

**Strategic Management Implications of Open Innovation: A
Critical Review of Theory and Practice**

By

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DECLARATION

I the undersigned, hereby declare that the work contained in this assignment is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

Signature

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ABSTRACT

Open innovation presupposes that enterprises can and should use external and internal ideas as inputs to the innovation process, by employing internal and external paths to market for the results of innovative activities. Its importance to business success has been dramatically increasing in recent years.

Based on the degree of their involvements to innovate, enterprises are on a continuum of innovation levels: closed, hybrid and open. Closed innovation model is aimed at augmenting internal innovation, and is the result of an in-ward oriented management practice. This practice is termed as extant strategic management approach. And its scope of operation is dominantly bound to building enterprise's internal competence; if it extends, it is limited to established business networks or partners.

A number of drawbacks have been noticed to the closed models of innovation. Inabilities to make use of external sources of innovation, putting them on the shelf - when they lack current market - are two among other deficiencies. Enterprises that pursuit an open innovation program, though, open-up their boundaries to absorb external sources of innovation regardless of the origin of the innovation source and give it away when lacking current market.

This implies that there is a need to modify existing strategic management mindset to (leverage) suit the cultivation of open innovation. For instance, leaders should play facilitator, symbiotic and participative roles rather than the traditional guidance and control role. Even traditional leadership titles: boss, foreman, and lineman are getting replaced by new titles: team leader, group leader and mentors. Structure wise, an open organisational structure that is fluid and flexible to reflect the requirements of an open enterprise is imperative, not the traditional one with a rigidly set boundaries. On the cultural side, organizations need to overcome the cultural syndrome of 'NIH' (not invented here), and facilitate the 'hackers'' culture. They also need to consider an appropriate mix of resource allocation between internal and open innovations, rather than providing greater weight to the internally based R&D.

Further implications of introducing an open innovation goes to innovation models. Traditional innovations models such as University alliances have lack of reach to the broader sources of innovation. To overcome these shortcomings, modern models of

innovation including subscription and open global networks are being introduced. Despite of its advantages on accessing multiple sources of innovation, subscription model is still limited to the subscribed member organizations. The open global network model, however, enables enterprises to access the global research findings and community.

Finally, the study concludes that in today's complex business environment, innovation in general, and opens innovation in particular, allows enterprises to stand on top of the competitive environment. It also helps customers appreciate their unique service needs at a reasonable cost. To effectively manage the open innovation phenomenon, a proactive management mindset that allows the cultivation of innovations by integrating internal and external sources of knowledge is required.

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CHAPTER I: INTRODUCTION

1.1 Overview

The concept of innovation is not new; it has been a subject of interest to numerous economists and managers for many years. In its broadest sense, innovation is defined as the intentional introduction and application within a role, group, or organisation of ideas, process, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society (West and Farr, 1990).

The view of strategic management of innovation, and the role it plays in organisational activities, has passed through successive levels of developments. During the past half century, technology-enabled innovation has migrated and changed. At first, it was being perceived and used simply as a support activity – often called research and development (R&D). However, by the 1980s, innovation was passed on to large industrial R&D laboratories and other units of large enterprises. Accordingly, it was increasingly viewed as being ‘strategic’. As such, innovation became more integrated into the overall, high-level decision-making of the enterprise, and can therefore be termed ‘strategic innovation’ (Horwitch et al., 2000).

The emergence of recent innovations in digital space brought the need for modern approaches to strategic management, namely networked innovation and open innovation. Network innovation emphasizes the need to move beyond the firm’s internal resources to access innovative capabilities, by forming specific and explicit collaborations (Horwitch et al., 2000). Open innovation is defined as: *making the boundary between the enterprise and the environment more porous, thus becoming “open” to the easy flow of ideas, innovation, and knowledge - both from inside and outside of the organisation* (Chesbrough, 2003a). Complementing this definition, West and Gallagher (2004) pointed out that open innovation is a phenomenon that makes use of all available technological innovations, based on the models and approaches first developed in open source software. Hence, organisations create a ‘platform program’ that enables users to design their own add-on products. For example: a cell phone

company designs a basic model, and allows its customers to personalise the colour scheme, and other features like the ring tone, a camera, Internet connectivity, etc.

1.1.1 The increasing emphasis on open innovation

Due to the rapid rate of innovation, the early 21st century is characterized by increasing turbulence. Hence, enterprises are realising that one of the best ways to secure sustainable competitive advantage is to effectively and quickly leverage innovative capabilities.

Many of the techniques of innovation that is used by strategic management, originally developed in the networked business environment, emphasizes the augmentation of knowledge capability through merger & acquisition, strategic alliances, partnerships (Thompson, 2001; Horwitch et al., 2000). Nowadays, however, there are indications that the mind-set of strategic management on network relations are extending beyond established networks, and are thus fortifying innovative competencies (Leibold et al., 2002; Chesbrough, 2003a; Leibold et al., 2004). This is increasingly happening, not through the form of traditional internal system of innovation through R&D and limited external linkages, but by implementing open innovation strategies.

Because of many innovative network-enhanced pressures confronting organisations today, strategic management of many companies have been forced to investigate the significance of open innovation strategies for business operations. The following are, among others, some of the challenges faced by several enterprises that compel them to carry out open innovation:

- saturation of many domestic markets (Mcloughlin and Harris, 1997),
- reduction in product life cycles (Keegan et al., 2003; Hamel, 1998),
- convergence of many strategic decisions (Hamel, 1998),
- the high costs, and long development cycles characteristic of internal innovation (Teresko, 2004).

A recent body of research has emerged in an attempt to understand how open innovation occurs. Among others, it indicates why it is important to consciously

employ innovative strategic thinking when developing theoretical frameworks to guide business organizations.

1.1.2 Foundations of open innovation

The two most important principles underlying the current concept of open innovation are:

- a) *Surrendering the right to intellectual property* (Ulhøi, 2004): the innovators in this regard were the 19th century British iron industry and the US steel producers that voluntarily chose to give up their right to intellectual property. Thereafter, their technicians freely disclosed detailed and vital technical information about critical underlying technologies to their competitors. Thus, all the aforementioned, through incremental innovation, achieved a steady increase in performance efficiency. To facilitate this, industrial journals and associations were used as a means to disclose innovative products and designs.
- b) *Open sourcing of computer software* (Horwitch et al., 2000; West and Gallagher, 2004; Ulhøi, 2004): The basic principle of open source software states that the source code of any software programs is thrown open so that anybody can contribute to its development (Lee et al., 2003). The living example of this is General Public Licensing (GPL) that inhibits software developers from hoarding source code originated by the GNU project. The prime objective of the system is to increase knowledge sharing among community of the world.

There are also indications that organizational practices such as festivals, exhibitions, workshops, conferences, etc., each plays an important role in providing a supportive basis towards the commencement of open innovation.

1.1.3 The current overall views of open innovation, and its challenges

Nowadays, despite the fact that open innovation is still in its infancy stage, there are ample evidences that many industries are committing themselves to this type of strategic approach (Marchall, 2000; Chesbrough, 2001; Pekka, 2002; Chesbrough,

2003a; Chesbrough, 2003b; Grand et al., 2004; Jay, 2005). The following are some of the industries that are increasingly adopting open innovation:

- music and publishing companies (Horwitch et al., 2000),
- sports (Ulhøi, 2004),
- tourism (Watson et al., 2004),

It is clear that stable external sources of knowledge, and a receptive organizational culture, is a prerequisite for implementing an open innovation strategy. These components, however, do not guarantee successful open innovation strategies. Some authors contend that for open innovation to succeed, harmonising an organization's internal and external strategies is indispensable to reduce the internal pressures accompanying the introduction of external knowledge. For instance, West and Gallagher (2004) indicated that integration of internal and external innovation poses three challenges to strategic management of a company:

- **Maximization.** This is to use a wide range of approaches to maximise the returns of a firm's internal innovation. In this regard, not only the company's normal pipeline of innovation should be used, but also to outbound licensing of intellectual property (IP). The latter will stimulate demand for technological innovations that have no market as yet.
- **Incorporation.** External knowledge provides no benefit to a firm unless it first identifies the relevance of that knowledge, and then incorporates it along with its related innovations.
- **Motivation.** Open innovation assumes that external innovation is an ongoing stream. Nevertheless, to secure sustainability, external innovation requires replenishment. For example, venture capital, joint projects, and the creation of interactive media for knowledge sharing need follow up, and significant investment of resources (money, personnel, etc.), to stimulate creative ideas.

In many industries, a failure to consider these challenges and to take appropriate action, in the sense of making use of the available external technologies to their own benefit, could cost businesses their very existence. For example, fresh from the success of its

user interface innovation of the 1980s, engineers of Apple computer rejected external ideas in areas such as handheld computers. The appropriate strategy would rather have been to maximise, by integrating handheld computers with their own existing technology (West and Gallagher, 2004).

Added to the aforementioned challenges, which aggravate the problem of assimilation in organisations, is the emergence of new behavioural characteristics of technological innovation adopters. Previously, literature sources classified the adopters of a product or service as innovators, early majority, early adopters, late adopters and laggards (Keegan et al., 2003). More recently, however, there is some evidence that the adopters of technological innovation exhibit unique behavioural characteristics, and can be termed as: technovators, supplemental experts, novices and core experts (Saaksjarvi, 2001).

It is important that strategic managers of open innovation need to consider such characteristics, because the latter characteristics of adopters play a vital role in combining available technologically sophisticated external sources of knowledge with current knowledge and practises. Similarly, recognising these categories of adopters assists an enterprise to decide on sound strategic management models and approaches.

1.1.4 Initial models and procedures of open innovation

There are some models and procedures for open source software adopted by the software industry that have been shown as having significant managerial implications (Grand et al., 2004; West and Gallagher, 2004). For example, Grand et al. (2004) identified various levels of external knowledge adoption, each with its own explicit managerial implications. West and Gallagher (2004) proposed a procedure that helps to integrate internal and external sources of knowledge by using maximisation, incorporation, and motivation, as stated above. These models and procedures, though, are limited to the software industry.

1.1.5 The rationale for knowledge sharing for innovation

The two main reasons that motivate individuals to get involved in interactive programs of knowledge-sharing are: firstly, satisfying either intrinsic or extrinsic value, and secondly, gratifying financial or non-financial drive (Ulhøi, 2004). These individuals, subsequently, constitute the main source of knowledge to implement the open innovation strategy.

Many sources show that organisations also involve in knowledge sharing by spinning-out of their innovation to others, rather than spinning-off for own benefit only. One obvious reason for such practice is that, opening internal sources of innovations facilitate the sell of supportive (complementary) innovations (West and Gallagher, 2004). For example, an organisation that spins-out product innovation may obtain an opportunity to sell spare parts, accessories, and expertise that offers technical assistance for the adopting enterprise.

Another facet of open innovation is the implementation of innovative thinking to leverage internal innovation of an organisation by establishing permeable boundaries, both inside, and outside the traditional form of its organizational structure. Thus, open innovation strategies pave a way to harvesting technological innovations from the expertise of the community pool, which usually fall outside their own organisational network configuration. This knowledge harvesting mechanism, among others, enables organizations to gain ready-made innovations, rather than starting from the scratch, thus reducing cost of innovation.

Chesbrough (2003a) further pointed out the specific benefits that open innovation provide to an enterprise. According to him, the basic tenet behind the logic for an organisation to incorporate external technology could be to:

- close the gap between what internal research can deliver, and what corporate growth objectives require,
- help get products to the market faster, and to maintain or improve product margins,
- pre-empt potentially “disruptive technologies” that could threaten existing businesses.

Although an open innovation strategy provides the previously stated benefits, it is pertinent to also highlight the rationale for an organization's involvement in knowledge sharing, and the stability of the pool of external sources of knowledge. Some sources on the theories of co-evolution, point out the persistent need of enterprises for mutuality. The co-evolution theory asserts that, firms have some degree of control over their market environment, and that they adapt to their habitat through learning processes (Baden-Fuller, et al., 2001). Consequently, there is mutual evolution of various entities, enterprises or value propositions through collaborative interactions. According to the mutuality principle, there is no hard boundary between the many interactive elements of a system: organizations today are considered as living organisms - hence treated as systems (Kelly and Papaefthimious, 2000). The reason is that, in the emerging turbulent and knowledge networked business environment, creating collaborative efforts enable enterprises to influence and co-evolve with each other. As such, various innovators (start-up companies, the mobile work force, venture capital, etc.) provide promising external sources of knowledge (Chesbrough, 2003b; Hastbacka, 2004). In addition, there is an indication that companies are turning to outside innovation agents in order to obtain innovative technologies from a wide array of sources (Hastbacka, 2004).

The rapid increases of technological innovations – such as the Internet and the World Wide Web – leverage the pool of 'open critical mass', creating an interactive community (Howitch et al., 2000). Thus, open innovation has the possibility to emerge with full vigour. As a result, new opportunities are facilitated for enterprises to create and add new or improved value to markets.

There are sources, however, which indicate that not all organizations exhibit the same degree of involvement towards open innovation. Such sources maintain that organizational involvement in open innovation depends on its product life cycle, as well as its product development cycle. For example, it is less likely for a company with long product development and life cycles (rocket engines, pharmaceuticals) to recycle its resources, and to open up on its innovations. A prolonged development cycle of its product demands more commitment from internal workers. This is where one finds pension plans, lots of training, expectations that employees build their entire careers within the firm (Callahan, 2004).

1.1.6 The background to strategic management implications of open innovation

For open innovation to be successful in a continuous sense, some authors concluded that identifying its implications to strategic management, and implementation of an appropriate form of management behaviour and perspective is important. Howitch et al. (2000) observed that in order to capitalize on emerging external opportunities, it is necessary to have a wide-ranging view at management (in this case open management: implementing the continual use of teams). This includes comprehensive way of looking at the domain of innovative ideas: socio-cultural environment. Viewing socio-cultural environment as a domain of innovative ideas, points to moving beyond the firm internal capabilities, and its limited network relations. The traditional leadership styles to management therefore are not appropriate to leverage innovation: an important requirement is a symbiosis style of leadership where a group of people work together without a formal leader (Amar, 2003).

Besides, strategic managers need to consider the establishment of appropriate organizational structure, which enables to accommodate emerging innovations. Emphasising this requirement, Davidoff and Kleiner wrote, “organizations that are not receptive to new technologies, and do not modify themselves to absorb them, will become corporate dinosaurs” (Davidoff and Kleiner, 1991, p. 6). Howitch et al. (2000) further pointed out the need for an open company structure that incorporates open marketing, open human resources, and open functions. This organisational structure is fluid and flexible, and with no definite shape. The extension of organizational boundaries far beyond their limited networked relations requires appropriate decision-making on how, and to what extent enterprises should open up their borders. The outcome of such type of decision-making, optimises the quality and speed of implementation of novel innovations, while simultaneously reducing costs (Rigby and Zook, 2002).

Creativity and innovation are also influenced by organisational culture including: norms, values, assumptions and beliefs that become enacted in establishing forms of behaviour and activity. These are reflected in structures, policies and practises, which impact directly on creativity in the work force; for example, by providing resource support to pursue the development of new ideas (Martins and Terblanche, 2003). In the

open innovation phenomena, however, there are indications that organizations need to develop a new cultural perspective called 'hackers ethic/culture' (Pekka, 2002). Hacker, here, refers to the original sense of the word: a person who is passionate about his work, and wants to share the results with others.

As already mentioned, the success of open innovation strategy requires an effective assimilation of external sources of knowledge with organisational culture. To accomplish this, however, is not easy: the existence of cultural variations and knowledge gaps causes a variety of problems during the marriage of internal and external innovations. Davidoff and Kleiner (1991) provide some principles that may help to match technological innovations to organisational culture, by reducing the challenge of assimilation.

When implementing the open innovation phenomena, one needs to critically consider several important implications. For instance, the use of external innovation might result in the reduction of the R&D budget. If it is not strategically managed, this will inadvertently lead to dependency on outside sources. That is why strategic management needs to implement appropriate strategies, which adopt external innovations, while optimising internal innovations, by maintaining sound business models.

The following company example (see the box below) is excerpted from an article in Harvard Business Review titled "Managing of technology and innovation". It is relevant to review here, since it illustrates the current practice of open innovation in enterprises, its implications to strategic management, and the role of open innovation plays in organizational success.

Establishing Technology Pull to Drive Future Growth

“Emhart Teknologies, a subsidiary of Black & Decker, sells fastening and assembly products in over 100 countries.

Company management recognized that it needed to identify innovation and technology sources to drive the development of new, higher-margin products. Emhart also recognized that the best ideas should be sourced from innovators regardless of where they originated. To establish itself as a leading innovator, and to generate “idea pull,” Emhart partnered with NASA to sponsor an annual design contest, regularly advertising technology needs in NASA’s journal and websites.

Emhart uses every opportunity to promote itself as an innovator and a technology buyer, even changing its name to reflect its new focus. The company receives 1,500 product ideas annually through its Create the Future design contest, which solicits entries from engineering professionals, students, and the public. Today, Emhart Teknologies’ two largest new product introductions are based on adding value to external technologies.”

Source: Chesbrough (2003b). Making Sense of Corporate Venture Capital. *Harvard Business Review*, 80(3): 4.

From this case example, one can observe that – in contrast to internal R&D and established networks – implementing an open innovation strategy enables you to get innovative ideas regardless of where they originate. This example further illustrates that, in order to draw appropriate management decisions when implementing new open innovation practices, there is need for the prior identification of its implications to strategic management. For example, the company changed its focus – reflected in its name change – which resulted in the introduction of new value adding technologies.

1.2 Statement of the problem

Among others, the three major practices of open innovation strategy widely used by organizations are: the copying of external innovations, modifying them to various forms of innovative technology (Grand et al., 2004), and ‘spinning-out’ internal innovations to outsiders (West and Gallagher, 2004).

These practices have three important implications to existing organisational operations. Such implications can be positive and/or negative, depending on the chosen strategy, i.e.:

- Firstly, copying other innovations “as-is”, offers a low cost advantage; but in the negative sense, it leads to the lack of self-confidence and dependency on outside innovation. This has a detrimental effect on the performance of the organisation.
- Secondly (in the case of modified innovation), new ideas may be stimulated during the interaction process between internal and external technologies. However, since the adapted technology is foreign, it also creates confusions and frustrations in existing operations – especially at the beginning stage. This may negatively influence the development of innovation.
- Thirdly, the strategy of open innovation provides an opportunity to spin-out internal innovations, even though there might not as yet be a market need to capitalise on it. Outsiders, though, can use these spin-out technologies as a base from which to leapfrog to the competitive landscape. In a negative sense, this later becomes a main threat to the out-sourcing company.

The challenge therefore is firstly, to develop an ability to analyse the trade-offs among the possible alternatives (positive and negative). And secondly, to develop the ability to recognise the possible strategic management implications accompanying open innovation. For instance, questions can be asked whether:

- creative management for internal innovation still would continue as being the main innovation ingredient,
- new methods of financing internal R&D be applied,
- organisations need new strategies in order to motivate their employees, etc.

Yet, identifying the possible strategic management implications of open innovation is not easy, because in the open innovation phenomena organizations have no boundaries; organizations implementing open innovation affect, and are also affected by a vast array of internal and external parameters. The increasing turbulence of today’s environment adds further complications to the challenge.

1.3 Objective of the study

The objective of the study is to review and analyse the significant strategic management implications of the phenomenon of open innovation, as emerging from extant researches.

1.4 Scope of the study

The scope of study includes an extensive investigation of the literature concerning strategic management approaches, strategic innovation, and open innovation as learned from open source software. It includes relevant innovative tools, the technological innovation adoption procedures, organisational innovation models, and principles to implement an open innovation.

Open innovation is examined from various points of views, including prominent authors such as Chesbrough, and the concepts developed on open source software. As has been stated in section (1.1.3), open innovation is as yet mostly seen in the computer, retail, sport, printing, and entertainment industries.

Whilst the emphasis of the study is on open innovation, an analysis of the major extant strategic management approaches, innovation theories, and networked innovation models, have been reviewed in terms of their relevance to open innovation.

1.5 Methodology

The study is based on analysis of all published and unpublished secondary sources of information. These include: published books, articles, research reports, published academic and professional conference proceedings, Internet sources, and other reliable documents. This was done using literature databases, and Internet searches. The findings and conclusions of the study were based on accepted scientific validation procedures including: content analysis, syntheses, and cross-checking to ensure internal consistency. 16972

1.6 Organisation of the study

The thesis is presented in seven chapters. Chapter one provides the background of the study, followed by the statement of the problem, the objective of the study, the scope of the study, the research methodology, and organization of the study. Subsequently, the outline of the structure of the study is delineated in logical sequence.

Chapter Two provides the concepts of business innovation and its changing nature. In describing the notion of innovation, this chapter traces the history of the development of innovation, and the nature, scope and process of innovation. It further reviews the relationship between the concepts of creativity, and organizational innovation.

Traditional strategic management approaches, regarding their view and incorporation of innovation and its practices, are presented in Chapter Three. The shifts in strategic management approaches, and the position innovation holds in the organizational context, are described.

Chapter Four discusses the nature of open innovation as applied to various industries and technologies. Particular interest is given to elaboration of the basic concepts, the fate of IP in the course of open innovation, sources of innovation and the motivation to undertake open innovation, and the trends of current industries towards an open innovation strategy, as revealed by extant research evidence.

Chapter Five provides an analysis of the management implications of an open innovation strategy specifically on: organizational culture, organizational structure, leadership style, models of innovation and resource allocation decisions. Since this strategy imposes the need for a different mind-set on existing managerial competencies, some suitable strategies and managerial toolkits are pointed out.

Chapter Six presents the summary, conclusions, and recommendations of the study. The recommendations outline suitable implementation, and use of open innovation in strategic management practices. Finally, possible areas of further research on open innovation are suggested.

1.7 Summary

Chapter one introduced the overview of the study and underlined the research challenge. It was described that innovation can develop internally in some contexts, and externally in others, commonly termed as open innovation. This study focuses on external innovation. The statement of the problem was clarified. It was demonstrated that opening organizational boundaries helps for an easy flow of ideas in and out of an enterprise. At the same time, it may increase organizational dependency on other innovation and creativity. These might confront existing strategic management approaches in a number of ways such as in terms of culture, leadership, organizational structure, models of innovation.

The objective of this study has been formulated. This study is proposed to investigate implications of undertaking an open innovation to extant strategic management approaches. The scope and methodology of the study were delineated and the structure of the study was outlined.

CHAPTER II: THE PHENOMENON OF BUSINESS INNOVATION

2.1 Introduction

For several years, science and technology have been seen as two of the factors that can be used to explain economic growth, or to correlate with it. Technology refers to the process by which humans modify nature to meet their needs and wants, while science is the study of the natural world through the accumulation of knowledge and application of a scientific inquiry (The national academy of science, 2001; McMillan, 2004). Innovation, as a broader concept, is increasingly becoming the central principle for explaining economic growth (Sundbo and Fuglsang, 2002). As a result, enhancing innovative power of enterprises is becoming the heart of present day organisation.

A review of the literature shows a significant paradigm shift in innovation. In the early years, entrepreneurs - outstanding individuals - were regarded as the engines of innovation (Pyka, 1999; Chuanqi, 2005). Later, though, integration and coordination between and among, business partners and network relations started to outweigh the sources of innovation (Leibold, 2002; Chuanqi, 2005). The increase in information technology in the late 1990s compels business enterprises to hold on to their information more than they really can afford to. Consequently, the focus of innovations is shifting towards the deployment of intellectual capital (knowledge) to enable the management of information overload.

Furthermore, a recent body of research on innovation reveals that a new form of focus on the motor of innovations began to emerge supplementary and/ or complementary to internal innovation systems, called open innovation. In this regard, the source of open innovation is the broader socio-cultural environment of business enterprises (Chesbrough, 2003a; Davis, 2006). For a more detailed discussion on the phenomena of open innovation in business enterprises refer to chapter four.

The transformation of the source of innovation - to enhance innovative capability - is mainly attributable to reaction of enterprises to adapt the complex, chaotic, and increasingly changing world of the business environment. Generally, innovation

presents flexibility, enabling enterprises to cope with uncertainties. Additionally, innovation may enable product performance to continue when implemented at its diminishing return, and even during its declining stage of economic performance.

In spite of the fact that innovation provides flexibility to uncertainties, and prolongs a profitable business by adding value - by its very nature - it is a very risky business (Grulke and Silbert, 2001; Kuczmariski, 1996; Lord, 2005). The risky ness of a technological innovation is directly related to the degree of the innovation involved with it. A radical innovation, for example is more risky than an incremental one. Enterprises, however, may not be threatened by the inherent risk of the innovation: nowadays the failure to innovate has become more risky than the risk to innovate (Lord, 2005). Valéry showed that enterprises that engage in continuous innovation, strive for good ideas; their track records attracts investment like flowers attract bees, despite the risky-ness of their approach (Valéry, 1999). A current survey by Boston Consulting Group shows almost 90% of the executives surveyed believe generating organic growth through innovation has become essential for success in their industry (Financial executive, 2005). Accordingly, the 21st century world economy can be recognized as an innovation economy (Voelpel et al., 2005). In the innovative economy, organisational competitiveness, survival, and advancement are mainly achieved by effecting innovative excellence - uniqueness, relevance, speed etc., (Voelpel et al., 2005).

Notwithstanding its significant contributions to the success of enterprises to economic growth and to social welfare, the exact meaning of the term innovation is often clouded by confusion (Flynn et al., 2003). Ijuri and Kuhn (1988) illustrate the lack of a single, all embracing and consistent definition of innovation. This creates ambiguity to its conceptualization. Similarly, Chuanqi maintained that the wide-ranging interaction between industries and various other institutions left innovation without a single clear definition (Chuanqi 2005). For example, an innovation defined by one industry may not be the same with the definitions given by other industries (Mahdjoubi, 2001). This chapter is therefore aimed at the systematic presentation of innovation to augment its conceptualization - with a particular focus on: the conceptualisation of innovation, the classifications of innovation, the input-process-output model of innovation, the diffusion of innovation, innovation waves in business enterprises and the future perspectives of innovation.

2.2 Towards defining and conceptualizing innovation

The term innovation is the amalgamation of Latin and Indo-European words. Nova (Latin) means a star that suddenly becomes a thousand times brighter, and then after gradually fades back to its original intensity. The prefix and suffix are Indo-European words, in (en) and ion, respectively. In (en) means “within” and ion denotes an “action” or “condition” (Schumann, 2005).

Two criteria that relate business innovation to the star that suddenly becomes brighter and gradually fades away are: firstly innovative enterprises are distinct, and may be seen as more energetic than their non-innovative counterparts. Secondly, unless an organization innovates continuously, the power of the enterprise diminishes, and it will be outweighed by other actors in the market. Other Researchers such as Flynn indicate that innovation is derived from the Latin word ‘innovare’ meaning ‘to make new’ (Flynn et al., 2003).

Since the introduction of the concept of innovation as an explanation to changes in economic growth and business practices, many years has been passed by. Nevertheless, the academic literatures hardly give any precise definition for innovation, rather broad and general ones. These concepts and definitions, though, have some features in common.

The first common characteristic common to the various definitions of innovation are: “new to the beneficiary or adaptor” and/or “new that has never been in existence - new to the world” (Ross, 2001). For instance, something that has already been practiced in one organisation, region and/or country might be considered an innovation when it is introduced to a market that has never seen it before. Such innovation is then new only to the adaptor or the market. Moreover, an innovation may occur when a new invention or creation, which has never been in existence, is commercialized for the first time in a market. The creation and commercialization of photocopier machine is an example of the latter. In contrast, a large body of researchers agree that an innovation is the application of an invention or creation, regardless of its novelty.

In most cases, invention and creativity are treated as synonyms. To some researchers, though, the two terms are slightly different. Invention is the birth of a new idea to a new product, process or procedure with some claim to novelty or originality

(Brodtrick, 2001; Flynn et al., 2003). An invention may often, but not always, be patented (Freeman, 1982). In contrast to this, creativity is the thinking that produces any creative idea (Radhakrishna and Varadaraja, 1991). In fact creativity exists in every stage of the innovation process (Radhakrishna and Varadaraja, 1991) and in all aspect of life (DeMarco, 2001). The impact of creativity is, however, stronger at the initial stage of the innovation process as it gives direction to it.

The second common characteristic in most definitions of innovation is the inclusion of the word 'process'. Despite the fact that the process of innovation is so complex - which involves a number of internal and external interactions - it basically holds three stages: invention, translation and commercialization. The implicit tenet behind the process of innovation is that invention/creativity - although important in the process - is not a prerequisite for an innovation to take place (West and Farr, 1990; Amidon, 2001); an already-existing idea, inside the enterprise or outside of it, may be turned into widely used business practices by exploiting them (Hirji, 2001). Innovation, in this case, is a match between a need, and an idea which already existed (Ijuri and Kuhn, 1988). On the other hand, a creative idea may not be turned into innovation if it is not suitable to commercialize or is hard to adopt. To no surprise, many creative ideas developed in the R&D department of many organizations may fail to be commercialized. For example, Dvorak's revised keyboard is an example of how an obviously superior idea was never implemented, and thus never became a true innovation (Brodtrick, 2001).

The third common characteristic in the definition of innovation is that it is an introduction of a deliberate action, to get a solution to a pressing problem. In this regard, among others, innovation stems from a need, greediness, and a challenge. During the intentional introduction, though of an action to fulfil these needs, an innovation may develop unintentionally (Schumann, 2005). The development of an innovation in such a manner is said to be an innovation generated by creative serendipity (Flynn et al., 2003). The polymer, which has dominated most of today's chemical products, is an innovation resulting from creative serendipity.

Finally, innovation may be seen as an organizational change; but not all organizational changes are innovations. Some changes occur as an adjustment in response to routine change to internal or external environmental conditions - without intentional or a direct

benefit to the entity (West and Farr, 1990). For example, a routine firing of hotel staff in winter when bookings fall would not constitute innovation.

As has been stated in chapter one, the definition of innovation adapted for this thesis is: *the intentional introduction and application - within a role, group or organisation - of ideas, processes, products or procedures (new to the relevant unit of adoption) that is designed to significantly benefit the individual, the group, organisation, or wider society* (West and Farr, 1990).

2.3 Classifications of innovation: types of innovation

The concept of innovation, as stated above, is broad and multidimensional in nature. This often creates ambiguity towards its conceptualisation. Many authors and researchers tried to simplify and reduce this through classification. Classification in innovation studies, as in any other scientific discipline, helps to manage the diversity, and to reduce the complexities of multidimensional phenomena (Adams, 2003). Likewise, intuitive categorisation of innovation as area of focus and degree of newness, become by convention, the default independent variables for many innovation studies. These classifications are not exhaustive; the classification of innovations based on their psychometric properties or attributes is incorporated later. A recent research by Adams (2003) proposes a three-fold holistic approach for the classification of innovation based on: area of focus, degree of newness and attribute.

2.3.1 The area of focus or functionality of innovation

Categorization of innovation based on its area of focus includes administrative, technological, process, service and product innovations.

Administrative innovations deal with the application of new administrative methods and systems aiming at finding new ways of doing or making things (Radhakrishna & Varadarajan, 1991; Adams, 2003). These innovations do not provide a new products or services, but can directly influence the introduction of new products or services or the processes for producing them. As such, administrative innovations are only indirectly

related to the basic activity of the organization and are more specifically related to its management, personnel, allocation of resources, and the structuring of tasks, authority and rewards (Subramanian and Nilakanta, 1996).

Technology innovation in turn is connected with the use of knowledge for the creation and implementation of new technologies, and for developing new things to sell. Unlike administrative innovations, technological or technical innovations are directly related to the primary work-activity of the organization. They occur in the operating component of an organization, and affect its technical system where technology is usually regarded in an instrumental sense by which individuals and organizations transform raw materials or information into products or services (Adams, 2003). Although some sources treat technological innovation as separate from *process, product and service innovations*, current researches maintain that technological innovations consist of these innovations, since they produce new products, or render services directly related to the basic purpose of the activities of the organisation (Mahdjoubi, 2001; Adams, 2003). Additionally, in an attempt to broaden the classification of innovation from being limited to products and processes, Mahdjoubi introduced the new concepts 'domain' and 'scope' (Mahdjoubi, 2001). Although there may exist some commonalities in the definitions of innovation for the various domains, Mahdjoubi (2001) stated that they are not identical in all cases. The domain (or discipline) of innovation is built into industry, medicine, military, art, etc. Within each domain, the classification of innovation is based on its scope. For instance, traditionally, industrial innovation was limited to the narrowly focused technological innovation (Mahdjoubi, 2001). Recently, such a scope is extended into technological innovation, learning innovation, organisational (leadership) innovation and market (customer) innovation.

2.3.2 Degree of newness

Along with the fact that many authors admit it is difficult to identify universally agreed definitions (or measures of newness), some evidences reveal that the degree of newness is generally determined along a continuum between contrasting polar extremes. As such, in literature, it is prevalent to find several categorizations of innovation, reflecting these extremes. These polar extremes are based on the degree of newness

and magnitude of change. They include: incremental vs. radical innovation (Grulke and Silber, 2001); continuous vs. discontinuous (Saaksjarvi, 2003; Bishop, 2005); sustainable vs. disruption innovation (Grulke and Silber, 2001). Incremental, continuous and sustainable innovation, all articulate a low degree of newness and low magnitude of change. In contrast, radical, discontinuous and disruptive innovation expresses a high magnitude of change and a high degree of newness. Based on the impact of the innovation on the component part, innovation can also be classified as modular vs. architectural (Henderson and Clark, 1990).

The following discussion is dedicated to the provision of a comprehensive understanding of each of the above categories of innovation.

2.3.2.1 Radical Innovation

Radical innovation is defined as the commercialization of products and technologies that have *strong differential impact on the market*, in terms of offering completely new benefits and also impacts on the firm, in terms of its ability to create new business (O'Connor and Ayres, 2005). Radical innovation is more focused on new technologies, new business models, and breakthrough businesses. As a result, it may threaten competitors and even the industry leaders. The phenomenon of displacing the products of your competitors is called *competitive displacement* (Kaplan, 2002). Similarly, radical innovation imposes pressure and thereby rather threatens a firm's own business model before someone else does (Grulke and Silber, 2001). This is known as radical cannibalism (Kaplan, 2002). Such cannibalization effect is the reason why most decision makers of a successful products or processes are often unwilling or slow to innovate (Cravens et al., 2002).

Cravens et al. (2002) maintained that value migration (the replacement of existing products and process by the value offering of a discontinuous innovation) serves as a proactive cannibalization initiative for such decision makers. For example, it is apparent that the digital technology will eventually upset conventional photographs. Accordingly, Kodak and other camera and film makers anticipated value migration towards digital pictures. It should become popular since via computers it can be processed, printed, stored, and e-mailed to interested parties.

In literature, there exist many terminologies that are used interchangeably with radical innovation, which usually create communication problems. Amongst others, these include words like: discontinuous, breakthrough, revolutionary, and paradigmatic innovation (Eloranta et al., 2002). Some authors treat them as synonyms, and others put them as having slight differences. For example Lambe and Spekman (1997), O'Conner (1998), and Bishop (2005) treat discontinuous innovation as closely related to radical innovation. Rabson and DeMarco (1999) view radical innovation as a revolutionary and paradigm change. The prime cause for such discrepancies can be attributed to the fact that innovation is researched from a variety of disciplines and languages (Garcia and Calantone, 2002). Thus for the sake of creating a common language, this thesis maintains the above terms as synonymous with radical innovation.

2.3.2.2 Disruptive innovation

The origin of disruptive innovation is traced back to Schumpeter's definition of creative destruction. According to Schumpeter, creative destruction is to create the disruptive effect of a true innovation (Grulke and Silber, 2001). Despite many researchers (Kippenberger, 2000; Cravens et al., 2002; Adams, 2003; Lyytinen, 2003) treat disruptive innovation as synonymous with radical and discontinuous innovation, while Grulke and Silber (2001) view it as of slightly different in meaning. They see disruptive innovation as a departure from an incremental innovation, by pursuing a radical innovation strategy. Such disruptive nature of innovation may best be described by using two matrixes: market linkages and technological linkages. According to Grulke and Silber (2001), disruptive is an innovation that destroys a pre-existing market linkage while enhancing the technological base. Alternatively disruptive innovation destroys the pre-existing technological base, while enhancing the market linkages. For instance, an airline business that invests in a new Internet-based seat reservation system using all the latest technologies, gives large improvement to the access by travel agents. This significantly lowers the costs, enhancing the airline's market linkage. However, when the current technical staffs of the airline are not able to deal with the latest technology, it causes disruption. On the other hand, if the airline business decides to provide its customers internet-assisted self-booking and Internet

payment, the agents will be bypassed. This is then called the disruption of market linkage.

2.3.2.3 Incremental innovation

Incremental innovation is a slight stepwise modification of the pre-existing state of an operation on its technologies. Incremental innovation is called a 'bottom-up' process, as it focuses on the improvement of the existing constituents (Terziovski, 2002). It seeks to improve on the systems that already exist, making them better, faster and cheaper. Incremental innovation may incorporate a dynamic modification of an existing one (Saaksjarvi, 2003). A wide screen TV and conference calling are good examples. In his study, Terziovski (2002) concludes that a continuous incremental improvement is the major driving force behind any improvement effort. Some commentators say that about 90% of all innovations in industries are incremental innovations (Gulke and Silber, 2001). Importantly, incremental innovation is one of the proactive strategies available to managers to reinvigorate with discontinuous innovations. A successful example of incremental innovation is Gillette's continuous improvement of its razors, thus averting discontinuity (Cravens et al., 2002). However, the rate of return from incremental innovation is, estimated to be only 10% - which is far less than the 50-60% rate of return accompanying radical innovation (Gulke and Silber, 2001).

Therefore it is not strange that some authors such as Kim and Mauborgne claim that it is hard to view incremental improvement is an innovation; rather than 'imitation' (Kim and Mauborgne, 1999). Their basic argument is that it does not involve a unique and different way of doing things, which only replicate the existing methodology and logic extension (Ross, 2001). Based on the definition of innovation, however, regardless of the employment of new technology and/or process, incremental innovation is considered innovation as far as it is perceived as new by the relevant adopter (West and Farr, 1990; Adams, 2003).

The literature holds a number of terms that are used alternatively with incremental innovation, which includes: evolutionary, continuous and sustainable innovations. Throughout this thesis, these terms will be used interchangeable with 'incremental innovation'.

2.3.2.4 Architectural vs. modular innovation

The classification of innovation as incremental, disruptive and radical is incomplete without including the theme of architectural Vs modular innovation. In this regard, the essence of the classification of innovation is based on its impact on a single component as well as the link between the components (Henderson and Clark, 1990). Architectural innovation deals with the way in which the components of a product-offering are linked together (Macher and Richman, 2004). On the other hand, modular innovation refers to the changes that impact only on the core design concepts of a technology. The replacement of analogue with digital telephones - that leaves the architectural aspect untouched - is an example of modular innovation. While leaving the core design concepts untouched architectural innovation reconfigures established systems in a new and (potentially) novel ways, and thus potentially destroys the usefulness of firms' existing architectural knowledge (Henderson and Clark, 1990; Macher and Richman, 2004). This does not mean the core components are entirely untouched by the architectural innovation; it is often triggered by a change in a component. This can entail change in the size or other parameters of its design, which creates new interactions and new linkages with other components in the established product. The thing that remains the same is the core design concept behind each component, and its associated scientific and engineering knowledge. Once a design is accepted within the industry, its architectural knowledge becomes stable, encoded and implicit. Incremental innovation, thus, occurs within the context of stable architectural knowledge.

To Henderson and Clark (1990), the classification of innovation as architectural vs. modular, incorporates radical as well as incremental innovations. They call a radical innovation the extreme case of an architectural innovation and its lower end is incremental innovation.

2.3.3 The attribute or psychometric property

An attribute is a descriptive property, quality, or feature, belonging to an innovative entity; it is the quality that individuals assign to an innovation. Categorizing innovation based on the psychometric property of an innovation, is a complex and multi-

dimensional. Existing literature asserts that an innovation attributes as a mono- or bi-dimensional, which deals with a single or dual attributes. Adams was the first to apply empirical research to explain the multi-dimensional nature of the attributes of innovation (Adams, 2003). He concluded that innovation adaptation, transfer and diffusion are influenced by the inherent innovation attributes, and these attributes are multi-dimensional in nature. The association of an attribute to the psychological process of an individual is difficult to conceptualize. For instance, what is incremental innovation to one may be radical or disruptive to another.

Finally, it should be noted that the above-mentioned three broad classifications of innovation (area of focus, degree of newness and attribute) are not to be viewed as locked within rigid boundaries. It is not uncommon to find one classification overlapping with another. For example, the degree of newness can sometimes be seen as an attribute category and at other times as an area of focus

2.4 The input-process-output model of innovation

Innovation stems from an ideation, that is, expressed as in information, ideas and knowledge. Such an ideation requires a creative mind (Adams, 2003). Ijuri and Kuhn (1988) illustrated a number of factors that stimulate creativity. Amongst are: *a shock (a major failure) to the system, random variability in experimentation, deliberate decision to invest in learning, formal vehicles for stimulating innovation such as research and development, managerial risk seeking or risk averse behaviour, availability of slack resources, management philosophy and organizational climate, and customer needs*. The conversion of creative ideas into innovation occurs through a process consisting three stages: the input stage, the process stage and the output stage (Radhakrishna and Varadaraja, 1991; Adams, 2003). An analysis of each of the three stages of the innovation process may assist to identify important variables incorporated in each stage, and the decision to be taken to enhance innovation.

2.4.1 The innovation inputs

The three basic input variables that organizations need to consider for idea generation are: structural factors, resource factors, and people factors.

2.4.1.1 Structural factors

Among others, the specific variables to be considered in identifying structural factors are:

Size: although there are ambiguities on the exact measurements of innovation, there exists some evidence that the relation between organizational size and innovation is positive. The measurement of organizational size used is based on personnel indicators (number of employees), non-personnel indicators (physical capacity), input and output indicators, and financial resources (Adams, 2003). Large organizations have more resources to invest, more marketing skills, research capability than small sized, as well as continuous innovation based on the pools of accumulated knowledge and loss tolerance. Large organizations may amplify information interchange with communities that have a variety of knowledge and culture. Out of friction caused by this interchange, competing ideas may arise that can initiate innovation within the organization (Brown and Duguid, 1991). Small organizations, in turn, have more flexibility than large ones: a competence necessary for creativity (Damanpour, 1996; Hegde, 2004). The optimal size of an organization to enhance creativity and innovation is, therefore, contingent on specific circumstances (Hegde, 2004), as well as its ability to integrate working, learning, and innovation (Brown and Duguid, 1991)

- **Complexity:** complexity, the amount of occupational specialisation and task differentiation within the organisation, can have a positive influence on innovation. The complex systems of today's products and services, however call for knowledge arising from multidisciplinary and collaborative efforts. Greater complexity provides an opportunity for a diversity of specialists, as well as more differentiated units from which collaborative relationships can emerge (Amabile, 1998). Caution must be taken, since complexity could have positive influence on the initial stages, while it can gradually turn to negative during the implementation (Wolfe, 1994).

- **Vertical diversification:** this is measured by the levels of hierarchy in an organisation. It usually has a negative relationship with organizational innovation. An increase in the number of hierarchies and in the bureaucracy inhibits the communication needed for innovation. Conversely, a flat organization structure facilitates intra-organizational communications, and thus enhances innovation (Roffe, 1999; Adams, 2003; Martins and Turblanche, 2003).
- **Functional differentiation:** this refers to departmentalization, measured by the number of units under the chief executive level. There is a positive relationship between functional differentiation and innovation. It assumes a high cooperation and integration among the various functional areas in uncontrolled and unrestricted fashion (Adams, 2003; Martins and Turblanche, 2003). A greater variety of specialists provides a broader knowledge base, and increase opportunities for the cross-fertilisation of ideas.
- **Organizational types:** there are numerous classifications of organizational types. However, researchers show that the dominant ones are 'mechanical' and 'organic'. Mechanical types of organizations hinder creativity and innovation (Youngblood, 2000). They favour centralization of authority, and formalization of procedures, which hinders initiation of innovation. Mechanical organizational types are convenient to operate in a stable environment. Adams (2003) maintained that they have positive impact on incremental innovation. On the other hand, organic organizations have a positive impact on innovation. They are well-adapted to changes, and unstable conditions, and are able to yield more radical innovations. In today's fast changing environment, organic organizational type enables an enterprise's success. 'Quantum organization'- an organization that succeed in the fast moving complex business environment - is a term used to describe organic types of organisations, as opposed to mechanistic organisations (Youngblood, 2000).
- **Longevity:** research has indicated a curvilinear relationship - positive relationship, but at decreasing rate - between innovation and organizational age (Maria and Marisa, 2003). However, there are some controversial

findings. Adams (2003), for example, indicated that matured enterprises develop organizational cohesiveness, which may facilitate innovations to the psychological safety it brings. Similarly, as the group in an organization matures the propensity to innovate gradually declines for the collective mind decreases gradually. The same is true with regard to the age of individuals. Young people tend to be more creative and innovative as they have less mental luggage in the form of preconceptions or assumptions. They are more future oriented and ready to experiment despite of the fact that they lack experience. As individuals advance in age they object too much, consult too long, and becomes less adventurous. Thus, their creative and innovative power diminishes (Adair, 1990).

2.4.1.2 Resource factors

According to the resource-based view, internal resources of a given enterprise include organizational processes, firm attributes, information, knowledge etc. These resources enable a firm to develop a dynamic capability; to envisage and implement strategies that improve efficiency and performance (Fahy, 2000; Adams, 2003). Competitive advantage of the firm is sustained as long as these resources are operationalised by the firm, unique to the firm, and imperfectly imitable. Adams (2003) illustrated that knowledge, technical knowledge, slack, and professional knowledge is particular resources that influence innovation in an organization.

- **Knowledge:** knowledge forms the fundamental component at the core of the innovation process. In an organization, it is, among others created by the interaction of individuals. Organizations accumulate knowledge over time by learning from its members, and other network partners (Adams, 2003). This knowledge becomes embedded in the organizational culture, and enriches its innovation meme: a unit of cultural transmission or imitation that carries information responsible for innovations, and that can be transferred to other carriers - employees, departments, and organizations (Voelpel et al., 2005). The culturally embedded explicit and implicit knowledge are transferred from an organization to individuals, groups, firms, and inter-firm through the four knowledge conversion processes: socialization, externalisation, combination,

and through the internalisation (Nonaka and Konno, 1998; Leibold et al., 2002). Additionally, learning through an unstructured and semi-structured process, is a key way of tacit knowledge acquisition and transfer (Brown and Duguid, 1991).

- **Technical knowledge:** it is suggested that the relationship between the technical resources in the innovation system and technical knowledge is directly proportional (Adams, 2003; Saaksjarvi, 2003). The same is true for administrative intensity - expressed as the ratio of managers to employees - and administrative innovation (Adams, 2003).
- **Slack:** slack is a resource above the minimum level of producing an output. Among others, slack can be an unused capacity or redundant employees. An excess of input allows innovation to be derived exogenously or to be purchased, provide opportunity for diversification, allow for relaxation of control, foster a culture of experimentation, and protects from a project failure. In these scenarios, slack has a positive impact on innovation. On the negative sense, slack is perceived as a waste that implies unnecessary cost that should be eliminated (Adams, 2003).
- **Professionalism:** Adams (2003) cited that there is a positive relationship between the number of staff with professional knowledge in an organization - measured by the number of staff with specific educational knowledge - and innovation. There are, however, some authors who comment that educational knowledge is only useful in an evolutionary environment, where it can assist incremental innovation. In the revolutionary environment of the knowledge and innovation economy, there is doubt on the relevance of existing educational systems: they are less likely to bring radical innovation (Leibold et al., 2002).

2. 4.1.3 People factor

Creative individuals seed new ideas to organizations. The conversion of these ideas into innovation requires a teamwork and organisation of skills (Adair, 1990; Adair, 1996). Generally, innovation in an organisation is directly related with the suitability of

the organizational climate; the later establishes a group personality that may facilitate or hinder innovation. For example: the establishment of communities-of-practice in an organization facilitate innovation (Brown and Duguid, 1991). The actual behaviour of communities-of-practice is constantly changing, both as newcomers replace old timers, and as the demands of the practice forces the community to revise its relationship to its environment.

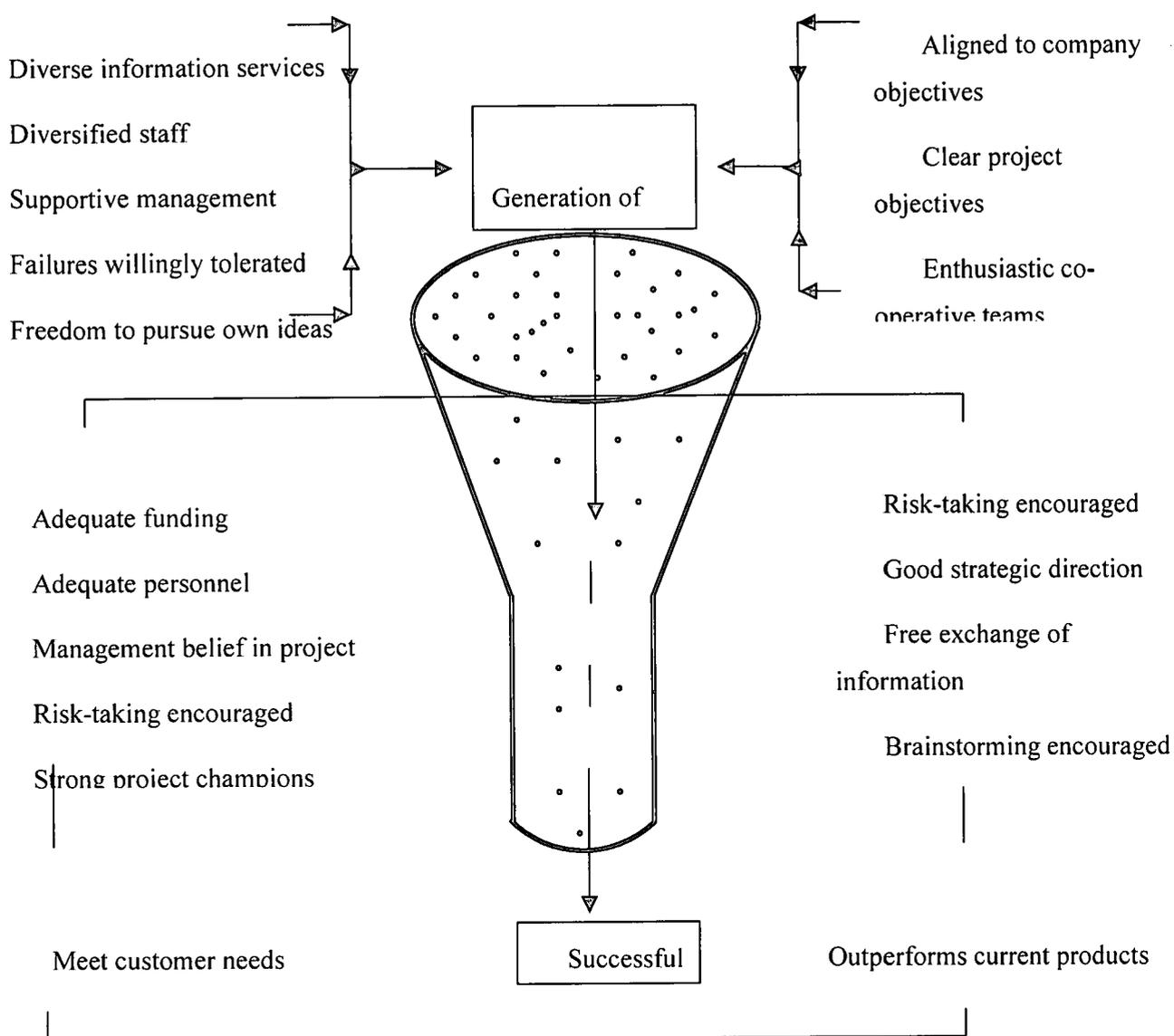
Despite the existing controversial views that the individual factors does not influence innovation, some evidence show that demographic characteristics (age, sex, cosmopolitanism, and education) and disposition (adaptors, innovators) of the individual play a vital role in innovation (Adams, 2003). Adaptors are persons who rely on previous knowledge for solving a problem, while innovators strive for new solutions.

2.4.2 Innovation process

Innovation process is temporal and sequential activities shaped by collective efforts. It commences with idea generation and ends with a successful application or commercialisation of these ideas. Figure 2, provides a comprehensive overview of the innovation process, with a particular focus on the associated individual variables to be considered at each stage of the process for an effective cultivation of innovation.

In the innovation process, there exist three overlapping sub-processes, namely: the production of knowledge, the transformation of knowledge into products, systems, products and services, and the continuous match of the latter to the market needs and demands (Adams, 2003).

Figure 2.1: Factors affecting the innovation process



Source: Flynn et al., 2003. Idea Management for Organizational Innovation. *International Journal of Innovation Management*, 7(4): 424.

Nevertheless, the process varies with regard to a firm's sector and size. In every process of innovation, two issues that remain generic are: coordinating and integrating specialized knowledge, and learning in conditions of uncertainty. To manage these scenarios, it seems a process-based approach to innovation (a corporate-wide effort that involves all employees and other partners to add value to the benefit of the customer) will play a significant role. The developments in information and communication

technology assist the management of the process-based approach. Despite of the advances in information and communication technology, the process of innovation remains unpredictable and difficult to manage (Pavitt, 2003). Hence, should the innovation process is to help a business to really prosper, and to enhance its innovation outputs, some reorganization have to take place. The management aspect of business innovation is discussed in chapter three.

2.4.3 Innovation output

The efficiency of the process of innovation is tested against to financial and market performance and economic indicators. Amongst other, the indicators of innovation-output include: the number of patents issued, the amount of R&D spending, new product announcements, and a firm's performance (Maria and Marisa, 2003). Some commentators argue that R&D spending is not an indicator of firm's performance, because it is normal input to the innovation process. They further assert that the number of patents is less likely to indicate organizational performance as it is only a representation of creativity, not an indicator of innovation (Richard et al., 2002). Those who agree that the number of patents is an indicator of a firm's performance, maintain that it may increase the absolute sales, but the year-to-year percentage of change actually declines due to the shift of customers to substitute products. Similarly, there are indications that the numbers of patents do not represent the entire innovation outputs of an organization; some innovations may be obtained from the external sources (outsourcing). For example, a further modification of a technological innovation by suppliers may result in a new innovation. A research by Maria and Marisa indicated that a curvilinear relationship exists between R&D spending and product announcement, despite an initial decrease in product announcement. The decrease in product announcement, at the initial stage, is due to the allocation of the expenditure to the basic research - the research component - of the R&D process. This leads towards the increase in patents without product announcement. As the expenditure extends to the development component of R&D the product announcement increases at a diminishing rate (Maria and Marisa, 2003).

2.5 Diffusion of innovation

Once a commercial application of an innovation is realized, the next step is how to disseminate or diffuse it. Diffusion, as used by innovation economists to denote the extent and pace at which an innovation is copied by others in the market place once proven as a commercial success (McLoughlin and Harris, 1997) and being socially beneficial (West and Farr, 1990).

Often, technological innovations can not necessarily be adopted as 'off-the-shelf' packages, featuring fixed parameters and universal application. It may sometimes require basic modifications or re-invention to fit the users-demand. The process in which technologies evolve during implementation through further elaboration is known as 'innofusion' (Fleck et al., 1990 cited in Robertson et al., 1996). The process of innofusion enhances organizational or user knowledge bases, as they - acting according to economic self interest - become aware of the cumulative and progressive transformation of an innovation. The relevant re-inventions are then incorporated to facilitate the development of new versions of the technology. As a result, adopters of the innovation benefits from the incorporation of the modifications that aids the diffusion process.

Among others, diffusion of innovation is influenced by the characteristics of customers. This concept stems from the work of Everett Rogers, 1962. Since then, it has been researched by a number of researchers. A common characteristic among these is the classification of adopters into five categories, namely: innovators, early adopters, early majority, late majority and laggards (Keegan et al., 2003; Verleye and Marez, 2005). This classification is based on the traditionally conceptualization of innovation adoption as a sequence of steps in which the consumer passes from the initial knowledge of an innovation, forming a favourable attitude towards it, to reaching an adoption. Recent research conducted on the adoption of technological innovation by Saaksjarvi, discloses that technological innovation adopters do not necessarily fall within the above-mentioned categories of adopters. Based on the core and/or supplementary knowledge base, Saaksjarvi' categories of the innovation technology adopters are: technovators, supplemental experts, novices, and core experts (Saaksjarvi, 2003). 'Technovators' are those who recognize the benefit of new technology earlier than others, adopts it, and communicates these benefits to other adopter segments.

They appreciate technology for their own sake. 'Supplemental experts' are the second adopter category. They want to apply their knowledge into different products and services. 'Novices' do not possess any expertise in core, supplemental product, or service area-which makes them more open to innovations. It therefore holds third place in the adopter category. 'Core experts' have know-how in the core knowledge, but not in the supplementary knowledge. They stand in the fourth position of the technological innovation adoption category. The existence of established knowledge - core information - helps core experts to understand incremental innovation. However, it hinders radical innovation due to the assumption that discontinuous innovation makes their knowledge base obsolete.

2.6 The paradigm shift in the source of innovation for business enterprises: the five waves of innovation

The concept 'innovation' was first introduced in business by Schumpeter in 1912, while he was reasoning about the causes for the long economic cycles in the capitalist economies - a question first raised by Kondratieff at the late 19th century. To Schumpeter, the cause for the up-down swings in economic levels is innovation, means not only to new inventions but also to any change in the method of supplying commodities (Grulke and Silbert, 2001).

Schumpeter's definition was the first initiative attempting to challenge the classical economics, which sought (and still seeks) to optimize existing resources within a stable environment. In this respect, economic growth is achieved through the optimization of traditional factors, which are inputs of labour and capital. This considers technical progress that including all contributions to growth such as education, management and technological innovation as a 'residual' factor (Freeman, 1982). Innovation waves and shift in the source of innovation are provided in table 2.1.

To this intellectual concept an entrepreneur, who with his rumbustious behaviour shifts economic resources out of an area of lower productivity into an area of higher productivity and greater yield and into an area of higher productivity and greater yield was introduced. The word 'entrepreneur' was coined in 1800 by a French economist, Jean-Baptiste Say. It is defined as a person who organises, manages and assumes the

risks of a business enterprise. He/she conceives or receives ideas and turns them into business reality. An entrepreneur often uses other people's ideas and other people's money to develop a market opportunity (Adair, 1990; Adair, 1996). Financial viability is the single most important aspect of what they do (Boschee and McClurg, 2003).

Schumpeter observed that a normal healthy economy was not in equilibrium, but it is one that is constantly being disrupted by technological innovation (Valéry, 1999). The importance of an innovative mind to enable continuous change was incorporated as major player among the traditional factors of production. Hence, entrepreneurs (inventors) are conceived as the source of innovation (Freeman, 1982). This transformation is recognized as the first wave of innovation, where innovation was seen as the introduction by the entrepreneur of a new combination of productive factors and conditions to the system (Chuanqi, 2005). **Table 2.1** below provides summary of the various waves and sources of innovation prevailed in the world economy.

Table 2.1: Waves and sources of innovation

Innovation waves	Innovation sources
First wave	Incorporation of individual inventor- entrepreneur to traditional production factors: labour and capital
Second wave	Bureaucratically managed large scale R&D
Third wave	Incorporation of marketing research to large scale R&D. Mergers and acquisitions to acquire innovative capacity
Fourth wave	Networking and collaboration to complement the deficiencies of M&A
Fifth wave	Knowledge acquired from the global community: open innovation

Source: Chuanqi, H. 2005. *From Innovation to Knowledge Innovation [online]*. Available: <http://www.modernization.com.cn> . [2005, September 23].

Innovation, however, is not the result of a few innovations by one or two innovators. At an economic level, it is the result of hundreds of thousands of entrepreneurs

innovating continuously over a long period of time (Gulke and Silbert, 2001). Accordingly, a bureaucratic management of innovation was replacing individualistic flair, and the larger corporation became the main vehicle for technical innovation in the economy. The source of innovation, in this case, has shifted from inventor-entrepreneur to the large scale R&D of organizations. The rationale for such a shift was that individuals with creative ideas could not afford to turn it into innovation on their own.

The high cost of innovation, therefore, compelled organized large scale of R&D - this constitutes the second wave of innovation (1950s-1960s). Subsequently, efforts to generate discoveries and inventions, based on the use of a simple linear technological push-model, have been increasingly centralized on a separate R&D department.

A technology push-model implies that the innovation process begins with the discovery of natural phenomena, and then waits till the science is completed and packaged, before using it for a product (Hsu, 2005). It is then perfected before being applied: no need for a particular research or discovery, or for trial and error in marketing innovation.

While the growth of R&D was the most important social and economic change during the 20th century, the extent of specialization should not be exaggerated. Important inventions were still being made by production engineers or private inventors, and with every new process many improvements were made by those who actually operate it. In some firms there were *technical* or engineering departments or sections, whose function is often intermediate between R&D and production. They may often contribute far more to the technical improvement of an existing process than the formal narrowly defined R&D department (Freeman, 1982).

During the innovation wave of the earlier 20th century, the market was seen as simply the recipient of R&D results. It is only in 1970's, that a demand-pull model became more popular, emphasizing the importance of marketing. The market was now seen as the starting point for creativity, and the guide of R&D. R&D was therefore extended in order to accept directives from the market. A chain link model was established when the linear model was supplanted by feedback stimuli received from discovery to application, and also from the market itself (Padmore et al., 1998). This might have helped to overcome the problem of refusal during the commercialization stage, thereby

reducing losses that can result when investments fails to produce economic benefits (Hsu, 2005).

In the 1970's-1980's, a third wave of innovation emerged: the industrial innovation (Chuanqi, 2005). Industrial innovation refers to research organizations engaging in innovation activities, by implementing R&D results through the finding of new industries or by aiding in the upgrade of existing one (Hsu, 2005). While the R&D department still maintains the generation of systematic technological innovation, the focus for finding sources of innovation has extended from limited internally generated ideas, to a broader level. Networks were also developed as intermediate coordinating mechanisms between traditional hierarchical organizations and market forces (Pyka, 1999).

In industrial innovation, in addition to its internal competence, another success factor of an organization is its ability to screen market opportunities, and convert them into innovation. Many organizations created value, by increasing capital deployments (investments) in order to face the challenge of competition. To effect this, mergers & acquisitions arose in enterprises and industries in order to supplement their internal R&D for effective innovation (Thomson, 2001).

Increasing capital deployment, though, does not necessarily sustain strong industrial competitive advantage. To leverage innovation, companies increasingly strive to complement their internal efforts with external opportunities. For many firms, partnering can provide quick, flexible, affordable access to new capabilities, which represent a better strategic option than merger and acquisitions. Likewise, collaborative efforts can help companies to get access to the most value from internal resources of others, which might not be obtained through their sole internal plans (Thompson, 2001). This is recognized as the fourth wave of innovation, which developed in the 1990's.

An innovation system, as a set of distinct institutions that contribute to the development and diffusion, also emerged during the fourth wave of innovation. Compared to the industrial innovation, this is a broader view to innovation. Along with this, concepts including national innovation, local innovation and regional innovation are developed, to reveal that innovation is achieved by collaborating and networking of institutions that operate at national, local and regional level (Porter, 1990; Chuanqi,

2005). These interconnected institutions form a system whose performance is determined both by the individual institution, and by how they interact with each other as elements of a collective system. Industries benefit from the resultant creative ideas of the R&D whose source of information is the interaction between these innovation systems. The role of the industries is to efficiently and effectively convert the resultant creative ideas into innovation.

The increase in the development of information technology, in the late 20th century, has flooded the world economy with information. Most corporations had more of this than they could handle. Knowledge management - the collection of processes that govern the creation, dissemination, and leveraging of knowledge to fulfil organizational objectives - has been introduced as a solving mechanism to this upsetting paradox: on the one hand the need for information as an input to the innovation process, and on the other hand the inability to handle and exploit it (Lee and Yang, 2000). This transition is recognized as the fifth wave of innovation; it led towards the birth of a new economy called the 'knowledge-based economy' (Nonaka and Konno, 1998; Leibold et al., 2002). The source of innovation in the knowledge-based economy is, as its name implies: knowledge. Thus, the competitiveness of enterprises is determined by their ability to deploy on, and exploit knowledge innovation: to be the first in the world to discover, invent, create or use new knowledge (Chuanqi, 2005).

Despite their significant differences, researchers show strong complementarities between knowledge and innovation. Knowledge is an observer's distinction between the objects in the background of his experience, and a self-consistent set of coordinated actions. Through the process of distinction, individual pieces of data and information become connected with one another and form knowledge. While information is data organized into a particular pattern, knowledge is therefore more than information and data. Information transforms into knowledge when a person reads, understands, interprets, and applies the information to specific work functions (Davenport and Prusak, 1998; Lee and Yang, 2000). In organizations, knowledge often becomes embedded not only in documents or repositories, but also in organizational routines. As a result, therefore two types of knowledge: explicit or codified, and implicit are identified. The former involves know-how that is transmittable in formal, systematic language. Explicit knowledge does not require direct experience of the knowledge that is being acquired, and it can be transferred into the formats as blueprints or operating

manuals. By contrast, tacit knowledge cannot be communicated in any direct or codified way. Thus, it represents embodied know-how that is acquired via the informal take-up of learned behaviour and procedures (Nonaka and Konno, 1998; Howells, 2002).

2.7 The future perspective of innovation

The prevailing 21st century business environment is characterized as complex, dynamic, and turbulent. Enterprises of any type are under a pressure of hyper-competition. Hence, the main threat of most enterprises is the competitive challenge that may emerge from anywhere by any other enterprise (large, medium, small, or newly emerged). For example, a survey quiz for 9,300 business leaders around the world on the most important trends influencing the global economy in the next five years, with a particular focus on growth and its constraints, concluded that strong competition is the major threat of growth (Carden, 2005). Many researchers indicated that innovation capacity - a continuous improvement of the overall capability of firms to generate innovation for developing new products to meet market needs - provides the potential to withstand the above-mentioned challenges (Carden, 2005; Voelpel et al., 2005). A recent survey on innovation in 2005 by the Boston Consulting Group showed that 74% of the executives surveyed said that their companies will increase spending on innovation by up to 64% from 2004 (Financial Executive, 2005).

However, a number of researches show that the innovative capacity of enterprise stems not only from the internal R&D but also through the opening of its boundary to external sources in order to leverage absorptive capacity. Intra-organisational integration, collaboration with business partners, inter-organizational networks including with competitors - regardless of their physical location, and collaboration with other institutions - are among the interactive sources of external knowledge to innovation. To obtain such new innovation capacity, enterprises need to open up their boundaries beyond the existing limit of networks of collaborations.

2.8 Summary

The purpose of the chapter was to provide a comprehensive understanding of business innovation. Innovation has been defined in various ways by different researchers. The basic concepts incorporated among these researchers are: new to the world vs. new to the market, deliberate imposition of action to innovate vs. creativity by serendipity and change. Distinction is made between changes that contribute to the firm, individuals, the group, and to other partners. Changes that emerge as a result of an adjustment to external environment can not be viewed as an innovation, because it does not benefit either to the entity and/or other stakeholders.

To simplify its conceptualisation, innovation is classified into three broad categories: area of focus, degree of newness, and attribute. This categorisation though can not be viewed as exhaustive.

The commercialisation of creative ideas (innovation) involves three conversion methods: input, process and output. A number of factors that affect the process of innovation have been identified. The output of an innovation entails distribution to the market through a process known as diffusion. Furthermore, it is illustrated that adopters of an output engage in further modification of the innovation through a process known as 'innofusion'. The chapter addresses interesting new behavioural categorization of adopters of technological innovation: technovators, supplementary experts, novices and core experts, in place of the traditional view as: innovators, early adopters, early majority, late majority and laggard.

From the time when innovation was conceived as an explanation to the up - and - down swing of economic growth, a significant transformation occurred in the sources of innovation. At an early stage, entrepreneurs, outstanding individuals, were the motors of innovation. To date, the source of innovation has shifted towards the interaction within the socio-cultural environment, which includes business partners and competitors.

Finally, the chapter concludes that innovation played a vital role in business enterprises, and will in future continue as the major source of competitive advantage. The next chapter reviews traditional strategic management approaches, and the shift in management thinking regarding their view and incorporation of innovation and its practice.

CHAPTER III: EXTANT STRATEGIC MANAGEMENT APPROACHES AND THEIR RELEVANCE IN DEALING WITH INNOVATION

3.1 Introduction

In the 21st century, business environment is increasing in complexity. Profound business uncertainties and discontinuities are the phenomena of the day. In these scenarios, a management approach that is supportive to innovation would enable companies to pave a differential path of success. It is this supposition that derived the chapter to critically review and analyze existing management approaches and their relevance to deal with business innovation.

Management approaches have long been viewed as the concept and process that link an organization and its environment. A review of the evolution of these management approaches shows a number of development streams over the past years.

Traditional strategic management approaches comprise all strategic theories and models prior to the late 1990s. The macroeconomic instability of the 1970 tested the relevance of a number of the early theories of strategic management. Many of them could not withstand and handle this challenge (Grant, 1998; Shay & Rothaermel, 1999). The two approaches that seem to have been most accepted over the last two decades, and which are still the subject of many academic reviews, are the Porterian five forces (Porter, 1985) and the resource-based view of the firm. The latter has originated from the work of Penrose 1959 and is commonly known as RBV (Rivard et al., 2005). These two approaches are representatives of the “*Outward-inward*” and “*Inward-outward*” outlook of traditional strategic management thinking respectively.

A careful analysis of the academics arguments on the relevance of traditional approaches to strategic management in dealing with innovation – among others - reveals the following general deficiencies:

First innovation was enclosed within the limit of enterprises boundaries, in the form of closed system of innovation, for many years. And so, despite many

organizations committed themselves towards strategic innovation, they do not even involve other functional areas rather than with in a separate SBU (Cottam et al., 2001).

Second the innovative efforts of many enterprises hardly incorporate the broader socio-cultural environment of the business; if a tendency towards opening of a boundary exists, it is more likely to the extent of a known and established value networks.

These criticisms stem from the field of strategic management's endeavours to develop a proactive approach to the competitive pressures that originate from profound business innovations, facing many business organizations today. It also seems that strategic innovation (open innovation) induces a different mindset on existing strategic management approach. It is; therefore, legitimate to analyze the relevance of traditional strategic management approaches to deal with the required innovation.

To simplify the conceptualization of the management approaches evolved over the past years, the evolution of management approaches, the outward-in approach to strategic management, resource-based view to strategic management, and contemporary developments in the field including: dynamic capabilities, complexity theory and complexity management are systematically presented. Examining such notions could help to design *business strategy* that would enable a firm not only to adapt to, but also to develop a proactive strategic innovation.

3.2 The evolution of strategic management

The progenitor of Strategy goes to the title of 'Stratego', a combination of two words - stratos and agein - developed in the 508 BC. With the democratization of organizational reforms, Kleisthenes institutes ten tribal divisions as military and political subunits of Athens, each with its own strategy. 'Stratos' refers to an army spreading out over the ground, and 'agein' implies to lead (Cummings and Wilson, 2003). Stratos is, therefore, an elected leader of each division of the army.

Originating from such a military perspective, strategy has been adopted to business context in many forms at different eras. See Appendix A; it summarizes the issues of

concern to management approaches evolved over time. It should be remembered that the stated periods, in Appendix A, should be conceived as a rough estimates rather than accurate representations. Similarly, the issues of concerns indicated are not exhaustive; they are some among others that the researcher believes to have an impact on innovation. As revealed in Appendix A, the following discussion is, therefore, dedicated for the management approaches evolved over time.

3.2.1 Product and market oriented thinking

Between 1820 up to roughly 1900, an industrial revolution that witnessed the birth of a firm took place. From 1900 on, the focus of management approach was to develop and consolidate the industrial structure of firms created during the industrial Revolution. This era is known as an era of *mass-production*, and lasted until the 1930s (Ansoff et al., 1976). During this era, the focus of enterprises activity was on elaborating and perfecting the mechanism of mass production, which progressively decreased the unit cost of products. Additionally, the industrial lines were well drawn. For example, the steel and automobile companies were in the steel and automobile industries respectively. Firm's success was dependent on its ability to deploy knowledge about discovering and representing the essential stability that underlies particularities toward ever more complex and certain images, reducing individual guess work. As a result, managerial attention was inward-focused towards the efficiency of productive mechanism. This resulted on a set of managerial perceptions, attitudes and preferences which afterwards came to be known as 'production mentality' (Ansoff, 1979); production management held a key role, focusing on the supply side of a market. Such a phenomenon is also known as sellers' market. For example Henry Ford's vision of the 1908 'every American should be able to afford a car' is a typical production-oriented approach. To achieve efficiency and low cost of production, the company followed a mass - production scheme.

On the political context, the business sector was well protected against outside interferences. Political and social control as well as government interference with the free enterprise was minimal.

Towards the end of the 1930s, the demand for basic consumer goods was on the way towards saturation. The increasing affluent consumer began to look for more than basic performance. To meet this requirement, General Motors - for example - triggered a shift from production to a market mentality in the early 1930s (Ansoff, 1979). The introduction of the annual model change, to meet the changing market demands, was symbolic of a shift from standard to differentiated products. Promotion, advertising, selling and other forms of consumer influence became priority concerns of management. Hence, power in enterprises has shifted from production managers to marketing managers.

Since the 1940s, Ad-hoc management (no centrally guided, planned strategic development, instead the firm is active in pursuing incremental strategic changes), became the dominant mode of behaviour among progressive firms with strong R&D and market-development departments.

3.2.2 Corporate planning

From mid-1950s accelerating and cumulating events began to change the boundaries, the structure and the dynamics of the business environment (Ansoff et, 1979). Corporate strategy, as people tend to understand it today, was born (Cummings and Wilson, 2003). Its focus was to develop financial planning and control procedures, aiming at assisting managers to deal with problems particularly in coordinating decisions and maintaining control of activities in firms that were growing increasingly large and complex. However, the coordination of capital investment decisions required a longer-term planning horizon than annual budgeting plans. Strategy to this day is seen by classical school as management of the highest, overriding and most detached levels 'the planning, directing, organizing and controlling' of a company's strategy related decisions (Lawrence, 1999).

During the 1960s the emphasis on longer-term corporate planning reflected concern. The aim was to achieve coordination and consistency in investment planning in times of stability and expansion. The typical format was a five-year corporate planning document that forecast key economic trends, established priorities for different products and business areas of the firm, and allocated capital expenditure. Investment

planning, financial budgeting, economic forecasting and linear programming were the major concepts and tools for managing (Leibold et al., 2002). At this time, business leaders were perceived as people of the highest quality, and capable of analyzing their entire industries. They connect the organization to its environment, and outline its future path through their rational and foresight skills. Organizations (believed as mechanistic in nature) simply fit to circumstances prevailing in the external environment.

During the late 1960s and early 1970s, large corporations came to view their management skills as unbounded by industry divisions. The drive towards diversification was accelerated. Consequently, corporate strategy focused on the management of diversified business units, to achieve synergy among different divisions, and to increase the global market share. During the early 1970s, the portfolio-planning matrices were developed as a framework for selecting strategies and allocating resources within the diversified corporation.

3.2.3 Strategic management

Mintzberg's research in the early 1970s found that practical managers were far less rational and foresight full map-makers than the literature on the management supposed (Cummings and Wilson, 2003). His findings coupled with the increasingly recurring changing business environment marked a turning point on traditional management approaches.

During the late 1970s, the rapid environmental turbulence forced firms to abandon their corporate strategy in favour of more flexible approaches to strategic management. Firms' endeavours have shifted from planning, for diversification and growth, to more on achieving competitiveness. As such, corporate planning has transformed to what is now termed *strategic management*. The main concern of strategic management is then to out weight competitors by establishing competitive advantage. Since the mid-1970s, some 10 per cent of the world's leading firms have been moving toward strategic management (Ansoff, 1988). The basic drive behind such transformation was the accelerated shift on strategic thinking towards the market orientation. The management

attention, thus, has moved towards the demand side of the production function rather than the supply side.

The research and development department of enterprises incorporated a comprehensive search for firms' market environment (Hsu, 2005). Mechanistic way of viewing organisation - having no ability to adapt their environment - has been contested. Mintzberg sought to get beyond the standard mechanistic 'boxes and lines', and led the organic viewed of organization. He further noted that strategic thinking does not emphasis on rationality, and decisions do not happen only by the interaction of top management with external environment. Strategy is somewhat fuzzy (management activities are an on-going and intertwined); it occurs where employees at the operational base of the organization interact with one another and react to or anticipate customer needs and wants. Hence, real strategy is not top-down one rather it is a bottom-up.

At the early 1980s, Michael Porter came with new models of analysing an industry. He concluded that firm's competitive advantage is determined by its ability to analyse its external industry structures based on the five forces: buyers, suppliers, new entrants, substitutes and rivalry among existing competitors. Porter also provided generic strategies among which enterprises should follow. His approach paves a way for researchers to analyze a broader industrial structure of a firm, whilst maintains the classical approach of top-down approach to strategic thinking.

3.2.4 Contemporary strategic thinking

The interest to create a unique competence in order to achieve competitive advantage continued during the late 1980s and early 1990s. Strategic thinking has shifted its focus towards the internal aspects of the firm. Resource-based view of the firm became the foundation for establishing competitive strategy.

As the 1990s drew to close, the field continued its rapid evolution. Important developments including knowledge-based view of a firm as a vital source for strategic innovation, cooperative strategies (particularly strategic alliances and inter-firm networks), organisational flexibility for speedy adaptation to, and proactively shaping the knowledge-networked economy (Grant, 2002; Schoenberg, 2003).

Socio-cultural model of strategic thinking has developed as a conceptual base of strategic management. This thinking enables the organization (multi-minded system) to further diversify its scope of environmental analysis (Gharajedaghi, 1999), and to find relevant source of knowledge. As a manifestation of this, networked and open innovations have been emerged at the beginning of the 21st century (Horwitch et al., 2000).

3.3 The management of strategic innovation

As indicated above, the two approaches that laid ground for major strategic management thinking and still play a significant role are the outward-in and inward-out management approaches. Within this background, herein follows a comprehensive discussion of each approach.

3.3.1 The outward-in approach

During the early management approaches where environmental factors were held stable, the focus of enterprises was product-oriented (Ansoff, 1979), as stated above. Products and services were produced based on the top-down planned production requirement. The market (customer) simply receives the innovation produced through a linear technological pushed model (Freedman, 1982).

The one way communication (producer to and consumer), hierarchical organizational structures with a restrained boundaries, mechanistic view of enterprises, and mass-production are among the main features of the approach (Ansoff et al., 1976; Glass, 1996; Youngblood, 2000; Tompkins, 2000; Cummings and Wilson, 2003; Keegan, 2003). These features, besides limiting innovations as a major responsibility of R&D department, seem to reduce the seeding and involvement of creativity ideas.

As markets start to saturate, the interest has focused to marketed-oriented production. Here, production was based on the market demand.

Although many of the above mentioned features of management approaches were still in place, a number of changes that enhanced the pace of innovation took place. The

role of internal R&D department has extended to incorporating external market stipulations (Asoff et al., 1976). A two-way communications between the enterprise and the market have come in response to market needs (See the case example below).

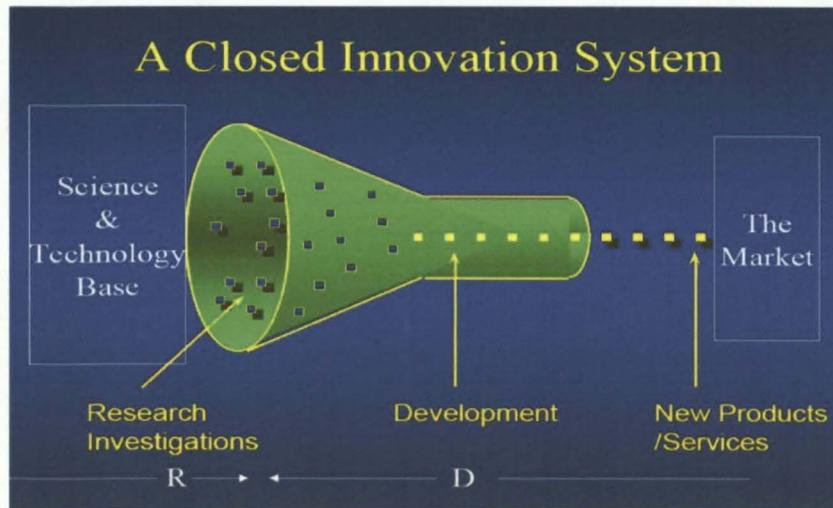
Frito-lay, the US potato chips maker provides an interesting case of product differentiation of a commodity, as a result of searching real customers' needs in the market. The company uses its sales forces to collect data about its customers. These data are analyzed and fed back to their sales people empowering them with superior customer knowledge and competitive intelligence. Frito-lay representatives not only use the information themselves, but they also give it away for 'free' provided that the shop buys their potato chips from them rather than their competitors. The end results are customized products that fit real market needs (Sveiby, 2001).

To fulfil this market needs integration and coordination of enterprises' functional areas became important.

The overall outcome of these developments is an improvisation of innovation, in terms of tailored made technologies, products and services. The wide-ranging responsibility given to marketing department gave rise to creative ideas and innovations in advertising and promotion (Ansoff, 1988). However, enterprises were limited to analyzing their internal environment, which perhaps limits the leveraging of innovation. In general, to this end, innovation was predominantly as a result of technology push and demand pulling (Wonglimpiyarat, 2005).

Innovative products and services are developed by the firm's internal efforts. This is a closed system of innovation (Chesbrough, 2003). Figure 3.1 shows the nature and process of closed innovation system. The closed innovation system is rooted on the assumption that successful innovation requires control through patenting intellectual properties. Accordingly, companies must generate their own ideas that they would develop, manufacture, market, and distribute and service themselves (Chesbrough, 2003a). The approach calls for self-reliance - if one company wants something done right, it has got to do it by itself.

In this model, science and technology are the tools for investigation and development of innovations.

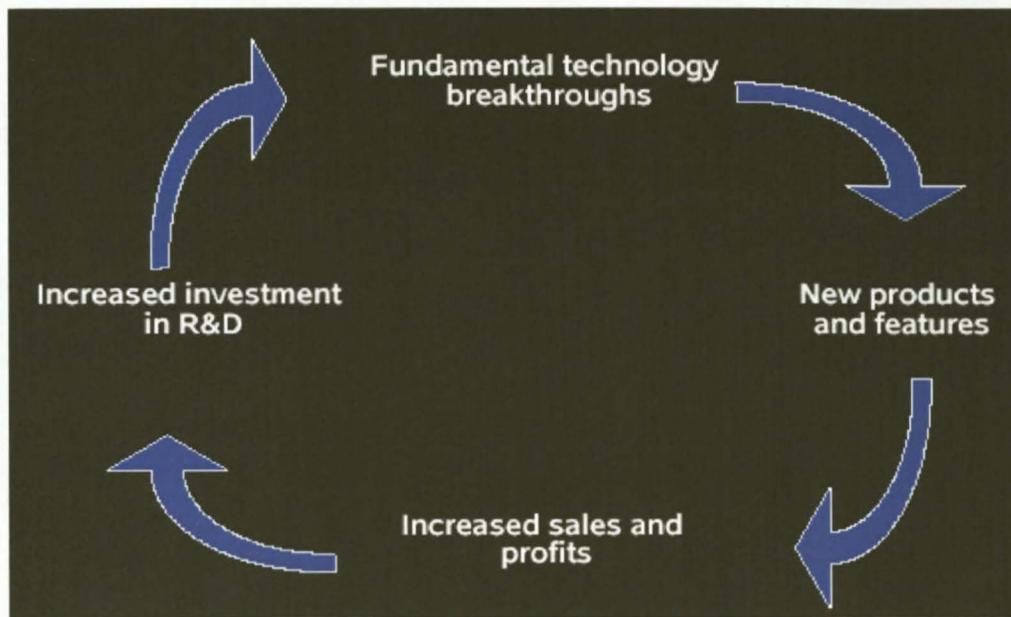
Figure 3.1: Closed system of innovation

Source: Chesbrough, H.W. 2003a. The Era of Open Innovation. *MIT Sloan Management Review*, 44(3): 35–41.

Chesbrough and Maula indicated that there are five dominant logics that held companies to rely on closed system of innovation (Chesbrough, 2003; Maula, 2005).

- If I discover it, I will find a market for it.
- If I discover it first, I will get it to market first.
- If I discover it first, I will own it.
- The important technologies I will need can be anticipated in advance.
- The best people in this field work for us.

Interestingly, to leverage and sustain innovation, these companies continue on re-investing additional assets rather than looking for alternative investment, for example spin-offs the innovation. Such a re-investment principle forms virtuous circle on R&D as shown in figure 3.2 below.

Figure 3.2: The virtuous circle for R&D

Source: Maula, M. 2005. Open Innovation in Systemic Innovation Context [online]. Available: http://www.vtt.fi/tte/uutta/2005/Maula_20050929_VTT_pdf.pdf. [2005, October 20].

From the table, it can be noted that increased investment in R&D contributes to the breakthrough of fundamental technologies. These new innovations are expressed in the form of new products and services. These are often taken to the market by the firm's own marketing efforts. The increase in sales and profits realized are, then, re-invested to the firm's own internal R&D.

An implicit concept underlying in this virtuous circle is that firms may not be able to utilize all their fundamental technological breakthroughs to take themselves to the market. The inputs they need to place to the basic R&D are dependent on the realized profits and sales, rather than importing additional inputs reaped elsewhere.

3.3.3.1 Porter's Industry Analysis

As the interest towards market-orientation increased, the gaze of many enterprises started to fall on same (similar) markets. The result was a fierce competition among various enterprises. The competitive challenges US companies faced from Japanese enterprises in the 1970s is a good example. Michael Porter illustrated that to succeed in

such a competitive business environment, it is crucial to establishing a competitive advantage (Porter, 1985, 2001), which depends on the analysis of industry structure. Porter developed five key forces to be addressed to analyze industry structure. These are:

- bargaining power of supplier,
- bargaining power of customers,
- threats of new entrants,
- threats of substitute products or services, and
- rivalry among existing competitor.

To deal with the increasing complexity of business environment, porter notified the inclusion of the notion of network relationships and clusters (Wonglimpiyarat, 2005). After analysis the external business environment based on the five forces, a firm seeks to position itself in the industry. Depending on its industry and its area of focus, the firm can have four generic strategies namely cost, differentiation, cost focus and differentiation focus.

Cost Strategy refers to rendering a product or service at a lower cost than competitors. A firm may obtain lower cost advantage either by providing the same product at lower prices or better quality at the same prices.

Differentiation strategy is to make some noticeable differences from competitors. It can be in terms of quality - basic product concepts or supplementary services. And *focus strategy* deals with either cost or differentiation strategy, but the area of focus is narrow and limited to specific market segments or niche. Porter indicated companies should avoid being stuck in the middle.

The aforementioned forces and strategies have remarkable implications to innovations and creativity. The R&D department went far to incorporate external factors of industry structures as well as network relationship and clusters as an input sources. Endeavours to establish industry standards so as to attain sustainable competitive advantage seem to enhance innovation and creativity.

Porter's model has a significant contribution to strategic innovation in terms of broadening the scope of industrial analysis, and the need to consider the importance of

establishing competitive edge. From the perspective of sound innovation management, there are numerous deficiencies of the model (Hammer and Champy, 1993; Rowe et al., 1994; Wonglimpiyarat, 2005). These include:

- **Challenge of analysis.** Examining in which industry a company fits may be a difficult task, because the operational scope of many companies extends is not limited to a single industry (Hammer and Champy, 1993; Rowe et al., 1994). For example, Alexander Forbs operates in the financial sector as well as insurance sector.
- **Strategic alternative.** According to porter, companies have to 'fit' themselves to their environment in either of the above stated positioning strategies. He warned that 'stuck in the middle' strategy should be avoided. But successful companies may take an innovative strategy that does not fall in the above mentioned generic strategies. Ikea – a Swedish company, producing house hold equipment - is a good example of those that achieved success by directing their strategy in the porter's 'stuck in the middle' strategy (Keegan et al., 2003).
- **Zero-sum game.** Porter's model stresses on a zero sum game where a given firm benefits at the expense of collaboration.
- **Inability to compete.** In a complex economic environment, it is unlikely that any single firm would have sufficient capabilities to compete in all domains of competition.
- **Offensive position.** The model represents a defensive position. It suggests that innovators should look at outside forces to design strategies to compete. His approach tends to be static and inadequate for a firm to gain competitive advantage.
- **Demand to create innovation.** The model suggests an introduction of innovation in response to customers' demand. An innovation is launched based on market signals to increase market shares in the current marketplace. The model, however, overlooks the potential group of customers in the unexploited market.
- **Path dependence.** The strategy to compete is based on company's technological position with corresponding current products. Emphasis on

existing innovation may not be able to cope with the ever changing complex business environment.

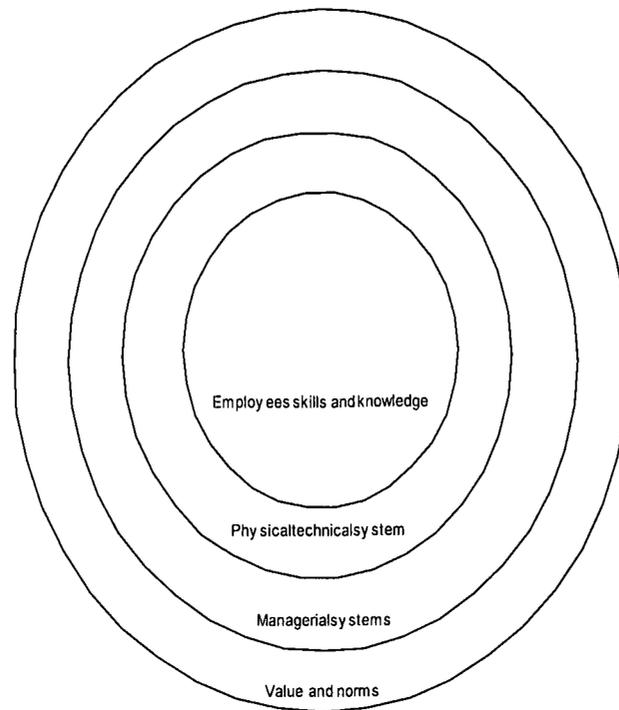
Therefore, the outward-in approach to management needs complementary efforts from the inward-out proponents, as discussed below.

3.3.2 Inward-out approach to management

The emergence of the resource-based view (RBV) to strategic thinking is marked as a turning point from outward-in to inward-out approach to management (Hamel and Prahalad, 1994; Leibold et al., 2002; Wonglimpiyarat, 2005). The prime feature of resource-based view is deployment of firm's core competence.

3.3.2.1 Core competencies

Advocators of the resource based approach contend that analyzing external industry structures do not guarantee firm's competitive advantage. To establish competitive advantage, firms have to deploy internal resources and core competencies. Competence is defined as an individual cognition, skills, capacity for action and decision-making. It is the sum of a person's knowledge (Riempp, 2005). Dorothy (1995) provides four components of core competencies.

Figure 3.3: Core competencies

Source: Leonard, D. 1995. *Wellsprings of Knowledge: Building and Sustaining the Source of Innovation*. United States: Harvard Business School Press.

- **Employ skills and knowledge.** These refer to the skills and knowledge embodied in employees. It encompasses techniques specific to the company and scientific understanding. Two other skills and knowledge that are obvious to the firm are public knowledge and knowledge of an industry.
- **Physical technical system.** Innovative competencies accumulate not only on the heads of people, but also accumulate in physical systems that they build overtime – database, machinery, and software programs.
- **Managerial systems.** The accumulation of employees' knowledge is guided and monitored by the company's system of education, rewards, and incentives. These managerial systems – particularly incentive structures- create the channel through which knowledge is accessed and flows; they also set up barriers to undesired knowledge-creation activities.

- **Value and norms.** These determine what kinds of knowledge are sought and nurtured, what kind of knowledge-building activities are tolerated and encouraged. These include systems of casts and status, rituals, of behaviours, and passionate beliefs associated with various kinds of technological knowledge that are as rigid and complex as those associated with region. Therefore, values serve as knowledge-screening and control mechanisms.

A number of researchers show that in a complex socioeconomic environment characterized by hyper-competition, source of competitive advantage falls within the firm (Hamel and Prahalad, 1994; Wonglimpiyarat, 2005). Similarly, the adoption of new strategies is determined by the firm's current competencies.

From the RBV perspective, firms are heterogeneous with respect to their resources or capabilities. To establish unique competitive edge, organizational emphasis on restructuring, reengineering, out sourcing and alliances are evidenced.

The major role of R&D department, in this context, is to come up with inimitable innovations. Since this approaches focuses on operational efficiency, the investment required to the R&D department may be high. Various tools and concepts including balanced score card, total quality management and business process reengineering have been developed to set a competitive advantage. Firm's effort to specialize operations seems to make significant contribution to innovation and creativity. However, they are all concerned with optimizing innovation at the firm's level.

In an increasing uncertainty of the prevailing business environment, no firm can keep pace with the development of all relevant technologies alone (Pyka, 1999). Additional activities such mergers and acquisitions, outsourcing peripheral competencies (not core competencies of the business) and alliances are noticed to complement firms internal competencies (Thompson, 2001), leading to the establishment of dynamic capability.

3.3.2.2 Dynamic capabilities

Dynamic capabilities refer to those activities that operate to extend, modify or create ordinary (core) capabilities. Hyper-competition and high-velocity strategist, further contend that one firm will outperform another if it is more adept at rapidly and

repeatedly disrupting the current situation by creating unprecedented and unconventional dynamic capabilities (Leibold, et al., 2002).

The essence of dynamic capability is nothing but core competence plus importing knowledge from outside and makes use of it. An organization is, therefore, said to have dynamic capability when it encompasses the aforementioned core competencies and opens its mind to import external knowledge.

External knowledge of an enterprise may be obtained by implementing collaborative strategies with a range of business partners. These strategies – collaborative strategy – posit a different approach to the management of innovation, than those provided by outward-in approach. There are four core strategic concepts that associate collaborative approaches to the management of innovation (Hamel and Prahalad, 1994; Wonglimpiyarat, 2005).

- **Offensive position.** The strategy takes an offensive position because it stresses the importance of networks for future markets and customers. Collaboration is crucial for opening-up future opportunities. This strategy lies on the logic of the dynamic approach. It identifies the use of technology alone is not enough to render competitive advantage; rather firms also need collaboration as complementarities to win the competition.
- **Innovation to create demand.** The strategy goes beyond the customer-led demand to capture the opportunity share in the future market. The management approach is to lead the customers to accept the innovation as it is argued that customers generally lack the foresight. It also includes the standard creation process as a commitment to create demand in the future.
- **Win-win type competition.** Collaboration is the main challenge of many strategies because the integration of skills and capabilities provides a basis for future competition. The real sources of advantages lie in the management of collaborative approach. Bovet and Martha disclosed that direct collaboration with competitors is hard to achieve; but indirect collaboration with third parties or joint ventures is more promising (Bovet and Martha, 2000). For example, Ford motor could achieve scale efficiency and cost saving through a distribution arrangement with Mopar, a Diemer-Chrysler division. The two parties agreed to deliver parts to dealers on the same trucks, managed to excel

logistics. Hamel and Prahalad argue that if collaborative links are well managed, they would bring about more profits than do the adversarial relations assumed by porter's competitive approach (Hamel and Prahalad, 1994).

- **Path independence.** This strategy is not confined itself to the product or process innovations launched in the marketplace; this has been stressed by the outward-in approach to management of innovation. The path independence concept places emphasis on launching new innovations and getting into the new markets.

The above stated collaborative strategies have significant implications to the internal R&D department of an organization. Because valuable innovations can be cultivated from joint efforts, investment budget allotted to firm's specific R&D department to create innovative values seems to decline. To many researchers, this is conceived as a step forward towards creating competitive values at an optimal input. A number of other researchers argue that an excessive reliance to collaborative efforts may lead to gradual depletion of absorptive capacity, a necessary competence for survival and competition (Hoecht and Trott, 2005). By the same token, an increased reliance on opening core competencies may endanger innovation if appropriate management approaches (such as trust, social control) are not taken.

Prudent companies that built their business strategies based on these suppositions are said to be a knowledge-based companies. These companies have an open mind to their environment, and are able to evolve through mutual learning. They are capable of adapting to their environment and can easily trigger disruptive innovations to their environment, thus, change the rules of the game.

One feature of a knowledge-based theory of the firm is that it challenges the perceptions about the boundaries of an organization. For example, boundaries that exist among the businesses and their value chain partners – suppliers and buyers - are loosening. The newly established interactive relationship between a business and its partner is called *value network* rather than value chain (Sveiby, 2001).

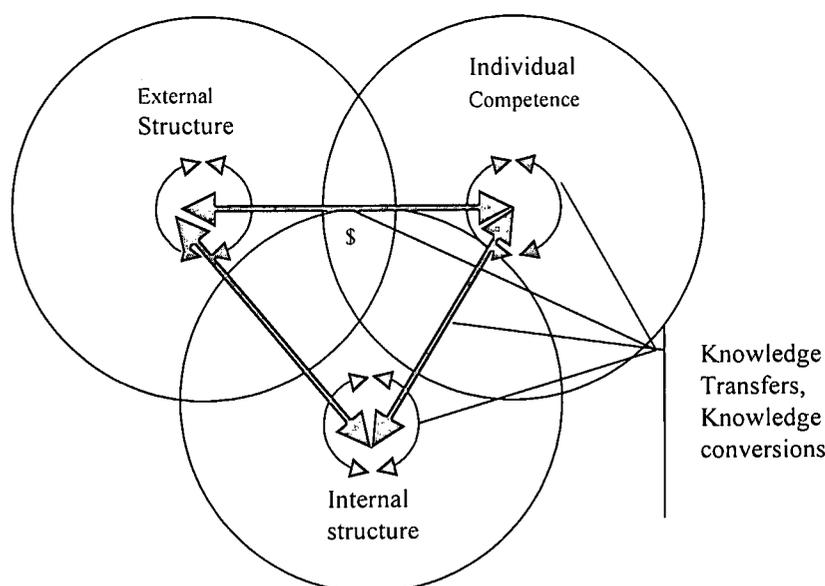
The networked value creators can use their competence in two spheres: by transferring and converting knowledge externally or internally to the organization they belong to. When they direct their efforts internally, they create an internal structure that holds patents, concepts, models, competence of individuals, computer systems and other

explicit processes. The organization can legally own only small portion of the internal structure because the most valuable individuals can leave the company despite the company entirely depends on them - especially those who are part of the internal and external structure, example consultants.

Generally speaking, in value networks, the persistent and free interaction of each business partner with each other and within themselves leverages innovation.

Figure 3.4 shows a typical value networked configuration. The interaction of people in different roles of the value network increases both tangible (\$) and intangible value. Two among the main reasons for knowledge transfer are: first, unlike physical asset that depreciates when it is shared and used, knowledge grows when it is used and shared; ones knowledge doubles when he/she gets from another. Second, when knowledge is transferred from one party to another, it does not leave to the party who is transferring the knowledge.

Figure 3.4: The firm from knowledge-based perspective



Source: Sveiby, K. 2001. A Knowledge-based theory of the firm to guide strategy formulation. *Journal of Intellectual capital*, 2(4): 1-15.

Despite its rewards, network innovation has some obvious deficiencies. First, networked relations emphasize on complementary assets and technology with specified

partners rather than distributed ones (Sveiby, 2001; Chesbrough, 2003b; Ulhøi, 2004). These may obstruct innovation. For example, Sveiby (2001) asserted that networked relations lead to technical knowledge, social, and logistics or administrative dependencies. Second, a number of organizations engage in extended collaborations. Nevertheless, these enterprises are not static in nature that waits for changes to come from specified networks, rather they are complex systems that influence and be influenced by their socio-cultural environment. This implies that the operational scope and source of knowledge of these enterprises is wide-ranging than proposed by the value network relations (Beinhocker, 1997; Leibold et al, 2002; Youngblood, 2000; Walters, 2002; Keegan, 2003; Ulhøi, 2004).

This is the phenomena of an open innovation, which has to be dealt in chapter four. Extending the source of innovation beyond networked relations has significant implications on the way people conceive an organizations and the strategic thinking holding them. Enterprises that operate in such an environment are known as Complex organizations. They are conceived as living systems exhibiting relentless co-evolution, and have self-regulating mechanisms. Therefore, they are adaptive complex systems (Beinhocker, 1997; Anderson, 1999; Kearney, 2004). Flexibility, integration and innovation are some among their success factors (Foster, 20005). Consequently, many researchers indicated that traditional strategic management approaches may not be appropriate on their own (Beinhocker, 1997; Hamel, 2002; Wonglimpiyarat, 2005; Chistensn, 2006). Systemic approach to strategic thinking seems more appropriate to add innovative value (Kim and Mauborgne, 1999; Leibold et al., 2002).

Systemic thinking to strategy drives its basic principles from the concept of complexity theory to understand the nature of these business organizations and how to deal with the complex business environment.

3.4 Complexity Theories

Complexity science refers to a body of knowledge focusing on purposeful co-evolution of systems via the influence of underlying patterns of self-organizing behaviour (Leibold et al., 2002).

The basic tenet of this theory is that, systems are so complex in nature but they exhibit self-regulating mechanisms - adaptive complex systems - (without a top-down master plan) to enable them to survive in their environment. A forest ecosystem can be taken as an example of adaptive complex system.

The concepts and principles of complexity theory may apply to business organizations because, as stated above, these organizations operate in an environment characterized by increasing turbulence. A survey conducted by Kearney (2004) shows that 88% of businesses have increased in complexity over the past halve decade, and 79% expect a further increase over the next five years.

Complexity implies to the varying degree of customer needs, added product brands (size, shape, colours etc) and product lines, fierce competition, and the tension that exists among increasing operational costs, need to set competitive edge, and traditional organizational practices (Peter and Raimund, 1991; Max and John, 1999). For example, Peter and Raimund (1991) illustrated that the challenges exerted by layers of hierarchy, bureaucratic methods, and functional compartmentalization to respond to the current market needs.

A large body of research agrees that the basic characteristics of complex organizations relate to the principles of adaptive complex systems (Beinhocker, 1999; Max and John, 1999; Anderson, 1999). Consequently, complex organizations that operate in the turbulent business environment exhibit the following basic features:

- They consist of a large number of interacting agents. Each agent interacts according to a set of cognitive structures called *schema*, which is a blueprint or image of the environment that attempts to capture its important complexity.
- The interactions between agents are dynamic, continuously shifting the pattern of interconnections and structures of the system. Thus, like complex adaptive systems, organizations evolve over time through co-evolution.
- Complex organizations operate under conditions far from equilibrium. Complex organizations, with many interactions among highly differentiated agents, can produce, under certain conditions, surprisingly simple, predictable behaviour while under other conditions; they exhibit the capacity of self-organization to produce *emergent complexity*. Maintaining a self-organized

state, i.e. to ensure the system's survival under critical conditions, requires injecting energy into the system. Absolute equilibrium means death.

- Although the behaviour that emerges is *complex*, the rules that govern the system are necessarily simple. This simplicity creates the freedom to behave in complicated, adaptive and surprising ways. Further, the rules are associated with the system not with individual agent. Systems that exhibit this type of leaderless yet orderly behaviour are said to be *self-organized* because the agents themselves figure out how to organize change.
- While complex organizations exhibit the capacity of self-organization and emergent complexity, the consequences of this emergent complexity is highly unpredictable. The interactions of agents in complex adaptive systems are characterized by weak cause-and-effect linkages or non-linearity. System transformation takes place in a situation where a small and undetectable change can product huge effects.

When one compares these complex organizations to traditional enterprises, a number of differences can be observed. Table 3.2 presents the comparison between traditional and complex organizations with their respective success factors.

Table 3.2: Comparison of traditional and complex organizations

Traditional organization	Success factors	Complex organizations	Success factors
Linear	Size	Non-linear	Speed
Hierarchical	Role clarity	Non-hierarchical	Flexibility
Reductionism	Specialization	Holistic	Integration
Controlling	Control	Self-organizing	Innovation
Inflexible		Flexible	Innovation
Uniform		Diverse	Innovation
Centralized		Networked	Innovation

Source: Adapted from Foster, J. 2005. *The Simple Analytics of the Firm as a Complex System*. EMAEE Conference, Utrecht.

An implicit implication one can draw from the above table is that the static traditional view of organizations have been transcended to organic and complex ones. Likewise, traditional success factors have changed. Strategic management approaches, therefore, need to incorporate new conditions to the management of complexities.

3.5 Managing complexity

Although managing complexity is complex and difficult issue, in the literature, there exist some principles that help to mitigate complexities. Most of these researchers agree that it is a key to understand the nature of complexity and take appropriate strategic decision that reduces organizational costs and optimized customers' value (Peter and Raimund, 1991; Kearney, 2004; Hoecht and Trott, 2005).

According to Kearney (2004), managing complexity involves strategic decision and remedial action. At the initial stage, such strategic decisions involve reduction of complexity by streamlining innovations. To ensure that the ongoing growth only adds necessary innovation, an ongoing strategic decision-making is important.

Other methods and principles that help to mitigate organizational complexity include understanding the concept of chaos theory, organizational transparency, optimizing variety, and minimizing business risk.

3.5.1 Chaos Theory

Chaos theory suggests that nothing in this world is random, and that all the disorder and apparent unpredictability of factors are natural products of entirely deterministic process - where future performance of a non-linear system emerges naturally from the current state of the system (Priesmeyer, 1992). The same theory has recently tended to change the way people think about organizations. Chaos theory, therefore, tries to identify and manage these forces. For example, an organization that avoids the inertia to change, and reduces being oversensitive to change is capable of standing at the edge of chaos - to be simultaneously conservative and radical (Beinhocker, 1997).

3.5.2 Transparency

Peter and Raimund (1991) noted that a failure to manage complexity is failure to succeed. And successful management of complexity, through transparency, increases creativity and innovation. The implementation of systems transparency enables to identify the drivers of total complexity and quantify their impact on cost, quantity and time (Peter and Raimund, 1991).

3.5.3 Optimizing Variety

This refers to finding the equilibrium point at which variety of an offering is maximised. In the case of sales for example, initially, variety improves sales because offering becomes more attractive. After some levels of offerings, the consumer starts to lose keeping pace with the variety of innovations. Consequently, the law of diminishing return applies. To manage such scenarios, organizations need to identify the internal and external complexities and finding the exact match at which an offering of is optimal (Peter and Raimund, 1991).

3.5.4 Minimizing Business complexity

Minimizing business complexity may employ a variety of techniques. Two among them are:

- **Procedures and systems.** It is generally agreed that making procedures and systems perfect seems to reduce complexity of a system. However, should it involves continual setting of rules and standards to follow by top management rather than *empowering organizational units* to create their own procedures, its result may be detrimental. The role of central management may be to set few rules to manage between organizational units.
- **Partners roles.** Organizations may have an alternative of minimizing their business complexity by transferring some of their complex problems to their suppliers and other partners. For the effective implementation, this option needs a close, joint development of innovations, long-term relationships with few

partners Peter and Raimund (1991). As stated in the previous discussions, other researchers noted that short-term relationships with multiple business partners would be a better option to manage complexity (Hoecht and Trott, 2005).

Max and John (1999) also provide two alternative approaches of adapting complexity: complexity reduction and complexity absorption.

- **Complexity reduction.** It is about getting to understand the complexity and acting on it directly, including attempt at environmental enactment. In their study Max and John (1999) found that western companies, working in china, stipulated complexity reductions behaviour.
- **Complexity absorption.** This entails creating options and risk-hedging strategies, often through collaborations.

In the literature, there are other alternatives to reduce risk of complexity. The above attempt is to shed light to few among other mechanisms to minimize the risk of complexity. Otherwise it is not the scope of this thesis to exhaust all the possible complexity management strategies.

3.6 Summary

The main concern of the chapter was to review the traditional approaches to strategic management, and to look at their relevance in dealing with innovation.

Since the industrial revolution, a number of strategic thinking has been identified. The mechanistic view of traditional organizations coupled with the stable business environment gave rise to the production-oriented approach of the firm. Many firms committed towards mass-production and standardization. In such context, creativity and innovation was most likely to be hindered as the practice of repetitive jobs become routine action.

The demand side of the market has gained emphasis since the beginning of 1940s. Major management approaches, to this time, were to fulfil the market needs based on top-down management's guidelines. The need to customized products and services according to customer preference made a significant contribution to innovation. However, reliance on detached strategy of top level managers and sole analysis of internal industry structure reduce the creative and innovative capabilities of the firm. As a result, many of these approaches could not withstand the macroeconomic crises of the 1970s.

The two approaches that have operational relevance - to hold and withstand- to the ever change nature of the field are the outward-in and inward-out approaches to management. This are discussed in view of Porter's model and resource-based theory respectively.

Porterian five forces model for analyzing industrial structure together with the possible generic strategic to establish competitive advantage, are presented. It has also been identified that the outward-in approach may not suffice to manage innovation as it focuses on rivalry. This strategic approach places less emphasis on deployment of internal competence of a firm.

The resource- based view of the firm, which focuses on the internal competence of the firm, has emerged to complement the above mentioned deficiencies. The RBV states that a firm can establish its competitive advantage when it deploys on core competencies. Four core competencies have been identified: physical technical systems, employee skills and knowledge, managerial and systems and norms.

Since organizations may not establish competitive advantage by deploying core competence alone, the need to develop dynamic capabilities (more on knowledge) has been introduced. Dynamic capabilities develop through collaborative efforts with business partners forming network of relations. The value chain concept developed by Porter has now extended and integrated to the value networked relations. Principles that help on how to manage collaborative value networks are indicated.

Obviously, enterprises that involve in a networked relationship have an opportunity to import knowledge from a range of collaborative sources. However, as its name implies, network innovation emphasizes on complementary assets and technologies in which known business partners, rather than distributed ones. It may, then, obstruct innovation. It also leads to technical, knowledge, social, and logistics or administrative dependencies.

Finally, the chapter concluded that organizations are increasing in complexity, and provided some complexity management concepts. Nevertheless, should these knowledge-based complex organizations are to develop dynamic capability and establish competitive advantage, they need to further open-up their boundaries to accumulate knowledge from a variety of sources - buyers, suppliers, competitors, and other knowledge communities such as universities and consultants and global research findings and communities. This is an open innovation phenomena, which has to be presented in chapter four.

CHAPTER IV: OPEN INNOVATION - A NEW PARADIGM SHIFT FOR UNDERSTANDING BUSINESS INNOVATION

4.1 Introduction

Extending the source of knowledge beyond organizational boundaries, in the form of value network, may enable to acquire variety of knowledge sources (Seivby, 2001). In most cases this knowledge is, however, bound to the capacity of business network partners (Horwitch et al., 2000; Davis, 2006).

A number of downsides are noted to this model. First, increasing reliance on network partners may not be the appropriate response in a business environment that operate under high uncertainty; managers should cultivate a culture of using third parties resources that perhaps provide global source of success (Brown, 2005, Davis, 2006). For example, one of the key reasons for Google's success is a belief that good ideas can, and should, come from anywhere (Ben, 2005). Second, basic research findings may generate spillover, defined as an accumulation of public knowledge that others can make use of it without having any outlay whatsoever for using them (Nieto and Quevedo, 2005). Companies that funded this basic research activity have limited ability to appropriate value from this spillover. In the majority cases, these spillover sat on the shelf and wait either for internal developments to commercialize it or its research proponents to leave the enterprise, and develop it on their own. In some instances, these technologies would be licensed to be used by others.

Nieto and Quevedo (2005) noted that a negative relationship exists between the spillover in an industry and the condition of appropriability - the more difficult it is to appropriate, the more spillover can be found in the industry. They further indicated the existence of technological spillover accelerates technological advances in an industry and increases social returns.

This implies that the benefit of the innovation accrue (spillover) is for those who could be able to capture it. For instance, Chesbrough (2003b) cited that Dow uses less than

half of its own patents while Procter & Gamble only 10%. This, then, disincentives private investment in internal R&D and reduces the level of firm's specific-efforts to innovate (Spence, 1984). For instance, recently, P & G changed its approach to innovate; it created a leader for external innovation with a goal of sourcing 50% of its innovation to come from outside sources (Chesbrough, 2003b; Chesbrough et al., 2006).

Based on the above discussion, it seems that enterprises would benefit from their innovation should they consider the recurring paradigm shift on open innovation. Open innovation models render companies an opportunity to capture external innovations from others while making use of their own innovations efficiently. For successful implementation of an open innovation, enterprises need to develop absorptive capacity – defined as the ability to identify, assimilate, and apply for commercial purposes know-how generated outside itself (Veugelers, 1997; West and Gallagher, 2004; Nieto and Quevedo, 2005).

Currently, there are a number of high technology industries such as computers, information technology, music and sport that have adopted the open innovation model (Chesbrough, 2003b; 2003c; Chesbrough, 2004). Most of the models they use share common ground with that of an open source innovations adopted by computer software developers.

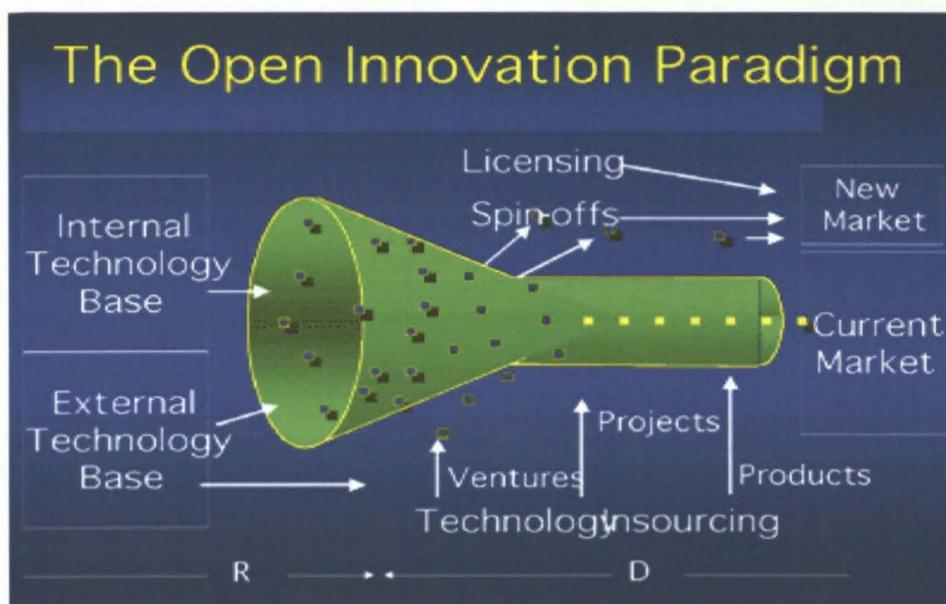
Some researchers indicate that it is too early to claim open innovation will make an enduring contribution to the understanding of innovation in industries. However, there are growing academic interest on the concept and research activity that, when taken together suggests that this may be a fruitful avenue for scholarly inquiry.

On view of this, this chapter is aimed at dealing with the phenomena of open innovation to add value to the on-going academic interests of the notion. Among others, particular interest is given to: elaboration of the basic concepts, the fate of IP in the course of open innovation, sources of innovation and the motivation to undertake open innovation, and the trends of current industries towards open innovation strategy.

4.2 The concept of open innovation

Open innovation is a paradigm that presupposes that enterprises can and should use external and internal ideas as inputs to the innovation process, by employing internal and external paths to market for the results of innovative activities (Chesbrough, 2003b). It relates as to applying the principles of free trade to the market place for new ideas, enabling the law of comparative advantage to drive the efficient allocation of R&D resources.

Figure 4.1: The open innovation process



Source: Chesbrough, H. 2003c. Open Platform Innovation: Creating Value from Internal and External Innovation. *Intel technology Journal*, 7(3): 1-8.

By collaborating with outsiders – customers, vendors, and even competitors - a company can be able to import low-cost, higher quality ideas from the best resources in the world. The importing mechanisms, as indicated in the above figure, may include joint projects, venture capitals, and product acquisitions (Chesbrough, 2003c). The open innovation process combines internal and external ideas into architectures and systems, using business models that define the requirements for these architectures and systems. These business models utilize both external and internal ideas to create value, while defining internal mechanisms to claim some portion of that value. The open innovation model assumes that internal idea can also be taken to market through

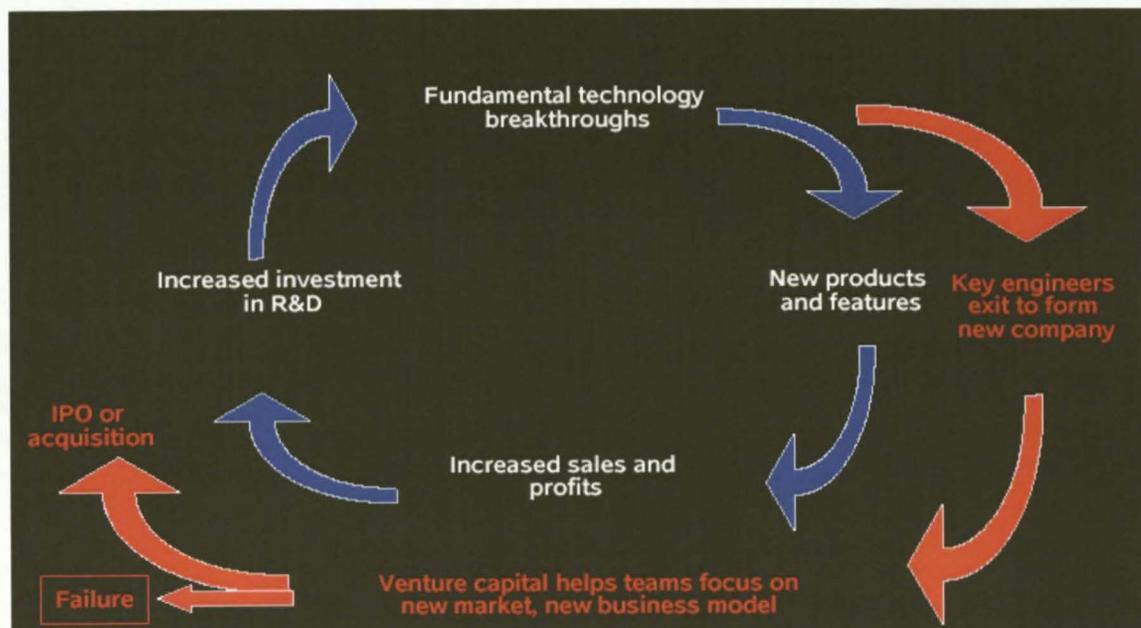
external channels, outside the current business of the firm through licensing and spin-offs, to generate additional value (Maula, 2005). The open innovation paradigm treats research and development as an open system. This approach places external ideas and external paths to market on the same level of importance as that of internal ideas and paths to markets in the earlier era (Christensen, 2006)

Open innovation some times contrasted to open source models for software development. In open innovation, organizations incorporate explicit business model as a source of value capture and creation to sustain their position in the industry, while open source shares value creation throughout the industry, denying value capture (Chesbrough, 2003c). Despite of such differences, open source provided the basis for open innovation (Ulhøi, 2004; Waters, 2005)

An open innovation paradigm imposes a complete erosion of the traditional closed model of innovation. Chesbrough (2003b) and Maula (2005) indicated six developments that are accelerating these erosions in business organizations.

- Organizations are becoming a ware of not to restrict innovations (research) to internal pathways to market.
- Enterprises provide high emphasis to the management of IP in order to manage research – by accessing external IP and profiting from internal IP.
- Expansion of organizational researchers' role as knowledge generators and knowledge brokers.
- Organizations do not originate the research to profit from it.
- Organizations believe that all smart people are not within their premises.
- Organizations strive to acquire enough smart people to enable them to conduct internal research.

When one incorporates the above-mentioned developments to the virtuous circle discussed on Chapter three, a new virtuous circle can be developed (See Figure 4.2).

Figure 4.2: The new virtuous circle – breaking the old virtuous circle

Source: Maula, M. 2005. Open Innovation in Systemic Innovation Context (online). Available http://www.vtt.fi/tte/uutta/2005/Maula_20050929_VTT_pdf.pdf. (25 October 2005).

Unlike to the old virtuous circle, in the new virtuous circle, engineers who develop a fundamental technology breakthrough, lacking current market, may form a new company by spinning-off from the parent company. With the help of venture capital, these teams are able to focus on new market as well as new business model. Although some of these start-up companies fail, the majority develop successfully, holding own intellectual property ownership (IPO). The virtuous circles continue to generate fundamental breakthroughs through increased investment in R&D. The sources of such investment are internal resources as well as external ones (Maula, 2005).

4.3 Porous boundaries: A supportive mechanism to implement an open innovation strategy

As evidenced in some high-tech industries such as Cisco and Xerox, maintaining organizational boundaries open to knowledge in-take and give-out may result in successful innovations. Open innovation does not mean outsourcing R&D nor closing down internal R&D; it is a strategy of finding and bringing new ideas that are complementary to existing R&D projects (Tresko, 2004).

Open innovation entails open boundary. There are numerous academic arguments that indicate the opening of business boundaries. Keegan et al. (2003) asserts that after World War II, for the free flow of goods and services around the world, political and geographical boundaries have been opened with the formation of GATT (General Agreement on Trade and Tariff). This provided organizations an opportunity to move their efforts from a 'market place' focused to market 'space' (Walters, 2002).

Industrial boundaries are also blurring. Tompkins (2000) and Keegan et al. (2003) noted that the profound mergers and acquisitions, partnerships and joint efforts have opened the boundary of industries, which were once static. For instance, the chemical, pharmaceutical, and agricultural industries are converging to life science beyond their industry boundaries (Leibold et al., 2002), which is an indication of a move towards a boundary less industries. Additionally, Tapscott (2001) writes that the Internet is enabling a new business architecture that challenges the industry structure as the basis for competitive strategy. From an ecosystem perspective, this new business architecture is called *business web*, defined as any system composed of suppliers, distributors, service providers, infrastructure providers, and customers that uses the Internet for business communications and transactions (Moore, 1993).

Similarly, on the organisational context, the growing use of new organisational structural concepts such as 'virtual' (Keegan et al., 2003), 'network montage' (Cummings and Wilson, 2003), and 'organograph' (Mintzberg, 1990) are indications of the move towards a more boundary less organizations. These new organizational forms assume that each business in the business web focuses on its core competence. And hence appears to be more agile, innovative, cost-efficient and profitable.

Despite the fact that organizations are increasingly opening their boundaries, Love and Roper (2003) observed three universal organisational boundaries – knowledge controlled, knowledge sharing, and knowledge coordination - that impacts on the success of an innovation process. They assert that boundaries among companies, markets or functional groups may act as a deterrent or constraint on innovation by, for example, imposing transaction costs on those involved, particularly where trust is lacking; while some argue to the contrary (Porter, 1991).

- **Knowledge control boundaries.** This relates to firm's ownership, organizational structure, and functional autonomy. There are two opposing

views on this context. The first argument is that, externally-owned companies have less in-house R&D department than their locally-owned counterparts, restricting innovation (Harries, 1991). Similarly dissociation of R&D department and product development from company head quarter has negative impact on innovation (Love& Roper, 2003). The second argument stresses on the fact that externally-owned firms and those who dissociate their knowledge control are more innovative than those maintaining the first argument provided that they have similar characteristics.

- **Knowledge Sharing Boundaries.** This signifies to boundaries between firms, or plants within multi-plant groups. Permeable boundaries that are usually expressed as an innovation networks and joint-venture enhance innovation.
- **Knowledge Coordination.** The basic idea behind this is that rigid boundaries that exist between different business functional groups may hamper innovation. In other words, the demarcation of functional boundaries perhaps delays the necessary functional flexibility. Multi-functional working groups that maintain a close working relationships among each other encourages knowledge transfer across skill boundaries and thus facilitate organizational innovation (Love and roper, 2003).

The lessons that can be drawn from this discussion is that despite there are increasing trends toward opening of organizational boundaries - to implement an open innovation system - companies may further need to consider the permeability of their boundaries to optimize their innovative efforts. Nevertheless, the extension of organizational boundaries far beyond their limited networked relations require appropriate decision-making on how, and to what extent enterprises should open up their innovations. The out come of such decision-making may optimizes the quality and speed of implementation of novel innovations while simultaneously reducing cost and risk (Rigby and Zook, 2002; Davis, 2006).

4.4 Antecedents to open innovation

Open innovation is not a new concept; it follows a long tradition of studying the process of innovation (Chesbrough, 2003b). Business historians have documented that market innovations that pre-dated the rise of the corporate R&D laboratory and the enforcement of intellectual property were open system. For example, the British iron industry and the US steel producers of the 19th century voluntarily chose to give up their right to intellectual property. Their technicians freely disclosed detailed and vital technical information about critical underlying technologies - innovations and designs - to their competitors, with the help of industrial journals and associations (Uihøi, 2004).

Later, R&D activities initiated out of the need in many industries to maintain and improve production activities, which were firm specific (Chandler, 1990). These activities are then organized internal to the large scale organizations that gradually gave rise to the proprietary innovation model. The managerial approach used for this proprietary model is like picking a man of genius, giving him money and leaving him alone (Conant, 2002). The model provided profound inventions and innovations to many companies. For example, successful companies of the 20th century that employed this model include Edison's Menlo park, AT&T'S Bell Labs, and Xerox's PARC. However, the R&D activities encountered difficulties when internal research generated spillover could not be internally commercialized, resulting in spillover (Nieto and Quevedo, 2005). Companies that are able to capture these innovations can make use of them.

Another successful source of antecedents has been substantial prior work on the importance of external technology. Nelson and winter (1982) modelled the firm's decision to search for new technology outside of its own organization. Others indicate the importance of investing in internal research in order to be able to utilize external technology, called 'absorptive capacity' (Nieto and Quevedo, 2005). Walter notes that many companies over-value their in-house intellectual property, rather than opening-up their intellectual property in order to seed a market (Waters, 2005). He further stated that companies can use their scarce R&D resources more efficiently by building on work already done by others.

Lastly, the practice of open source software adopted by many software companies lays healthy ground for open innovation. The basic principle of open source software states that the source code of any software programs is thrown open so that anybody can contribute to its development (Horwitch et al., 2000; West and Gallagher, 2004; Lee et al., 2003; Ulhøi, 2004). Open source proponents prefer licenses that provide freedom from obsolescence and eliminate dependency on the original owner of intellectual property. The prime objective of the system is to increase knowledge sharing among community of the world. The General public Licensing (GPL) that inhibits software developers from hoarding source of code originated by the GNU project is a good example. Open source software projects are object lessons that shows users can create, produce, diffuse, provide field support for, update, and use complex products by and for themselves in the user context of user innovation communities (von Hippel, 2004). The profit of an open source enterprises is the money earned from services. When such earning is compared to the licensing method - that develops innovations once per year compared to six months in case of open source – it is worth rewarding.

Today many companies in other industries are adapting a more open approach to innovation that resembles to the principles of open source software, though not all the ideas developed in the open source software. They often let customers adapt their products, then learning from the results. Procter and Gamble, as stated above, set out to draw a lot more of its ideas from outside the company through its 'connect and develop' programs (Waters, 2005). This is made possible with the help of an Internet. According to Waters (2005) in the internet age, the next big idea to change industry may come from unexpected direction. The following example elaborates this issue.

Followers of extreme sport have become expert at adapting and refining the equipment they use with the help of an internet. Kite- surfers, who stand on surf boards holding kites which whisk them over breaking waves, producing acrobatic leaps and twists – have taken to using sophisticated computer modelling software to design the most efficient kites. Then, they share their ideas over the internet and refine their concepts, based on the acquired expertise before sending them to a manufacturer (Waters, 2005).

4.5 Sources of Open Innovation

The real magic for the development of an open innovation is the community process. A company may get innovative ideas from a number of these communities, besides its internal source. Eric von Hippel (1988) identified four external sources of useful knowledge namely, suppliers and customers, university, government and private laboratories, competitors and other nations.

In the paradigm towards democratizing innovations, *customers and suppliers* involve directly in the innovation process. They have an access to the innovation source, and their constant feedback may add-up to the innovation pool to serve as a source of further innovation (von Hippel, 2004). Universities, through their constant research augment an innovation. *Competitors*, unlike to traditional defensive approach, may serve a source of innovation on one end while competing on the other end, revealing a special characteristics called 'co-opetition' (Sanchez and Heene, 2004). *Government* plays significant role by establishing sound environment, and supporting research and development activities to generate innovations. Noting the difficulties of competition encountered to established incumbents, Chesbrough asserts that start ups and private venture capitals provide a source of innovation (Chesbrough, 2003b). Private *venture capital* helps to finance new firms, usually start up companies, and their efforts to commercialize ideas that have spilled outside the silos of corporate research labs. Successful *start-up companies* do not reinvest in new fundamental discoveries, but instead, like Cisco, they would look at outside opportunities to commercialize. Spin-offs from large established firms also provide external knowledge to innovation (Chesbrough, 2003c).

The rapid increases of technological innovations – such as the Internet and the World Wide Web – leverage the pool of '*open critical mass*', creating an interactive community (Howitch et al., 2000). For example, the QuickPlace software developed by IBM provides a free interaction for organizational communities regardless of their physical location. Thus, new opportunities are facilitated for enterprises to create and add-up a new or improved value to markets. Similarly, the increase in *mobility of skilled work force, and knowledge spillover* provide promising external knowledge (Chesbrough, 2003c; Hastbacka, 2004).

Finally, there are growing trends towards relying on intermediaries that work as brokers of external source of knowledge (Hastbacka, 2004; Chesbrough, 2003b). Such brokers help enterprises to trade relevant external knowledge.

4.6 Innovation adoption

According to Chesbrough, many companies have been defining new strategies for exploiting external sources of technologies by focusing their activities into three primary areas: Funding, generating or commercializing innovation (Chesbrough, 2003b).

4.6.1 Funding

Two types of organization – *innovation investors and benefactors* - are focused primarily on supplying key innovation.

- a) **Innovation Investors.** Originally, *innovation investor* was the budget allotted to corporate R&D. But now a wide range of other investors including venture capital (VC) firms (as stated above), corporate VC entities, private equity investors, small business investment companies (SBICs) that provide VC to small firms, and licensed and regulated independent businesses are emerged. These companies move ideas from corporations and universities to the market, often through the creation of start ups using their capital. Although their influence is affected by the recent downturn and implosion of numerous dot-com firms, these players are still active. Chesbrough (2003b) indicated that they will likely to fund new developments in areas like genomics and nanotechnology.
- b) **Innovation Benefactors.** They provide new sources of research funding. Unlike to investors, benefactors focus on the early stages of research discovery. An example of the later is the National Science Foundation (NSF). Interestingly, there are some companies that are devoting a portion of their resources to playing the role of benefactors .By doing so, they get a first look

at the ideas and can selectively fund those that seem favourable for their industries.

4.6.2 Generating innovation

Innovation explorers, merchants, architects and missionaries are organizations that primarily generate innovation.

- a) **Innovation explorers.** Innovation explorers are specialized in performing the discovery research function principally done within corporate R&D laboratories. Consequently, they evolve as spin-offs of laboratories that used to be a part of the larger organization. PARC, for instance, became a separate independent from Xerox. The innovation explorers innovate for the sake of innovation.
- b) **Innovation merchants.** These merchants also innovate, but focused on a narrow set of technologies that are then codified into intellectual property and aggressively sold to others. For innovation merchants' royalties from their IP enable them to do more research in their areas of focus – they rise and fall with the strength of their IP portfolios. Qualcomm that currently boasts more than 100 licensees including Motorola, Nokia and Kyocera is a typical example of innovation merchant.
- c) **Innovation architects.** Innovation architects provide valuable services in a complex and fast moving technology world, characterized as disfavoured do-it-yourself approach. To create value to customers, they develop architectures that partition this complexity, enabling numerous other companies to provide piece of the system, by ensuring that all work is fit to the system.
- d) **Innovation missionaries.** These comprise of people and organizations that create and advance technologies to serve a cause. Unlike to the innovation architects and merchants, they do not seek financial profit from their work. This is the characteristics of many community-based non-profit and religious groups, as well as software industry – in the case of open source software. The evolution of the computer operating system Linux is an example of this model. It developed with the help of informal network of programmers regardless of their location.

4.6.3 Commercializing innovation

Innovation is brought to the market by two organizations: innovation marketers and one-stop centre.

- a) **Innovation marketers.** Profiting from marketing their own and others ideas, while at least performing some of the function of the other organizations, is the prime attribute of innovation marketers. To do so, they engage in deep understanding of current and potential needs of the market, which in turn helps to bring relevant ideas in-house. For instance Intuit (a seller of personal financial software products) acquired two of its popular products - turbo tax and quick book – from the outside, and enhanced both programs to meet its customer needs.
- b) **One-stop centres.** Like innovation marketers, one stop centres take the best ideas and deliver to their customers. Unlike to the innovation marketers, they form constant connections to the end users. The website for yahoo that enables customers to perform a number of activities – sending e-mails, shopping, searching for jobs etc - is a good example.

Generally, these models rely on a continued supply of useful ideas and technologies from the outside. Now, university researches are abundant and of higher quality than in the past. But the flow of that knowledge into the commercial sector is facing several challenges (Chesbrough, 2003b). First, these researches necessarily filter through academic departments. Such a process tends to discourage cross discipline breakthrough. Moreover, universities are now allowed to patent their discoveries. Professors who can form their own commercial venture may benefit from this. But it has taxed companies, especially small firms, to profit from that source of innovation. Second, it has been shown that the drawback of University researches is the lack of reach (Davis, 2006). By connecting to the University Labs, companies hardly get the reach sources of innovation from the global community.

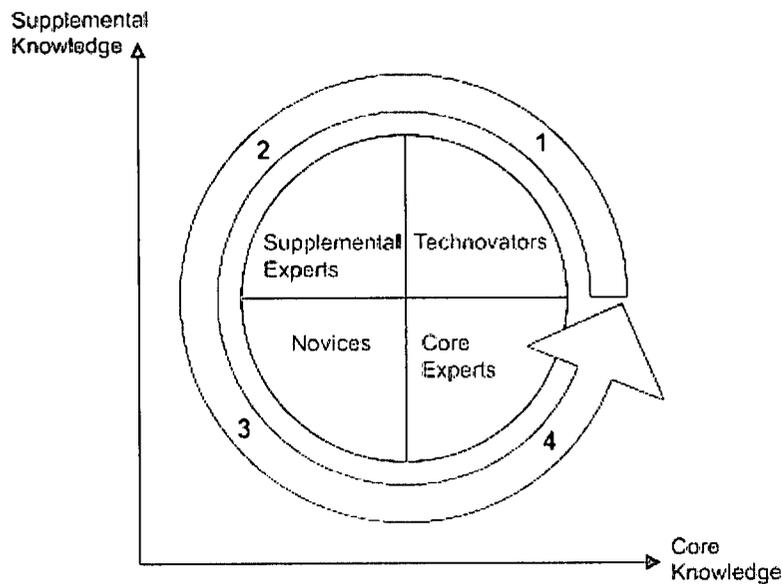
4.6.4 Methodology for sound innovation adoption

As indicated in chapter three, building own competence is the prerequisite for innovative capacity building. Although the detailed discussion on the management of open innovation is left to the up-coming topics, here, it seems legitimate to indicate some models of innovation adoption.

All forms of the above mentioned organizations - regardless of their scope of innovation involvement – primarily need to consider their absorptive capacity. Absorptive capacity is the ability of a firm to identify, assimilate, and apply know-how generated outside itself for commercial purposes (Nieto and Quevedo, 2005). This capacity provides flexibility to search relevant sources of knowledge, harmonize and adopt them.

Bases on their ability to adopt an innovation, enterprises may be classified into four adopter groups: supplemental experts, technovators, core experts and novices. Originally, this classification was found in consumers of new technological adopters (see Saaksjarvi, 2003). These definitions and concepts are clarified in chapter two. The reason to undertake the concept in here is that enterprises' embedded knowledge impact on its openness to foreign innovations. **Figure 4.3** shows the inherent knowledge base of innovation adopters. Technovators are rich in supplemental and core knowledge of an innovation. Hence, their ability of know-how enables them to adopt an innovation before others. Experts in supplemental knowledge are second to adopt an innovation. Their supplemental knowledge helps them to develop flexibility on innovation adoptions by comparing variety. Novices are poor in both knowledge – supplemental and core. The lack of any knowledge makes them more open to innovation, but of course they account third adopters. The last adopter category is core experts. The existence of core knowledge creates resistance to adopt an innovation.

Thus, these knowledge categories may help to determine firms' ability to exploit external knowledge of innovation and the efforts they put to build absorptive capacity. Interestingly, it may also enable them to recognize the innovation composition of their internal employees and take appropriate strategies when diffusing innovation internally.

Figure 4.3: The technology adoption cycle

Source: Saaksjarvi, M. 2003. Consumer Adoption of Technological Innovations. *European Journal of Innovation Management*, 6(2): 90-100.

Importing external sources of knowledge, often, confront to existing organizational practices in a number of ways. Inability to cope-up, which usually causes frustrations and confusion, and cultural differences are among others challenges. West and Gallagher (2004) noted three integration challenges that face for most enterprises in integrating internal and external source of knowledge.

- **Maximization.** This is to use a wide range of approaches to maximize the returns of a firm's internal innovation. In this regard, not only the company's normal pipeline of innovation should be used, but also to outbound licensing of intellectual property (IP). The latter will stimulate demand for technological innovations that have no market 'as yet'. Furthermore, companies can maximize their return by pinning-off innovations in the form of start up companies (Chesbrough, 2003a).
- **Incorporation.** External knowledge provides no benefit to a firm unless it first identifies the relevance of that knowledge, and then incorporates it along with its related innovations. Chesbrough (2003c) warns for the consideration of ideas that, at the initial stage, do not fit to the firm's business model but afterward

alter to good once after appropriate care is taken. The same is true for ideas that first fits existing business model but later fail to reward.

- **Motivation.** Open innovation assumes that external innovation is an ongoing stream. Nevertheless, to secure sustainability, external innovation requires replenishment. For example, venture capital, joint projects, and the creation of interactive media for knowledge sharing need follow up, and significant investment of resources (money, personnel, etc.), to stimulate creative ideas.

Awareness of the above challenges and the benefits derived should appropriate management attention is given may serve as a trouble-shooting when implementing an open innovation.

4.7 The Relevance of IP in the course of open innovation

Intellectual property rights (patents) protect an original innovator of a product or a service. They are supported by intellectual property law. The prime objective of intellectual property law is to increase investment on innovation, and hence, to augment social welfare (von Hippel, 2004). Similarly, West (2006) shows a direct relationship between IP and open innovation. He observes that strong IP establishes willingness to out-license and promote vertical innovation. But research on the impact of IP law on social welfare indicates the opposite – decrease on social welfare (Faray, 2004).

Protecting innovation from revealing to others freely may not guarantee long term sustainable innovation. Sharing intellectual property can be more profitable than keeping it by your self (Economist, 2005). Hiding own inventions perhaps result in cultivating similar ideas by different innovators, which leads to a stiff competition without benefiting to nobody (Von Hippel, 2004). The huge investments by individuals, simply account to sunk cost. On the eye of social welfare, this is a decrease on the social efficiency.

On the open innovation phenomena, innovators freely reveal their innovation to others – customers, competitors, suppliers, etc (Chesbrough, 2003a; Ulhøi, 2004, von Hippel;

2004). The other partners, then, modify these innovations to complement the original innovation according to their needs. Interestingly, the unshakable connections developed among the innovators and users support for an exchange of constructive ideas, which may help to enhance innovation.

The advantages of this approach – open innovation - are multi-facets. First, end users acquire tailor made innovation. Research studies indicate that the more users involve in the modification of their own products, the more commercial attractive will be these products to them (von Hippel, 2004). Second, Social efficiency may be achieved due to the fact that innovators are no longer left on backing similar innovations independently but to complement on an innovation freely available. Innovations will be more valuable to society provided that they are somehow diffused to others. Third, it increases the pool of innovation due to the fact that companies strive to achieve first move advantage, by adding value to existing innovations.

Nevertheless, today, based on the degree of free riding innovations, companies are termed as user centered and manufacturer centered, and some are in between (von Hippel, 2004; Uihøi, 2004; Waters, 2005). Those who impose strong IP on their innovations are manufacturer centered, while user centric is the opposite. Those who fall in between holds a hybrid form of innovation (Uihøi; 2004). When taken together, such relationship forms a continuum of innovation. Table 4.1 shows these relationships. The strengths and weaknesses of each approach are entailed. These two approaches also greatly differ on their motivation drive as discussed on the next sub-heading.

Table 4.1: The continuum of innovation democratization

←	→	
Manufacturer centred	Hybrid	User centred
<ul style="list-style-type: none"> ◦ Proprietary knowledge ◦ Economic motive ◦ Legal measures of control ◦ High cost of participation ◦ Rival among innovators ◦ Free riding are concern ◦ The value of knowledge diminishes when consumed by others ◦ Market rigidity 	In-between	<ul style="list-style-type: none"> • Non proprietary and non-collectively owned knowledge • Psycho-social motives • Social control mechanisms • Low cost of participation • Cooperation between innovators • Free riders are not considered a problem • The value of knowledge increases with wide consumption • Market flexibility

Source: Adapted from Ulhøi, J. P. 2004. Open Source Development: A Hybrid in Innovation and Management Theory. *Management Decision*, 42 (9): 1095-1111.

The current trends toward opening innovation – democratizing innovation - are driven by advances in computer software and hardware, and the ability to connect and combine via new communication media such as internet (von Hippel, 2004). Arguments on why do users interested on free riding innovations and modify them suggest that, besides to satisfying their heterogeneous needs (Henkel and von Hippel, 2005), they do also achieve economic gain such as agency costs by not relying on custom manufacturers – specialized in developing products for one or few users (Hippel, 2004).

In the open innovation paradigm, it seems that holding IP rights on innovations may slow the innovation process. After all, the innovation process culminates when innovations are taken to market and verify for their commercial worth (Chesbrough, 2003c). The social welfare and fairness considerations suggest that innovation related policies should be made neutral with respect to the source of innovation (von Hippel, 2004). A number of innovation players such as innovation merchants, discussed above, may be affected by such trends negatively.

Contrary to this, Chesbrough (2003c) indicates that under new IP law university researches, which contribute a remarkable source of innovations are allowed to protect their innovation (IP) - limiting to the free access of innovation. However, a number of researchers warn that firms that do not open-up their boundaries for the free flow of innovations may be at a severe competitive disadvantage (Nieto and Quevedo, 2005; Davis, 2006). Finally, Davis (2006) reveals that companies should implement an open innovation programs whilst placing an appropriate safeguard on their intellectual property.

4.8 The case of motivation in open innovation

Often the issue of motivation generates strong debate on incentives about knowledge workers. In some context, it stress on the monetary value - extrinsic - of motivation whiles in other circumstances on the satisfaction - intrinsic. Lawrence (2004) shows that intrinsic motivation results in more creativity. Generally, it is agreed that motivation systems depends to a greater extent on the cultural norms of an organization or group (Malhotra and Galletta, 2003) as well as individual behaviour (Lawrence, 2004). For example, in Xerox, the technicians get motivated when they see their names post 'in lights' in front of thousands of peers rather than financial incentives. Similarly, peer recognition is the prime driver for community participation in organizations; the same is true for people who often contribute to community development (Malhotra and Galletta, 2003).

In the case of open source software, most of these developers are professional programmers whose endeavour is to flourish knowledge on the wider community. Researchers observed that the intrinsic motivation of these professionals is more important. Generally, Ulhøi (2004) cited four specific motivation drivers for open source innovation developers, though emphasizing the intrinsic motive is more prominent.

- economic drivers - seeking cost efficiency,
- social drivers - social prestige and expectations of reciprocity,
- psychological drivers - feeling of altruism and efficiency, and reputation, and
- intellectual driver learning opportunity, aesthetic needs, and individual needs.

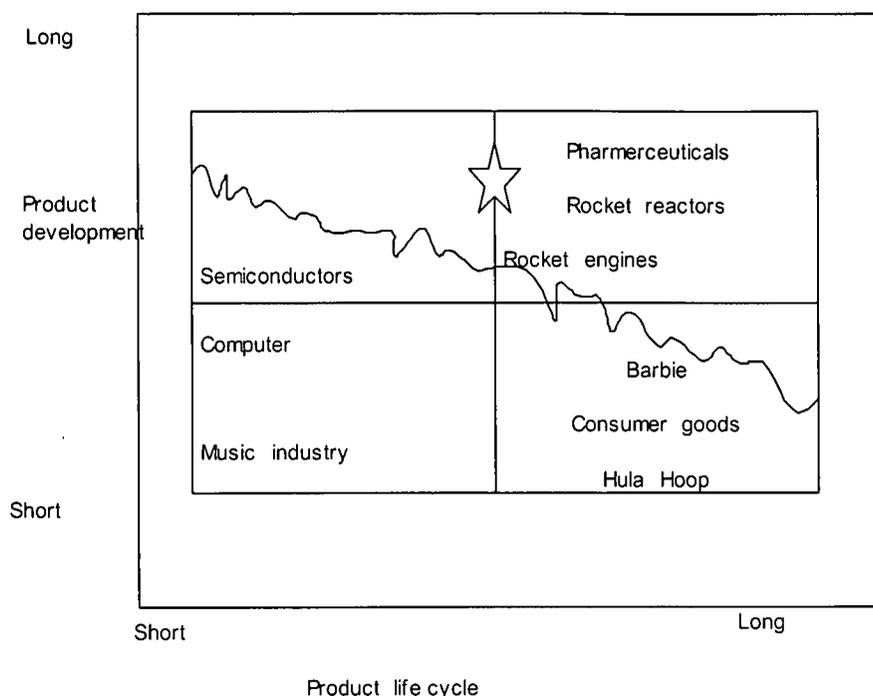
In the course of open innovation, despite there are indications that point a need to review the relevance of existing motivational factors, it seems that the intrinsic motivation may result in more innovation. From table 4.1, it may be deduced that as an enterprise opens its innovation systems to others, the motivational factor tend to shifts from economic to psycho-social oriented (Ulhøi, 2004).

Regardless of the types of motivational incentives, West and Gallagher wrote that for sustainable innovation, the contributors of open innovation need continual follow-up, and firms should invest in resource to motivate them. Such resource may include monetary rewards, creating interactive platforms, and other intrinsic incentives (West and Gallagher, 2004). Most importantly, the rewards systems must be implemented so as to enhance the cultivation of external innovations rather than orienting them towards internal breakthrough.

4.9 The prevalence of open innovation

Although the open innovation phenomena is in its infancy stage, many industries such as music and publishing companies (Horwitch et al., 2000), sports (Ulhøi, 2004; Waters, 2005), tourism (Watson et al., 2004), and pharmaceuticals and plant genetics (Lowry, 2004) are committing them selves towards the open innovation approach (Marchall, 2000; Chesbrough, 2001; Pekka, 2002; Grand et al., 2004; Jay, 2005).

This is, though, not to conclude that all industries have been migrating to open innovation. Chesbrough asserts that at this point, various businesses can be located on a continuum – closed innovation on one end and the open innovation on the extreme end (Chesbrough, 2003b). Complementing this supposition, Callahan developed an *open innovation frontier* by considering two factors: the product life cycle on the horizontal line and the development cycle of an innovation on the vertical line (Callahan, 2004). Industries are then put into hierarchies according to their migration efforts to open innovation (See Figure 4. 4 below).

Figure 4.4: Open innovation product life cycle

Source: Adapted from Callahan, R.H. 2004. The Open Innovation Frontier [online]. Available: http://www.corante.com/ideaflow/archives/2004/04/06/the_open_innovation_frontier.php. [2005, December 20].

From **figure 4.4**, it is noted that industries at the bottom left corner are more committed to open their innovations. Music video industry and computer industry are typical examples (Chesbrough, 2003a; Chesbrough, 2003c; Callahan, 2004). These industries are characterized by short development cycle as well as short product life cycle. From the music industry for instance, Hollywood has involved through a network of partnerships and alliances between production studio, directors, talented agencies, actors, scriptwriters, independent producers and specialized subcontractors (Chesbrough, 2003a). The mobility of these work forces is extremely high.

Industries situated on the top right corner of **Figure 4.4** have a long product development cycle and long product life cycles. Pharmaceuticals and rocket-reactor industries are good examples. They mainly depend on the internal ideas, with few start-ups, and slow workforce mobility.

Rocket engines seem to fall in between of the two upper quadrants due to the fact that they take an average product development and product life cycles. Semiconductors are

situated on the top left of the continuum, because the development cycle of these industries is high while product life cycle is low. Interestingly, it can be noted that in that quadrant, the open innovation paradigm seems to progress upward. Nonetheless, Callahan (2005) indicates that this quadrant is the toughest one to be.

Industries situated on the bottom right corner are characterized as having short product development and short product life cycles. Examples of these are consumer goods, Hula Hoop, and Barbie (Callahan, 2004).

According to Chesbrough (2003b) many industries that have not been indicated in this figure - such as copiers, disc drives, telecommunication equipment, biotechnology and even military weapons and communications systems – are currently transitioning from closed to open innovation. He further indicated that the locus of R&D of these industries has migrated beyond the confines of the central R&D laboratories of the largest companies and situated among various start-ups, universities, research consortia and other outside organizations, as illustrated above. Such a move renders flexibility to respond to the rapidly changing competitive challenges. **See case example below.** It shows the success of travellex's financial exchange unit, CFX, by implementing an open platform and networking to get a flexible business.

Open platform and networking a means to flexible business

Poised for the next stage of its evolution as a business, Travelex's commercial financial exchange unit, known as CFX, wanted to establish the flexibility to respond rapidly and cost-effectively to emerging strategic opportunities. The company is a classic model of those enterprises that have grown very large, and very quickly. To keep its competitive edge, CFX needed underlying systems that would complement its agility as a business, rather than hampering. To address its problem, Travelex teamed with IBM and IBM Business Partner Osmosis Integration to create a new, open platform for developing and integrating foreign exchange applications. Employing an open development environment enabled Travelex to streamline its development process, thus removing what had been an obstacle to the rapid deployment of new services.

Process-wise, the key to its success was the newfound ability to reuse core service applications - such as an exchange rate conversion engine - across an array of more specialized applications, instead of each having its own underlying engine. This led to

a shorter, lower cost development cycle on the front end, as well as lower application support burden going forward. The other big benefit of an open development environment was application integration. By enabling the development of 'integration-ready' applications, Travelex simplified their integration. This action further shortened the development cycle (Richards, G. 2005).

Based on the recurring trend towards open innovation, it seems that the open innovation frontier is migrating up word. But, such shift is dependent on the type of an industry and the outcome of a cost-benefit analysis of an open innovation strategy. After all, a continual reliance on external sources of innovation, either by copying them 'as-is' or modifying them to various forms, may cause dependence on others (Grand et al., 2004; West and Gallagher, 2004).

4.10 Summary

The prime objective of the chapter was to deal with the new paradigm of innovation, open innovation.

Open innovation has been defined as a paradigm shift in innovation that uses external ideas to complement internal capabilities, and looks for external market to commercialize innovations, which lacks current market.

Open innovation practice is not new concept; it was practicing in the iron and steel industries of the 19th century. And more recently, it has been conducted in soft ware industries, as open software innovation.

Due to the fact that promising sources of external knowledge such as customers, suppliers, competitors, venture capitals, universities etc are available, the open innovation paradigm seems to emerge as full vigour. It has further been found that organizations involve in the innovation process as funding innovators, innovation innovators and commercializing innovations. Recently such sources, however, have been found to have lack of reach towards the global research

Based on their core and supplemental knowledge base, it is indicated that organizations adopt innovations in different levels: technovators are the first to adopt an innovation while core experts are the last. Because innovation adoption may confront with existing operations, three methods of handling methods – maximization, incorporation and motivation – of such differentials have been pointed out.

It became clear that opening ones innovation reduces the backing of similar ideas in different organizations. For this reason, the consumption of resource is economized. From the social welfare point of view, this is an increase of social efficiency. Thus, the importance of protecting ones innovation through a patent is becoming questionable.

In conclusion, the chapter addressed a number of industries that are moving forward towards opening their innovation. These industries have been put in an innovation continuum based on the product development cycle and product life cycle. An open innovation frontier, revealing the open innovation involvement of different industries has been found. This frontier further shows the current efforts made by a variety of industries to open up their innovation systems.

An open innovation approach poses some implications to existing management practices. These implications together with alternative management models are presented in the following chapter.

CHAPTER V: THE MANAGEMENT OF OPEN INNOVATION AND ITS IMPLICATIONS TO EXTANT STRATEGIC MANAGEMENT

5.1 Introduction

In an environment characterised by uncertainties and discontinuities, enterprises need to innovate in order to survive. Innovation is, then, considered as a blood stream of business enterprises. It may stem from a closed or an open model (Chesbrough, 2003c).

In the closed model of innovation, as has been illustrated in chapter three, enterprises develop innovations internally based on their internal competencies; whereas in an open innovation, the emphasis is to make use of external competencies to augment business innovations.

Regardless of the innovation model followed, it is generally agreed that enterprises involve in innovation when: agency cost of innovation is high, opportunity cost of an innovation is low, information is sticky on the principal's side, and cost of not to innovate is high (Gehring, 2004). To benefit from and making use of an innovation enterprises need to set appropriate management techniques.

Many of the traditional management approaches and techniques discussed in chapter three portray several deficiencies. It, then, seems that enterprises would less likely to depend entirely on these approaches to deal with the newly emerging paradigm of innovation, open innovation.

It is a current academic argument that implementing an open innovation phenomena entails a management mind-set that goes beyond extant management practises. Chesbrough (2003c), Chesbrough (2004), Chesbrough et al. 2006), Christensen (2006) and Davis (2006) disclose that in the emerging paradigm of an open innovation, enterprises need to open up their boundaries to access the global knowledge and research findings. Horwitch et al. (2004) and West & Gallagher (2004) portray a wide range of opportunities put forth from an open innovation. They did not, however, hide

the existence of challenges associate with it. Leibold et al. (2004) reminds an enabling management mindset to deals with an environment characterised by networks and open innovation. A research conducted by Horwitch et al. (2004) addresses managerial implications for firms that particularly opt to move their strategy from networked to open innovation.

Based on the above discussion, it can be noted that the implementation of an open innovation strategy prevail new management implications. Among others, such implications include challenging existing organizational culture, organizational structure, leadership style, innovation models, resource allocation and management mind-set (Horwitch et al., 2004; Amar, 2001; Chesbrough, 2003b; 2003c; Chesbrough, 2004).

Accordingly, in this chapter, management concepts that associate with an open innovation and their implications to extant strategic management approaches are reviewed. In addition, some managerial toolkits to help manage an open innovation have been addressed.

5.2 The Management of open innovation

Strategic management approaches have continually been shaped to encompass the ever changing developments in business strategies. For example, in chapter three, it has been shown massive trends of industries to network their innovations. These compel for a management mind-set that goes beyond traditional hierarchical and tightly locked boundaries. The benefits of networked practices, among others, include getting access to multiple cultures, competencies and knowledge sources. Building knowledge sources through a networked approach, though, hampers innovation for the fact that it leads to dependency on existing knowledge basis.

The current practices of high tech-industries, open innovation, seem to supplant the deficiencies of networked innovation approach. Open innovation models strive to lax the knowledge controlling mechanisms, and make use of existing knowledge sources to build-up new innovations. The knowledge base, in an open innovation, is accessible to a wider community that extends beyond networked business partners (Chesbrough et.al. and Davis, 2006).

In an open innovation, management practices adopted in the networked innovation seem to extend their areas of scope to embrace global sources of innovation. This is due to the fact that new conditions are evidenced in the open innovation (Horwitch et al., 2000). **Table 5.1**, below, provides these stipulations in comparison with networked innovations.

Table 5.1: Comparison of networked and open innovation

	Networked innovation	Open innovation
Feedbacks	<ul style="list-style-type: none"> • Limited to the members of the system/network • Internal to the system 	<ul style="list-style-type: none"> • From all parts of the environment • Users/Market • Suppliers • Experts • Competitors • others • external to the system • continuous
Quality control	<ul style="list-style-type: none"> • Well defined and determined by the organizational structure • Internal to the firm 	<ul style="list-style-type: none"> • Third party • Respected members of the community
Ownership	<ul style="list-style-type: none"> • Firm (s) • Direct ownership (first degree) of the product of the innovation 	<ul style="list-style-type: none"> • Public domain • Derivative ownership (second degree) of the product /services related to the core product of the innovation
Management	<ul style="list-style-type: none"> • Very sophisticated, complex project management 	<ul style="list-style-type: none"> • No management • Self-adaptive system
Personal driving forces	<ul style="list-style-type: none"> • Contractual binding • Loyalty building to the corporate 	<ul style="list-style-type: none"> • Self-motivation with diverse objectives – glory, professional respect, curiosity, money, fun, etc • Loyalty to the product/community
Process	<ul style="list-style-type: none"> • Analogous to building a skyscraper • Very sophisticated complex project management 	<ul style="list-style-type: none"> • Analogous to the formation of a crystal • Self-adaptive systems • Facilitation leadership

Source: Adapted from Horwitch, M., Parikh, M. & Ziv, N. 2000. *Open Innovation: Transferring Lessons from Software for Modern Value Creation. CISEP Workshop on Innovation and Diffusion.* Institute for Technology and Enterprise. New York.

From the above table it can be observed that, in the open innovation, a given enterprise is faced with multiple feedbacks regardless of their destinations. And the measurement

of organizational operation does not rely on internal control models, rather in a third party's quality control systems. Consequently, ownership of first degree innovation is less likely to be firm specific - it is a public domain. Such enterprises possess mainly products and services related to the core products (derivative ownership). Moreover, Enterprises that operate in an open innovation environment exhibit no management. Hence, they are said to be a self-adaptive systems. These organisations are mainly composed of partners and communities whose personal driving force is self-motivated with diverse objectives, ranging from money to just for fun.

These new phenomenon seem to challenge existing strategic management approaches in terms of culture, leadership, organizational structure, innovation models adopted, resources allocation to innovations, and measurement metrics of an innovation process.

5.2.1 Culture

Innovation is a culture not a process (Robert, 2005). Culture is a system of shared assumptions, policies, values, and norms that describe appropriate attitudes and behaviours for organizational members that impact on organisational creativity and innovation (Youngblood, 1997; Youngblood, 2000; Martins and Turblanche, 2003). Organizational culture is a depository of generally understandable assumptions in an industry and its wider community. It is, therefore, compared to computer's operating system that runs the overall activities of an organization. Since most of these cultures are simply accepted as truth of basic operations and assumptions, they are invisible to most companies. Consequently identifying, analyzing and changing them to reflect current needs of an organizational system may not be easy (Youngblood, 2000).

Nevertheless Davidoff and Kleiner (1991) showed that corporate culture audit and culture changes facilitate for better matching a company's culture with the development and implementation of new technologies. There are at least three steps for matching culture to an innovative behaviour.

- Strategies for implementing new technologies and all its complements must be explicit and understandable.
- Through the help of cultural audit, current culture must be analyzed and made tangible.

- The strategy must be revealed in the context of the culture to determine where the cultural risks are. Based on the relevance of that culture to innovation, organizations can ignore the culture if it produces negative impacts, manage it if it is rewarding or change it to match the innovation (Davidoff and Kleiner, 1991). Youngblood (2000) though, reminds that cultural change is a slow process.

The essential cultural change, in a given organization, depends on the innovation type (incremental, disruptive, and radical) involved. Major incremental innovations do not involve a departure from existing organizational practices and operations. Upgrading existing culture without a total change may suffice for upholding the required innovation. Disruptive and radical innovation, however, cannibalise existing technologies and operations. Hence, they require a radical cultural change.

In the 21st century, most innovations are radical and disruptive. Through radical and disruptive innovation, innovative enterprises strive to outperform their competitors. However, cannibalising enterprises own existing practises is one remarkable negative implication of disruptive innovation. Chesbrough (2001) believes that an open innovation strategy may fill the threatening gap that emanates from disruptive innovation.

To succeed in an open innovation environment, therefore, cultivating a proactive cultural change that accommodates the required technologies seems necessary. As it has already been indicated in chapter one, in the course of open innovation, 'hackers culture/ethic' is one that companies need to introduce in their existing culture (Pekka, 2002). Hacker, here, does not point to a computer criminal, but rather to the original sense of the word: a person who is passionate about his work, and wants to share the results with others. Such culture may enable them to absorb external sources of knowledge. Similarly Chesbrough (2003b) wrote that companies need to overcome the culture of 'not invented here' (NIH) that dominated existing organizational innovations. Hacker's culture is an enabling culture that helps organisations to make use of others innovations by incorporating into their existing knowledge base. They also need to develop a culture of releasing their innovation to outsiders when it lacks a current market. However, such cultural changes need a close attention as it alters the reward and motivational systems in most organizations.

5.2.2 Leadership

In the open innovation phenomenon, organizations seem to shift their leadership orientation. Traditional leaders conduct their operations by instructing and guiding employees. This involves controlling employee's performances by comparing outputs against set standards (Amar, 2001). Based on their achievement levels to the set standard, employees are evaluated, rewarded and /or promoted. Such a leadership function seems as lacking relevance to reflect the required competence level of employees. In the innovation economy, employees' competencies are evaluated against their ability to create; and ones creativity can not be traced by employing output measurement tools. Furthermore, traditional leadership becomes too complex because organizational approach shifts to networked innovation. For instance, in the networked innovation, leadership involves the handling of complicated and complex project. In an open innovation, personal derives are not bounded by contracts (Horwitch et al., 2000). Hence the role of a leader involves a minimal control because these organizations are self-adaptive systems as described in chapter three. In complex-adaptive systems (organizations), leaders strive to establish a balance between order and disorder – an ability to manage at the age of chaos (Leibold et al., 20003).

Generally, for an effective innovation management, leaders should play an innovation enabling role. Traditional leadership title such as 'bosses' and 'foremen' are getting modified by new titles, namely, 'team leader' and 'group leaders'. These leaders play a symbiotic role that favours participative team and group working rather than standard production that imposes exclusive control (Amar, 2001).

According to Amar (2001), symbiosis leaders possess four characteristics, namely:

- **Dormant existence.** This kind of leadership exists in organizational structures that defy traditional leadership. In such organizations, the aforementioned traditional leadership titles: *bosses, foreman, and lineman* are customized with new titles such as *group leader, team leader, and mentors*. These new leaders function as supervisors do in traditional leadership, but their degree of control is lax enough to allow the flow of creativity; they do not exhibit their leadership power, rather they only perform a leadership role when the employees need to be led. Hence, it is the employees who vested acceptance against the leader

that makes them obey the lead, rather than traditional leaders who lead through their leadership authority (Amar, 2003).

- **Catalytic interaction.** Leaders should now that creativity is not some thing that can be measured through performance output by comparing against set standards like products and services. Similarly, they have to note that innovation can not be obtained from their employees. It is only by developing a conducive environment favourable to employees' creativity that a leader would hope such creativity to turns into an innovation. Symbiosis leaders thus play a catalytic or facilitation role – creating an environment favourable for employs creativity (Horwitch et al., 2000). This kind of leadership, besides creating a favourable situation to use any kind of knowledge beneficial for an organisation, initiates a culture of ' I will do myself ' on individual employees.
- **Leadership as reversed follower ship.** An innovation leader is called 'reversed follower ship' when the employees who want to be led by a particular leader give the authority. These leaders perform a follower ship role that has been confirmed by the employees. Emphasising the role of reversed follower ship's contributions to organisational innovation, Amar (2003) argued that leaders with a formal power authority hamper employee's innovation.
- **Mutualism.** For a successful innovation, it is essential that leaders and groups should work in mutualism. These groups function best when reward and success, as well as failure and punishment - from their outcomes - affect every member of the group equally to the proportion of their contribution, and no one, not even the group leader, would take a disproportionate share. Hence, a leadership style that suits for quantum organizations - organisations that operate in complex business environment – is not one that favours to hold a specific position but it is a process, which allows every one to participate (Youngblood, 1997). In an open innovation, the extent of mutualism seems to extend to a wider array of individuals, groups, organizations, institutions and communities to allow the flow of relevant knowledge into the relevant knowledge pool. This leadership style is an 'open leadership.'

5.2.3 Organizational structure

Traditional organizational structures are designed in such a way to suit the conduct of ongoing needs. Hierarchical organizational structures, based on hierarchies of authorities (Youngblood, 2000; Riempp, 2005) were the usual designs for the push model of innovation, discussed in chapter three. These structural approaches have been found not suitable for organizational needs that focus on efficiency of operations. This is because many innovations would remain unfit to the market needs, counting only to the total cost of production. For that matter, an organizational structure that renders cost effective processes is needed. Hence, management approaches shifted to the analysis of external environment. And organizational structures were designed to enable and make use of external market stipulations (Ansoff et al., 1976; Riempp, 2005) by networking with multiple market players (suppliers, customers, competitors etc). Knowledge of such a network relationships enable firms to 'fit' into their environment and produce tailored products to the market. Under this umbrella, a number of network innovation models have been shown. Due to the shortcomings of these networked innovation models, as shown in chapter three, firms need to further consider the relevance of organizational structures designed for the networked economy.

For enterprises that strive to leverage knowledge by implementing an open innovation strategy, an open organizational structure seems relevant. This structure is fluid and flexible, and with no definite shape (Howitch et al., 2000; Keegan et al., 2003; Cummings and Wilson, 2003). More specifically, Howitch et al. (2000) pointed out an organizational structure that encompasses an open company, open marketing, open human resources, and open functions.

- **Open company and marketing.** This refers to increasingly ascertaining customer needs and taking into considerations their responses. In the open course innovation, customers are no more recipients of the innovations; rather they are co-creators of their own needs (Hippel, 2004; Leibold, 2004). For instance, Dell innovation starts by directly interacting with the requirements of tens of thousands of customers' daily, organised events, and customer panels.
- **Open human resources.** A portfolio of key and diverse human personnel is important for an open innovation to take place. More variety of diverse

personnel is needed to create 'human radar' that recognizes stipulations of external sources. Without such resources many external sources of innovation may go unnoticed.

- **Open functions.** New functions and jobs may be emerged in an open innovation settings. To effectively utilize such an emerging opportunities, the open company needs to have:
 - **Scanners** - refers to people who seek for new ideas and developments that may be valuable to an enterprise.
 - **Sentinels** - implies to those who are charged by a firm to deeply immerse in the external world of open innovation. They operate like listening posts of an earlier era, and provide a dialogue and act as channels to incorporate relevant open innovation developments.
 - **Strong links** – is to develop networking with external sources including trade groups, policy and standards bodies, research organizations, and universities, which are necessary for the continual use of an open innovation.

More recently Davis (2006) shows the drawbacks of existing open innovation models. They lack the principle of 'reach'. The organizational structure suitable for an open innovation is one that enables to connect to the global knowledge and research findings.

5.2.4 Resource allocation

In an open innovation phenomena, organizations should consider three basic areas of resource allocation decisions (Grand et al., 2004).

- **Private innovation.** *Private innovation* assumes that returns to the firm result from private goods and efficient administration of intellectual property protection. It takes place within firm's boundaries or as part of its web of partnerships. This would enable firms to practice their (internal) technologies without being blocked or held up by external IP. In the open innovation phenomena, IP flows in and out of the firm on a regular basis. The financial worth of protecting IP (internally) is becoming questionable. And even some times IP is given away through publication, or donation. This may have a

negative impact on enterprises' innovative power. Interestingly, private investments on long-term discoveries and innovations in organized large firms' R&D laboratories seem to decline because, these firms do not realize the returns on their innovative activities; and their innovations are easily imitated by free-riding competitors. However, it is a research agenda of many academics on whether huge private investment on innovation will continue under such circumstances.

- **Open innovation.** Open innovation, as indicated above, does not mean opening the entire R&D of an organization and closing the internal R&D functions, rather it is complementing the internal innovations with externally available ideas (Tresko, 2004). Hence, enterprises that committed to open their innovation, implicitly, engage in dual complementary knowledge leveraging modes of innovations: private and collective. This means, although an internally cultivated innovation is publicly released, the firm's-specific individual knowledge and expertise accumulated through the engagement in the process of open innovation development remains *within the firm* or individuals. Therefore the resource allocation decision in an open innovation seems to depend on organizational commitment to the approach, and the cost-benefits involved with each strategic mix - private or collective (See Grand et al., 2004). For instance, on one hand, the more a firm opens its innovation the less it will invest on private innovation, and the more it is to depend on others. The obvious implication of this decision is the necessity to build a capability space that enables to capture externally available innovations. Moreover, it may lead to dependency on others sources risking own survival. On the other hand, the less it opens its innovation the less it will depend on others. But the outlay of its investment will be high. This latter decision should be balanced against the externally available missed opportunities.
- **Public innovation.** This innovation assumes that firms collaborate with public institutions such as universities, start-up companies, specialised small companies, individual investors, graduate students, and even retired technical staff to produce a public good, where public access to the results and transparent communication of the research and development process are inherent (Grand et al., 2004). Interestingly, as innovation became more open

process, intermediate markets have now arisen in which parties can transact at stages which previously were conducted entirely within the firm (Chesbrough, 2003). To benefit from public innovation, enterprises need to invest on relevant technologies that enable to extract public knowledge.

A further derived implication, out of the above resource allocation decision, is the question of existing metrics for assessing the performance of firm's innovation process. Classical metrics of performance assessment include the percentage of sales spent on - internal - R&D, new products developed in the past year, percentage of sales from new products, and the number of patents produced per dollar of R&D (Chesbrough, 2003; Maria and Marisa, 2003). These measures are less likely to represent the entire performance of innovative firms (Richard et al., 2002). In the open innovation process, new metrics seem to expand and perhaps to substitute for some of these metrics (Chesbrough, 2003). The new metrics for evaluating the performance of an innovation process of a firm may include:

- the amount of R&D activities being conducted within the firm's supply chain (rather than firm's specific R&D activities),
- percentage of innovation activities originated outside of the firm, and how this compares to the industry in which the firm operates or other industries,
- the time it takes for ideas to get from the lab to the market, and how does this vary by channel – internal, out license, spin-offs, etc.

Hence, analysing the necessity of an innovation and allocating appropriate proportion of resource seems imperative.

5.3 Business models for an open innovation management

According to Davis (2006) joint development, alliance, working with Universities or private labs is among traditional models of implementing an open innovation. The purpose is to bring ideas and technology into the firm. The drawback to these approaches is lack of reach, defined as the ability to connect globally with thousands of potential providers of basic research, services, technology, or ready-made products. These existing models are depriving firms from reaching potential partners and solutions around the world.

In his research, Davis disclosed that the National Science Foundation estimates over three million peer-level researchers around the world. The research further shows that even large companies, such as pharmaceuticals, have less than 1 percent of the global research and development community as part of their staff (Davis, 2006). Companies must consider how they can best access this global network of innovation to speed the firm's innovation efforts, rather than sticking themselves to the traditional models.

There are some emerging models for implementing open innovation. One of these is Subscription model. In this model, companies have to sign up to have access to the solver community - which is comprised of finite network of individuals and companies. They surrender the rights to their IP in order to be eligible to work on problems posted by member firms. Membership is acquired and maintained through an annual fee.

Another technique is the open network model. In this model each firm runs individual projects to find new technologies or innovations. Every time a new project is launched, a new global search for researchers and innovators to find the required expertise to meet the specific project needs. Unlike to the subscription model, membership does not involve any fee. **Table 5.2** below summarises the traditional and new models as well as their advantages and disadvantage.

Table 5.2: Comparison of traditional and modern models of innovation

Model	Example	Advantages	Disadvantages
<i>Traditional models</i>			
Simple and straightforward process	Short-term use of existing suppliers to develop a specific technology or innovation	<ul style="list-style-type: none"> Existing relationship Reduced cost and risk Eliminates need to search for and evaluate new partners 	<ul style="list-style-type: none"> Lack of new knowledge Better alternatives if searched for Lack of competitive advantage due to supplier owning IP
University alliances	Utilization of universities or specific professors to work on both basic and applied research	<ul style="list-style-type: none"> Expertise External perspective IP relationship pre-defined 	<ul style="list-style-type: none"> Lack of reach to global innovation community Multiple priorities
Multiple priorities	Structured partnership to develop and exploit a new technology or innovation in the marketplace	<ul style="list-style-type: none"> Complementary skills Reduces risk and spreads costs Dedicated resources 	<ul style="list-style-type: none"> Potential cultural conflict between partners Competitive issues Ownership issues
<i>Modern models</i>			
Subscription-based	A finite or “closed” network of solution providers that will work on	<ul style="list-style-type: none"> IP ownership defined Structured environment 	<ul style="list-style-type: none"> IP assignment limits potential solution partners Lack of control over contractual terms Solution reach limited to in-

	technology requests from member organizations		network members <ul style="list-style-type: none"> • Annual subscription fees
Open global network	A structured process for developing requests for technology or innovation, and distributing them to the global research and innovation community	<ul style="list-style-type: none"> • Control of IP and contractual terms • Access to global sources of innovation broadly across technology disciplines • Real-time access to new technology/innovation • Finds un-obvious connections • Potential for finding disruptive technologies 	<ul style="list-style-type: none"> • Broad communication of key needs • Evaluation includes more unknowns

Source: Davis, R.M. 2006. How to Make Open Innovation Work in Your Company. *PDMA Visions*, January 2006.

Besides to the above explanations, experiences from open source software provide rich alternative opportunities for enterprises and industries that particularly commit themselves to an open innovation strategy (Gehring, 2004). These include:

- 1) *Facilitating distribution in the physical space.* After giving innovation open to outsiders, companies can design their business model in such a way to distribute the products physically to those in need of such innovations. These are customers who have no access to get the openly revealed innovations as well as those who have no time and other resources to use it. Example in the open source software, the software is distributed in CD-ROM bases to the aforementioned customers (Horwitch et al., 2000).

- 2) *Providing physical support.* There is an opportunity to provide technical support services for the non-technical user organizations of the innovation – in technological intensive enterprises and industries. For example, in the open source innovation, many independent programmers some of whom are involved in the OSS projects also provide fee-based technical support to their clients.
- 3) *Providing value-added feature.* Innovations that are freely available are often standardized, which can mostly be used by the experts. In order to be used by the wider community, a number of experts engage in value-adding services. Since such value-adding innovations are not required to be revealed them freely, the developers can collect a fee from them. For instance, in the case of open source software, Red Hat provides special security features for the Apache web server. Covalent Technologies also do offer an SSL module for the Apache web.
- 4) *Providing specific application development.* A constructive lesson learned from open source software is confinement of the OSS it self to only change the source code and distribution them freely. However, if any successful developer creates some programs that can run over the OSS, the creator is not required by the General Public Law (GPL) to reveal it freely.
- 5) *Providing training and services.* The open innovation may provide an opportunity to establish a training business. The innovator can publishes self-help books providing information, guidance and training to their innovations, like what has been done in the open source software. Furthermore, these enterprises can undertake class room-based training to users of the innovation – if a need exists.

By developing and implementing innovative new business models, firms can discover ways to make business out of an open innovation. Moreover, the existence of such alternative business models, perhaps, minimizes the losses from errors made on R&D projects evaluation. In the closed model of innovation, innovation processes were managed to reduce the chances of 'false positive' projects, which would result when an R&D project went entirely through the process, went to market, and failed

(Chesbrough, 2003c). Many firms lacked any processes for managing false negative R&D projects – projects that do not fit to existing business models of the company.

In the open innovation, business models of enterprises are cognitive devices that filter projects that fit with current business models, and selects against those that do not. While firms seek to minimize the occurrence of 'false positive', they also incorporate additional processes to manage 'false negative' to appropriate value from them by identifying potential new markets and business models (Chesbrough, 2003c; Chesbrough, 2004). Often many enterprises deliberately ignore 'false negative' ideas; only few companies – though - take initiatives to manage the risks of evaluation by focusing on new business models. Hence, the above mentioned alternative business models provide an opportunity for potential business to invest in.

5.4 Strategic toolkits for managing open innovations

As companies move their approach from closed to open innovation systems, a new management metric is required to deal with the technological and market uncertainties of innovations.

Chesbrough stresses that, in the open innovation paradigm, companies need to learn how to play 'poker' rather than 'chess' (Chesbrough, 2004). The strategic moves - as a metaphor of 'chess and poker' - to manage an innovation are presented in table 5.3 below.

Table 5.3: Management of open innovation – a metaphor of chess and poker

Chess	Poker
<ul style="list-style-type: none"> ◦ Must plan several times a head ◦ Resources are well defined ◦ Competitors resources are well understood ◦ No new information arrives during the game 	<ul style="list-style-type: none"> ◦ Must adapt and adjust as new information arrives ◦ Resources emerge overtime ◦ Competitors resources emerge over time ◦ New information arrives regularly

Source: Chesbrough, H. 2004. Managing Open Innovation. Research Technology Management, 47(1): 23-26.

From the table above, it can be noted that the strategic moves of an open innovation managers are not rigid and not bound to the original plan. These moves are rather flexible and adaptive to an ongoing development. Nevertheless, today, it is not surprising to notice many companies fail to take advantage of the latter strategic move by limiting themselves to the former move. These companies are said to be good at playing 'chess' but not at 'poker'. For instance, Xerox was good at finding technologies to advance its copiers and printer business but poor at exploring the potential options of competing technologies in new markets (Chesbrough, 2004).

To implement an open innovation approach, it is important to develop competencies that enable to play 'poker'. These competencies may develop by making use of all relevant information and knowledge that evolve along the process. In other words, in complex business environment characterized by innovations and business reinventions, it is important to nurture a managerial mental space, that is, open to the environment in terms of market searching, and tapping available knowledge. Mental space, here, refers to the images and patterns engaging the mind when considering markets, industries, boundaries, strategies and capabilities (Leibold, et al., 2004).

Market space consist consumers and products. The perception on customers has moved from being recipients of a physical product to co-producers of non-physical product. With regard to industry space, traditional industry spaces have been transcended from linear and competitive industry system to non-linear and collaborative business system. By the same token, the traditional geographical space as encompassing inward supportive regions has been displaced by linked and open regions. The perception on traditional standardised global spaces has shifted to localised metanational space (Keegan et al., 2003; Leibold et al., 2004). Finally, managerial intuitions to invest on training and information, as competence building, have been substituted by new capability space: learning and knowledge. Leibold et al. (2004), disclose some managerial levers - derived from the experience of successful companies - that would enable to enhance the implementation of new mental space, and overcome confinement on traditional mental spaces (See Leibold, et al., 2004).

For an open innovation to succeed, it is essential to nurture new mental spaces. It is also important to identify the impact of these new notions on existing strategic

management approaches, and take appropriate steps to accommodate them by creating innovative business models that enables them to stay ahead of competitors.

Lastly, it is important to note that building a dynamic capability through an open innovation involves combined efforts of traditional and modern approaches to strategic management. For example, an open innovation approach seeks a management perspective that stimulates inflow of ideas from diverse sources. The open management concept – open company, open leadership, and comprehensive cultural analysis - and the cultivation of appropriate mental spaces seem to enable the absorption of relevant ideas at early stages (Sundbo and Fuglsang, 2002; Chesbrough, 2004; Leibold, 2004). For the implementation of these ideas, though, a constructive management approach - reducing complex ideas through an appropriate management control - is indispensable (Sundbo and Fuglsang, 2002).

5.5 Summary

The purpose of the chapter was to review the implications of an open innovation strategy to traditional strategic management approaches, and to provide management toolkits that perhaps suit the new management paradigm.

New stipulations to management have been observed as enterprises extend their management approach from a networked to an open innovation. These stipulations impose various implications to extant strategic management approaches, particularly, in terms of: culture, leadership, resource allocation, business models and an overall management mindset.

An organizational culture that challenges the idea of a 'not invented here' (NIH) and supports a 'hackers culture' is necessary to benefit from an open innovation strategy. Additionally, it has been found that a symbiosis leadership style is important. These leaders have a strong motivational power, and encourage mutualism with employees. It is also indicated that an open innovation strategy impacts organizational resource allocation decisions. Enterprises' commitment to rely on open innovation strategy and the cost-benefit analysis of each alternative strategy seems to determine a proper mix of resource allocation decision. By establishing a suitable business model that enables to benefit from an open innovation strategy, companies may reduce the complexity of resource allocation decision.

The chapter concluded that for an effective open innovation, organizations should have to take strategic moves that are conscious of incoming ideas, and maximize newly created market opportunities. Such moves can be realized when companies broaden their mental space in terms of markets, industries, boundaries, strategies and capabilities. Nevertheless, for the implementation of a successful strategy, a combination of traditional and new implications to strategic management seems to be imperative.

CHAPTER VI: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The objective of the study was to review the strategic management implications of an open innovation approach. The concept of business innovation was clarified in comparison with creativity. Additionally, it was analysed by classifying into various innovation types.

Extant strategic management approaches (the outward-in and inward-out) and their relevance in dealing with innovation were examined. At the end, the study examined the phenomena of open innovation and pointed out significant implications to strategic management.

Chapter six presents the summary, conclusions and recommendations. The first section provides a concise summary of the thesis. In the second section, based on analysis done in this study, conclusions of key points are provided. Finally recommendations to apply the concept, open innovation, to strategic management approaches and its advancement are addressed.

6.2 Summary

Summaries of the main contents of each chapter are provided in unified ways.

6.2.1 Overview

Chapter one provided the overview of the study and highlighted some challenges that can face business organisations when implementing an open innovation strategy. It was indicated that an open innovation practice involves dual activities: opening internal innovation to outsiders and making use of external innovations. It is also indicated that an open innovation phenomena encompasses internal and external paths of taking innovations to market. The case of *Emhart Technologies* was used to illustrate and establish a centre of ground on how industries implement the open innovation strategy.

6.2.1.1 Statement of the problem and the objective of the study

The problem statement of the study was based on the exploratory research undertaken regarding an open source software and open innovation. It was indicated that an open innovation strategy involves opening of organizational boundary for the ease flow of ideas and innovations in-and-out of an enterprise. Pursuing this strategy may result in organizational dependency on others' creativity and innovation, though it offers various knowledge sources. These scenarios, among others, confront extant strategic management approaches in terms of culture, leadership, resources allocation, and organizational structure. This needs an identification of possible implications of an open innovation phenomena to strategic management and taking a proactive approach to the management of an open innovation strategy.

6.2.2 The phenomena of business innovation

Since the introduction of the term 'innovation' in business enterprises, to explain the changes in economic growth and business practices, many years has been passed by. Nevertheless, in the academic literatures, it is hard to find an all inclusive single definition of it. Despite of its complexity, common characteristics incorporated among the definitions of innovation are (i) new to the beneficiary or new to the world (ii) involving a process (iii) deliberate action. To simplify its complexity and facilitate its conceptualisation, innovation has been analysed by classifying it into: area of focus and functionality, degree of newness, and the attribute or psychometric property.

Among the above-mentioned classifications, particular interest has been given to the 'degree of newness'. Innovation types have been put in a continuum by considering two variables: degree of newness and magnitude of change. Incremental, continuous and sustainable innovation, all articulate a low degree of newness and low magnitude of change. In contrast, radical, discontinuous and disruptive innovation expresses a high magnitude of change and a high degree of newness. Existing differential views in meaning regarding these innovations have been reviewed.

Regardless of its type (incremental, continuous, disruptive, radical etc), innovation is the commercialisation of ideas. The conversion of ideas into innovation occurs through the input - process - output model. For management considerations, specific elements influencing each process in the model are addressed. For example, structural factors, resource factors, and people factors are three basic input variables that organizations need to consider for idea generation. The process ends when innovations are successfully diffused to the respective beneficiaries. Special characteristics of technological adopters – as differentiated from traditional adapters – that could help to facilitate the diffusion of innovation have been pointed out.

It has been identified that the orientation of enterprises on the source of innovation passed through five waves. At the early stage, an entrepreneurs (creative individuals) were regarded the engines of innovations. This is marked as the first wave of innovation. To date, in the knowledge-networked economy, enterprises extend their boundaries to look for reliable source of innovation including from competitors and other communities. This practice is recognised as the fifth wave of innovation.

Innovation played a vital role in establishing competitive advantage in the previous eras. Likewise, in the innovation economy, it seems to play a significant role.

6.2.3 Extant strategic management approaches and their relevance to deal with innovation

A brief history of the evolution of traditional strategy models was presented. The early evolution showed a production oriented approach to management. This approach does not take customers demand into consideration; it rather pushes innovations to the market. The one way communication – from the producer to the customer – may significantly hamper important innovations.

A market oriented management approach had been emerged as customers became increasingly aware of their needs. An active customers' involvement to design their products facilitates innovation. The model of analysis employed by the market oriented approach was an analytical strategy. It was noticed that much of the analytical strategy models prior to the 1970s did not have much relevance to deal with innovation because they could not stand the economic turbulence of the 1970s.

The two influential management approaches believed to have relevance are the Porternian five forces and RBV models. The former five forces model tried to relate the firm to its environment. It particularly emphasizes on the analysis of industry structure and competition. This is referred to as *outward-inward* analysis. A number of weaknesses such as defensiveness, zero-sum game and path dependency were observed to this approach. Furthermore, it led to internally focused innovation models. Alternative to this, a resource based view (RBV) was introduced. RBV emphasized firm's specific resources and capabilities as source of competitive advantage, and is referred to as *inward-outward* analysis. The focus of enterprises went on building competitive advantage based on core competencies. Four core competencies: employee skills and knowledge, physical technical system, managerial system, and value and norms had been identified. Like the outward-inward approach, much of the RBV led to the cultivation of internally focused innovation.

It was demonstrated that in a complex business environment, achieving competitive advantage does not depend entirely on enterprises' internal core competencies; but also on dynamic capabilities. Such capabilities leverage through collaborative efforts with business partners forming network of relations. The value chain concept developed by Porter has now extended and integrated to the value networked relations. Principles that help on how to manage collaborative value networks are indicated.

It was described that enterprises that involve in a networked relationship have an opportunity to import knowledge from a range of collaboration sources. However, networked innovations emphasize on complementary assets and technologies with a known business partners, rather than distributed ones. This has two significant shortcomings. First, connecting with established business partners has a lack of reach to the global sources of innovation. Such phenomena may obstruct innovation. Second it leads to technical, knowledge, social, and logistics or administrative dependencies.

Setting a dynamic capability into the extended source of innovations (business partners) requires the ability to manage complexity. Complexity management measures such as chaos theory, establishing transparency, minimizing variety and minimizing business complexity are highlighted.

With the help of complexity management measures, today's knowledge-based complex organizations are opening their boundaries to accumulate knowledge from a variety of sources - buyers, suppliers, competitors, and other knowledge communities such as universities and consultants and global communities. This move is recognized as an open innovation.

6.2.4 Open innovation - a new paradigm shift for understanding business innovation

The concept of open innovation was clearly delineated. Open innovation was defined as a paradigm shift that presupposes that enterprises can and should use external and internal ideas as inputs to the innovation process, by employing internal and external paths to market for the results of innovative activities. It relates as to applying the

principles of free trade to marketplace for new ideas so as to drive efficient allocation of R&D resources.

In the open innovation phenomenon it was demonstrated that a new virtuous circle, which breaks the old virtuous circle, was formed. In this model, fundamental technological breakthroughs usually spin-off to form a new venture; the creative individuals who developed the idea exit from the company to form new firm or spin-out to others if such innovations could not fit to the existing business model. The existence of permeable boundaries (geographical, industrial, and organizational) among industries and enterprises facilitate for the easy flow of innovations. It was indicated that suppliers and customers, university, government and private laboratories, competitors and other nations are among the basic external sources innovation. It was further demonstrated that there is growing trend towards relying on intermediaries that work as brokers of external source of knowledge. Many organizations defined various strategies for adopting external sources of innovations as funding, generating innovation and commercializing innovation. Since such innovations confront existing operations, organizations need to consider three innovation-handling methods – maximization, incorporation and motivation.

Opening of ones innovation reduces the duplication of similar innovation among organizations. From the perspective of social welfare, this results in optimization of social economy. Consequently, protecting innovations through intellectual property law is becoming questionable. These trends have been exemplified by different industries that took various levels of initiatives. It was illustrated that industrial activities to open-up innovations depend on the time required to develop a product and the life cycle needed to last that same product.

6.2.5 The management of open innovation and its implications to extant strategic management

The final chapter described the management of an open innovation and some implications to strategic management. The first concern was the comparison between management approaches employed in the networked as well as open innovation. Important distinctions have been made based on feedback dimensions, quality control,

and ownership, management of an innovation, personal driving forces and the process of management involved. It was also indicated that new stipulations commonly seen in an open innovation - multiple feedback and public ownership of an innovation - challenge existing management approaches in terms of culture, leadership, organizational structure, resources allocation and management models.

Among others, a particular focus was given to the organisational structure suitable for an open innovation. This structure is termed as a 'open' structure. An open structure encompasses an open company, which pertains an increasing ascertaining of customers as co-creators; open human resources creating 'human radar' (variety of personnel that recognizes internal as well as external sources of innovations); and an open function that fits to an emerging jobs and opportunities. To accomplish the latter function, an organization need to have: (1) scanners – people who seek for new ideas and developments, (2) sentinels – people who are deeply immersed in the analysis of external opportunities, and (3) strong links – to establish sound relationships with policy makers and standard bodies, trade groups, research organizations and universities to make a continual use of an open innovation.

A further concern in an open innovation is an organizational decision to allocate resources. Although it is a complex process to determine the righteous resource allocation decision, it was illustrated that enterprise's commitment to rely on open innovation strategy and the cost-benefit analysis of each alternative strategy seems to determine the proper mix. Furthermore, it was demonstrated that establishing sound business models reduces the complexity of such a decision. The study looked at the comparison of traditional and modern models of an innovation together with their advantages and disadvantages. In either case, these business models should have to take into account strategic decisions that consider incoming ideas, and maximize newly created market opportunities.

At the end, management toolkits to guide the management of an open innovation were addressed. Strategic move that resemble to the movement of 'pocker' rather than 'chess'- when playing games – seems essential. Implementing such an approach requires establishment of suitable mental space: images and patterns engaging the mind when considering markets, industries, boundaries, strategies and capabilities.

6.3 Conclusions

The objective of the study was to review and analyse the significant strategic management implications of the phenomenon of open innovation, as emerging from extant researches.

In view of this objective, the phenomena of business innovation, extant strategic management approaches, open innovation concept and the management of open innovation frameworks and tools were critically examined and reviewed. Based on this, the following conclusions are made:

(a) The analysis of origins and impacts of an innovation upon organisational success reveal that whilst all innovations involve some sort of change and/or newness, they differ in the degree of newness or change. Three characteristics are decisive for identifying innovation in an industry or organisation: (1) they must be new to the world or to the adopter, (2) they involve a process, and (3) they must have some sort of change (but it should be remembered that all changes are not innovations). A closer scrutiny of the topic reveals that many innovations can emerge as an incremental, continuous or sustainable. These are too small to be noticed. Despite the distinctions in terminologies, many literatures treat them as synonyms in meaning. On the other extent, in today's highly unpredictable business environment, innovations can emerge as discontinuous, disruptive and radical. They suddenly strikes hard without warning should no suitable measures have been taken.

The above mentioned innovations may arise internal or external to a firm. The latter innovation type has been given a closer look in this study. External opportunities can best be exploited by adopting an open innovation strategy. Open innovation signify a profound change in how value is created in the modern economy. Perhaps the most important implication is that the locus of activity and effort is increasingly diffused and distributed in the open innovation environment or community, rather than anchored within an organization, cluster of organizations or even a defined network. This conclusion rationalises the need for identifying the innovation intensity involved, the domain and scope of innovation, and its impact on an industrial or organisational performance so as to take appropriate management measures.

(b) In view of the above conclusion, the following points can be highlighted about the impact of an open innovation to extant strategic management approaches. First, open innovation involves generation of internal ideas. This means, extant (modern) management approaches, which primarily emphasises on efficacy within organizations or at least within a defined set of organizations would continue to play significant role to manage innovations. Second, open innovation involves an incorporation of external ideas. It is also about releasing internal innovations (having no current market) to outsiders. Hence, existing strategic management approaches are less likely to fit in such scenarios on their own. A suitable approach is to design an open strategy that holds external opportunities while utilising internal innovations. Conceptually viewed, participating in an open management practices broadens enterprise's scope of decision making, and immediately recognises wherever useful ideas might have originated.

(c) When open innovation occurs, usually, the involved parties comprise a 'network' that is actually morphing into a more elastic, permeable and continually changing grouping of individuals, organisations and links among various nodes. The environment consists of complex and shifting confederations of temporarily or more permanently connected entities, all of which may be experiencing an on-going state of dynamic re-organisation.

(d) In an open innovation, goal setting involves a process of continual assessment, exploration, adaptation and speedy decision making. Moreover, achieving objectives is more complex. Goals emerge as a result of the interaction between the various entities. The role of management, in this context, is to find an optimal means within which a system can operate at its optimum and at the same time be flexible enough to change and adapt continuously. There is an increasing need to leverage complex relationships, which may be symbiotic at times, non-linear and often self-organizing in nature. The managerial mindset and perspective holding this concept includes staying attuned to surprises, seeking opportunities in the periphery as much as the core, and playing greater attention to outside sources - such as from customers and others.

In the final analysis, this study concludes that incorporation of an open innovation concept to extant strategic management approaches imposes a multi-dimensional implication. A lesson to be drawn from this research is that, first, innovation managers need to consider every possible potential implication of an open innovation decision.

And second, there is no one best way of managing them. This is, thus, a challenge for further research.

6.4 Recommendations

Based on the results of the study, the following recommendations have been made for the application of the open innovation strategy to organizational practices and regarding further research for the advancement of theory development.

6.4.1 Recommendations for the application of an open innovation in organizational practices

(a) Organizations should seek to extend their extant management approaches beyond specified networks in order to make use of available external opportunities. The concept of complexity theory helps organizations to deal with complex business environment and guide scenarios prevailing order and disorder simultaneously. It further enables to identify and deal with the multidimensional implications of an open innovation strategy.

(b) Opening of ones innovation enables utilization of similar ideas generated some where else. This reduces duplication of resource consumption; it also optimizes innovation variety. The overall out come is maximization of social economy, which may benefits individual organizations, industries and the public in general. Thus, organizational leaders and policy makers should take appropriate measures, such as flexible organizational structure and symbiotic leadership style, to get the best out of an open innovation strategy. Specifically, the following recommendations facilitate the implementation of an open innovation strategy:

(i) Holding an open human resources – this refers to a diversified personnel and work force having cultural variety and skills. It also incorporates the development of ‘hacker’s culture’ - where employees could be able to identifying and make use of ideas generated outside. This is to have a human ‘radar’ that handles external innovations, and

(ii) Establishing an open company and marketing – creating an environment suitable for overall operations, specifically for marketing. Open marketing, among others, treats customers as co-creators of their own services rather than being recipients of end products. An open company implies having open functions. To facilitate this function, companies should strive to get individuals with appropriate skills: scanners and sentinels. It also needs to develop strong link that provides access to the global research and findings.

(c) Enterprises should revise their existing strategic management models. Usually these models are oriented towards the exploitation of opportunities by networking with established business partners: customers, suppliers, competitors, universities etc. Organizations should consider the incorporation of emerging strategic models such as subscription and open networks. The new strategic models give an opportunity to the application of complementary operations including the provision of services and supporting activities, in addition to the main business areas.

(d) Organizations implementing an open innovation strategy should consider proportionate resource allocation decision between private vs. public domains or internal vs. open innovations. Taking private innovation may have the advantage of optimizing creativity, despite of lose in externally available low cost of innovations. On the other hand, taking an open innovation strategy may have the advantage of obtaining low cost of knowledge sources. However, the latter decision may lead to a decrease in individuals' creativity and dependency on others resources. Thus, enterprises should examine the cost-benefit analysis of each alternative investment decisions prior to the implementation of any of the above mentioned strategic mix.

6.4.2 Recommendations for further research

(a) The most challenging issue for further research is to develop strategic management theory appropriate for an open innovation strategy. Previous researches outlined the need to address the conceptual gap that exists between the complexity theory of non-linearity and unpredictability, on the one hand, and the assumption of analysis and predictability, on the other hand. These researches further added a challenge to the complexity theory concept of a system that undertakes an open innovation decision. Complexity theory assumes that proactive management strategies are contingent up on unexplained non-causal factors of operational dynamics. These dynamics increase in complexity as a system opens its boundaries to outsiders. Decision making elements (variables) of any system are non-linear by nature; they are hardly explained in terms of a cause-and-effect relationship. This supposition negates the relevance of analytical approaches to manage an open innovation.

It would be of a better value if further research could entirely examines the suitability of scientific analysis so as to incorporate relevant analytical models to the complexity management theory, which in turn would enable the management of an open innovation. This is important because it appears that, despite the non-linearity assumption of decision making and unpredictability of variables, the practice of strategic management seems to continue relying on analytical strategic models. A complete reliance on analytical approach, though, hampers flexibility to exploit reaped opportunities from an open innovation.

(b) The concept of an open innovation strategy assumes organizations as open systems that portray a fluid and flexible structures, holding a symbiotic leadership styles. Innovative ideas usually come from outside, besides to the internal innovations that develop inside the R&D department. The commercialization of these ideas involves surrendering them to outsiders rather than bounding them internally. It, then, appears that strategic management can hardly support organizations to operate constantly under the phenomena of an open innovation. This is because creativities seem to take place at a socio-cultural business system level. This is different from traditional creativities that are bound to the industry limits through joint efforts, and some times recombination of several formerly independent boundaries. An important task to the implementation of an open innovation strategy to existing strategic management

approaches would be researching for models on how creativity at the socio-cultural level takes place and verify viability of the model. More specifically, it is about finding a reliable process rather than finding some to contract with.

(c) An open innovation decision involves a critical scrutiny of cost benefit analysis, in order to come out with an appropriate resource allocation decision. Open innovation facilitate innovation adoption, a prerequisite for economies of scale; it increases social welfare; and it enriches horizontal integration of a business. It further provides flexibility to respond to and establish a temporary competitive advantage. These are among the advantages of an open innovation decision. Parallel to that, an open innovation is also associated with negative implications. It may kill internal innovations as the original creators lack financial incentive from their creation. This phenomenon leads to innovation interdependency. In addition to that, under the open innovation phenomenon, long term competitive advantage of enterprises seems to weaken because of the fact that imitators actively disrupt business models of original creators.

An open innovation assumes the co-operation of two or more organizations – at least one generating an innovation and at least the other utilizing it – with viable business model for each. Despite of the fact that innovation attitudes differ from one industry to another industry, a research on the analysis of the cost benefit of an open innovation is needed. This would help to understand the extent of openness required by each organization, and the commitment of resource allocation to each alternative decision: internal and/ or open innovations.

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APPENDIXES

Appendix A: The Evolution of Strategic Management

Issue of concern / Period	Major episode	Management Approach	Boundary ¹	Scope of analysis	Focus of R&D
1820-1900	Industrial revolution; birth of the firm	Top-down; mechanistic view of the firm	Clear and restrained ²	Limited to the firm's internal environment	Individual entrepreneur
1930s	Mass-production	Top-down; mechanistic view of the firm	Clear and restrained	Limited to firm's internal environment	Individual entrepreneur
1940s	Birth of market-oriented production	Ad-hoc planning but dominantly top-down; mechanistic view of the firm	Clear and restrained	Limited to firm's industry structure	Organized R&D department
1950s	Consolidation of marketing-oriented production	Birth of corporate strategy; Top-down; mechanistic view of the firm	Clear and restrained	Limited to firm's industry structure	Exogenous large R&D department
1960s	Consolidating market-oriented production	Long-term strategy; Top-down; mechanistic view of the firm	Clear and restrained	Limited to firm's industry structure	Exogenous large R&D department
Late 1960s-early 1970s	Dominance in market-oriented production	Flexible plans; Top-down; organic view of the firm	Clear boundaries with many SBUs	External industry structures	Large R&D department supported by functional areas
Late 1970s-early 1980s	Market-oriented production	Birth of strategic management; Top-down; organic view of the firm	Extended but clear boundaries, and unrestrained interference	External industry structure (value chain analysis)	Large R&D department ; external business communities

Late 1980s-early 1990s	Resource- based view	Strategic innovation; fuzzy strategy ; deployment of core competence	Blurring but limited to value networks	Value networks	Large R&D department; external players as well as competitors
Late 90s-early 2000s	Knowledge-networked systemic view	Open innovation; fuzzy strategy; systemic view of the firm	No boundaries	Socio-cultural environment	Open to the systemic environment

¹ refers to the geographical, political, psychological, industrial, and organizational lines.

² implies to the political interference (Ansoff et al., 1976).

Appendix B: The Process of Operationalizing an Open Innovation

The process for a successful implementation of an open innovation - implementing new innovation or extending an existing innovation – involves:

launching pilot program. Pilot program refers to taking a group of research and development projects and looking for technology or innovation partners globally to meet the project needs. This is the first step in an overall transformation program to open innovation. It is testing the suitability of an innovation to an enterprise. The pilot program involves sponsorship, project selection, search process, success criteria, and most of all, people.

A pilot program begins with a sponsorship coming from a leader of product development or R&D group. The sponsor is responsible for setting the strategic objectives of the pilot program and success criteria, but does not involve on the day to day activity of the program. The sponsor is also active in the project selection and approval process for the pilot.

Project selection is another important activity. The pilot program should be structured should it has an impact on the business by speeding product development process, leveraging staff, reducing risk, finding new technologies and global connections, or other tangible benefits.

Search process is the next critical stage in the process. A firm can either use internal or external expertise or process to connect with the right resources. It can also use one of its firms that specialize in an open innovation. The research may range from early research to the down stream operations.

The next process is to evaluate the search and determine if there is a respondent to the required technology. It may start with a phone call and lead to a non-disclosure agreement, for in-depth agreement of the technology. After evaluating the project as a successful, the parties can move to a contract.

Evaluation of the pilot program is the final process. Key question that should be asked in here are: did it meet the goal developed at the front end? How was the process perceived? And is it a fit to our business.

Parallel to searching and launching a pilot program, it should be taken into consideration its impact on people in the organization. Generally it is agreed that there must be a change on management, specifically, on the process of communication, training and reward.

Communication involves providing the organisation with 'what is the reason' for undertaking the pilot, objectives behind the pilot, success factors of the pilot, and organizational change involved as a result of the open innovation. Bringing people into this process early and monitoring their ideas with respect to structure of the pilot speeds the implementation of the process.

The pilot also forces a change on the way training is made and reward system is awarded. The new work process will emphasize searching for, finding, and acquiring technology globally. Hence, training must be given regarding project selection, writing of requests, search processes, and evaluation of results. Reward systems need also to be modified to reflect success not by internal breakthrough, but by finding an external partner and successfully acquiring and integrating their technology, by considering the trouble-shooting principles mentioned in chapter 4, section 4.5.4.

Source: Davis, R.M. 2006. How to Make Open Innovation Work in Your Company. *PDMA Visions*, January 2006.

Appendix C: Open Innovation in Practise

Open innovation at Eli Lilly

In 2001, Lilly created a wholly owned subsidiary informal innovation known as InnoCentive. It has recruited a distributed network of more than 80,000 research participants called "solvers", in over 170 countries, to help its clients find solutions to difficult R&D challenges. InnoCentive subsidiary has now more than 30 such clients known as "seekers" including large companies such as Dow Chemical, P&G, and its own parent, Lilly. When seekers confront with a particularly difficult research challenge, they post their requirements to InnoCentive's solver network and offer a reward to anyone who finds a solution. Although InnoCentive's success rate is only about 50 percent, it is a good result for research problems that the seekers' internal R&D staffs couldn't handle.

Most interesting of all are the signs that InnoCentive's solvers network are beginning to self-organize, with diverse solvers coming together to address a specific seeker's needs. This is a classic open innovation system; when needs can't be easily determined in advance, companies can create platforms to mobilize distributed resources readily.

Source: Brown, S.J. 2005. The Next Frontier of Innovation. *McKinsey Quarterly* (3): 1.