulation and deals, there are also a number of online innovation intermediaries such as ‘Nine Sigma’, and ‘Innocentive’. These online intermediaries provide a channel to reach out to a very large pool of talent, which otherwise would be very difficult for companies to reach.

Sheer necessity drove large firms to look at start-ups as a potential source of technology supply. They connect with the start-ups either for ‘in licensing’ a technology that could be taken through the in-bound open innovation or to acquire / merge relevant start-ups.

1.4 TECHNOLOGY START-UPS AS A SOURCE OF INNOVATION PROVIDERS

Start-ups are essentially entrepreneurial ventures with intent to grow into large enterprises in the future. A significant majority of conventional micro, small and medium ventures reach a stage where further growth is heavily linked to infusion of resources and therefore stagnate. However, technology and innovation based start-up ventures have options for defying this logic and to grow exponentially.
The innovative idea, enormity of the problem being addressed, size of the market, ability of the innovation to address the problem (product-market fit), availability of risk capital in the form of Government and private grant funding, angel and venture capital investments are some of the factors that facilitate charting a new trajectory of growth process for these knowledge based start-up ventures.

Start-ups by virtue of their lean structure are in a position to innovate quickly and they iterate fast enough to get desired outputs in their innovation to market journey. Unlike large firms where new product development decisions have to go through a structured decision tree, the founding teams in the start-ups either innovate themselves or provide the required decisions / resources to their team members in a swift manner. While innovation issues could easily be addressed, a significant percentage of the start-up ventures fail in the innovation to market journey as growth challenges require different set of skills.

The obvious questions here are:

- Can some of the start-ups having strong technological assets look at large firms as a market for licensing out technology?

- Is getting acquired / merged with a large firm a prudent decision to monetise the efforts?

- Would this be a smart way considering road blocks and challenges in organic growth?

- Can imminent failure in most of the start-up efforts be minimised through outbound OI route?
1.5 BUSINESS INCUBATORS (BI) AS OPEN INNOVATION (OI) INTERMEDIARIES

BIs were set up in the mid-fifties and early sixties in the USA as organised office spaces for small businesses. Later such efforts were morphed into innovation centers, technopoles and science parks in Europe and United Kingdom. BIs serve the political, economic and social objectives of any nation for meeting some or more of the following objectives:

i. Job generation

ii. Wealth creation

iii. Innovation and technology commercialisation

iv. Establishing linkages between academic researchers based out of Universities, industry, government agencies and research institutions.

v. Organised development of industrial clusters and reviving sick industrial regions.

vi. Guiding, mentoring and coaching young individuals

vii. Carrying out entrepreneurship promotion and development activity

viii. Promoting area / regional development

BIs as physical entities provide office space, flexible lease terms, access to common facilities such as meeting rooms, conference halls, training facilities, specialised infrastructure for technology development, prototype development, lab scale process development, funding /or facilitate fund raising, mentoring, other forms of technical and business assistance support
such as accounting, intellectual property rights, legal, talent, business
development and customer acquisition.

1.6 BUSINESS INCUBATION IN INDIA

The ‘Department of Science and Technology (DST)’, Government
of India was a pioneer in setting up BI movement in India. DST has
established around fifteen ‘Science and Technology Parks (STEPs)’ during
1983 - 2000 and fifty ‘Technology Business Incubators (TBIs)’ during
2000-13. The other departments of Government of India such as ‘Ministry of
Information Technology’, ‘Ministry of Agriculture’, ‘Department of
Biotechnology’, ‘Ministry of Micro, Small and Medium Enterprises’ too have
started business incubation programs in their respective domains. From 2012
onwards, the state Governments of Kerala, Maharashtra, Karnataka, Andhra
and Telangana have embarked upon several ambitious business incubation
programs. A number of private firms too have initiated business and venture
accelerator programs.

A majority of the DST supported BIs have evolved into mature
start-up support organisations by virtue of their business models mirroring
that of multi stakeholder organisations. They work with Government
departments, ‘Non-Government Organisations’, international development
agencies, industries, academia, research agencies, industry associations,
voluntary agencies and start-ups. Such strong networks provide them good
bandwidth for garnering support from various quarters in order to support
start-ups. Indian incubators have worked as innovation promotion agencies,
technology commercialisation providers, seed fund managers, project
management agencies, consulting service providers and on several occasions
undertaken some innovation and technology commercialisation assignments.
In order to succeed, start-ups need to be connected with their potential customers. They need to get early feedback from potential consumers of their product and service offerings. Acceptance of start-ups’ product / service offerings by customers would enable them to manage their revenues, cash flows and eventually result in profits and growth.

By undertaking innovation intermediary activities, business incubators might address an important requirement of providing access to markets and customers to their incubatee clients. For firms scouting for innovations through in-bound OI (seekers), business incubators might become an important source of providing such connections to innovative start-ups (providers). Thus BIs could become partners in carrying out intermediary / facilitation between seekers and providers.

1.7 NEED FOR THE STUDY

Start-ups get crucial support from incubators and this helps them to minimise / mitigate the risks. However, in order to survive and grow beyond incubation, start-ups need to succeed in the market. For start-ups that have embarked upon an innovative idea, levels of risks are even higher. Often start-ups on their own cannot undertake market exploration, motivate customers to adapt to a new product or technology and eventually grow that into a mainstream product.

Large corporate firms have started embracing OI as a method to strengthen their innovation capacity. However, there are always challenges in reaching out to start-ups at large. Every now and then, start-ups spring up greater surprises by introducing disruptive products. Identifying them early and partnering with them, investing in them and if possible acquiring them provide significant competitive advantage to large firms. Periodic
competitions, innovation scouting programs and market intelligence activities are becoming resource intensive but less effective.

There is a need for both emerging companies (start-ups) and high-growth (technology) firms to embrace open innovation for staying relevant and to reduce costs and risks. This OI approach opens up new pathways and insights to collaborate for mutual long term benefits (Segers 2014).

BIs have the primary responsibility of making their start-up incubatee clients successful. BIs have strong association with industries, industry associations and continuously scan technologies / innovations of prospects in their incubation pipeline.

The success of BIs is heavily dependent on the success of their incubatee clients. The success of incubatee start-ups is reliant on their success in the market. If the OI intermediary activities are going to help the incubatees succeed in the market place, BIs would embrace the same as it offers them enough ammunition for facilitating the access to market support. Consequently, sustained association with industries (through innovation intermediary activity) would help BIs in improving their reputation as a hub for innovation exchange.

Actively participating in the industrial association events and programs provides a clear understanding on the happenings in the business environment. Consequently, appropriate course corrections in policies and systems and for result orientation would be essential (Suresh Kumar & Sudharani 2012).

Sustainable regional growth is dependent on the development of innovation ecosystems. (Segers 2014).
There is a need for research in the incubation process variables. Despite several studies conducted in the field since Temali & Campbell (1984) set the standard for describing incubators and their configurations, it is clear that research has just begun to address the rudimentary levels of the incubator-incubation phenomenon. Not much attention has been devoted on the incubatees, their innovations, and the corresponding outcome. There is an immense need to focus on the incubator-incubation process dynamics. The variables associated with the incubation process are to be understood thoroughly and using these variables, incubation process models are to be built, validated and tested. Focusing on the process of incubation rather than on the incubator facility and its configuration will draw attention to the underlying causes of new venture development in an incubator-incubation environment (Hackett & Dilts 2004).

The earlier studies on the ‘start-up incubation success factors’ were heavily reliant on funding, mentoring and individual entrepreneurial traits of founding teams. Very little research has been carried out on the success of incubatees based on the access to market service. Hence, positing incubators role as innovation intermediaries in the OI arena is quite novel and needed.

Incubatee development studies are rather underdeveloped and probably will remain so due to the difficulty of obtaining data from early stage ventures. Nonetheless, key findings from this area of research include the importance of providing dynamic, proactive feedback to incubatees, assisting incubatees with business planning, and encouraging incubatees to introduce control systems during the early stages of venture development (Hackett & Dilts 2004). A number of incubators are being established and every single model is unique and difficult to imitate. Hence, the incubator management should develop a unique model for its operational success based on its operating environment (Suresh Kumar & Sudharani 2012).
From the above, it is becoming clear that there is a definite opportunity for BIs to become an innovation hub. However, research in the areas of BI & OI is in nascent stages and not enough empirical data is available to substantiate the postulation mentioned above. Furthermore, with the exhaustive amount of literature studied and interactions with stakeholders concerned, there are strong reasons to state that the proposition of BIs as OI intermediaries is first of its kind and no evidence of such an effort elsewhere is available.

Hence, there is a need firstly to develop a model that attempts to establish incubation environment influencers affecting the success of start-ups and secondly to discover relationship between them. In addition, there is a need to estimate the potential of business incubators playing the role of OI intermediaries. This would help the incubators and their stakeholders to explore and embrace this idea.

1.8 OBJECTIVES OF THE STUDY

Major exploratory propositions are grouped into primary objectives and their allied propositions are grouped as secondary objectives for this study.

Primary Objectives:

i. To discover qualifiers which describe success of an incubatee firm and identify the dominant ones among them.

ii. To determine whether ‘Access to market support’ rendered by a business incubator is the most significant factor among various factors that are contributing to the success of an incubatee start-up venture.
iii. To determine if the ‘open innovation activities of the business incubators’ would enhance the success of incubatees.

Secondary Objectives:

i. To examine if business incubators can be open innovation intermediaries and if the necessary wherewithal is available with them.

ii. To determine if the ‘open innovation activities of the business incubators’ would result in improving the access to market support provided to incubatees.

1.9 SCOPE OF THE STUDY

DST has established a separate board –“National Science & Technology Entrepreneurship Development Board (NSTEDB)” to promote innovation, incubation and entrepreneurship in the country. NSTEDB has established more than 60 incubators in different thrust areas across the country. Hence, considerable domain experience is available with DST promoted business incubators over a period of 30 years. Most of these DST supported business incubators are hosted and supported by academic institutes of repute. Hence, the study focuses on business incubators promoted by the DST.

The study confines itself to the micro environment of ‘Business incubators’. Macro environment such as economy, Government policies, entrepreneurship culture and human factors are not considered.

The study attempts to uncover the preparedness of BIs in playing the role of innovation intermediaries and confined its target respondent group to managers at the helm of BI operations. Other stakeholders in the OI system namely corporate firms and start-ups are not considered.