

**INTELLECTUAL CAPITAL BASED
INNOVATION CAPABILITY MODEL PROPOSITION**

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**ENTELLEKTÜEL SERMAYE TABANLI
İNOVASYON YETKİNLİK MODELİ ÖNERİSİ**

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ABBREVIATIONS

IC	: Intellectual Capital
RBV	: Resource Based View
KBV	: Knowledge Based View
KM	: Knowledge Management
TPP	: Technological Product and Process
SC	: Structural Capabilities
HC	: Human based Capabilities
RC	: Relationship Capabilities

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ENTELEKTÜEL SERMAYE TABANLI İNOVASYON YETKİNLİK MODELİ ÖNERİSİ (ÖZET)

Bu çalışmada, entelektüel sermaye tabanlı inovasyon yetkinlik modeli önerisinde bulunulmuştur. İnovasyon yetkinlik modelinin temeli olarak teorik bir yapı inşa edilmiştir. Bu teorik yapı, entelektüel sermaye ile inovasyon yetkinliği arasındaki ilişkiyi açıklamaktadır. Yetkinlik, bazı görev ve aktiviteleri yerine getirecek bir grup kaynağın kapasitesidir. Bu çalışmada özel çeşit bir yetkinlik, inovasyon yetkinliği ile ilgilenildiği için inovasyon yetkinliği yönlendiren kaynaklar araştırılmalıdır. Tezde bahsedilen teorik model, bu kaynakların şirketin entelektüel sermayesine gömülü olduğunu açıklamaktadır. Bu kaynakları açıklamak için, geçişli bir yaklaşım kullanılmıştır. Kaynak tabanlı bakıştan bilgi tabanlı bakışa, bilgi tabanlı bakıştan entelektüel sermaye bakışına geçiş bu çalışma içerisinde açıklanmıştır. Bilgi de bu yapının bir parçası olarak eklenmiş ve bilginin inovasyon kaynağı olarak fonksiyonelliği açıklanmıştır.

Teorik yapıyı, inovasyon yetkinlik modelinin temeli olarak kurduktan sonra model literatür araştırmasından sonra belirlenen yapı taşları üzerine inşa edilmiştir. Bu model, çalışmanın öncül modeli olarak çalışmanın ilerleyen aşamalarında örnek olay inceleme yaklaşımı ile test edilmiştir. Modelin yapı taşlarının nasıl bir araya gelerek modeli oluşturulduğu da açıklanmıştır. Bu yapı taşları üç ana yetkinlik alanında toplanmıştır. Bunlar, yapısal yetkinlikler, beşeri yetkinlikler ve ilişkisel yetkinliklerdir. Literatür araştırmasına dayanan model dokuz alt yetkinlikten oluşmuştur.

İnovasyon yetkinlik modeli örnek olay incelemelerinde test edildikten sonra, sonuçlar analiz edilmiş ve tartışılmıştır. Sonuçlar, bir ekleme ile birlikte modelin gerçek hayattaki işlerliğini desteklemektedir. Bu ek yetkinlik alanına literatür araştırması esnasında rastlanmamış ama bu ek alanın önemi örnek olay incelemesinde fark edilmiştir. Sonuç olarak modeldeki alt yetkinlik seti güncellenmiştir.

INTELLECTUAL CAPITAL BASED INNOVATION CAPABILITY MODEL PROPOSITION (SUMMARY)

In this study, an innovation capability model based on intellectual capital is proposed. A theoretical framework is build as foundation of innovation capability model. This theoretical framework defines interrelation of intellectual capital and innovation capability. A capability is the capacity for a team of resources to perform some task or activity (Grant, 1991). As far this study interested in special kind of capability, which is innovation capability, resources driving innovation capability shall be explored. Theoretical model mentioned in the thesis explains that these resources are embedded in intellectual capital of the firm. In order to explain these resources, a transitive approach is used. Transition of resource based view to knowledge based view, knowledge based view to intellectual capital view is explained in this study. Knowledge is also added as part of this framework and functionality of knowledge as a source of innovation is discussed.

After establishing the theoretical framework as the basis of innovation capability model, model is built on constructs determined after literature review. This model became the preliminary model of study which was tested by a case study approach in following phase of study. How these constructs of model gathered to form innovation capability model is also explained. These constructs are classified in three main capability areas. These are: structural capabilities, human based capabilities and relationship capabilities. Preliminary model based on literature review was formed by nine sub capabilities.

After testing the innovation capability model at the case studies, the results are analyzed and discussed. Results were supporting the functionality of model in real world with an addition. This additional capability area was not recognized during the literature review, but its importance was realized during the case study. As a result set of sub capabilities constructed in model is modified. Modified new innovation model consists of ten sub capabilities.

1. INTRODUCTION

In this chapter an introduction is made in order to provide background to the research problem of the thesis as well as specifying the research problem itself. In addition, this chapter includes information about the methodology used, scope and limitations of the research followed by an outline of the thesis.

1.1 Background of the research

In today's competitive business world, sustainable competitive advantage rests on the ability to constantly develop organizational capabilities that form the basis for products and services offered by the firm, thereby constantly renewing the competitive advantages of the firm.

This sustainability can only be achieved by creation of continuous and successful innovations. Thus for more than 50 years, innovation has raised a growing interest among the academic, political and business worlds. From Schumpeter (1942) academicians paid great interest on subject innovation. More recent research has established a positive link between innovation and business performance. Innovation is increasingly recognized as a key driver of long term firm's growth. It is observed among the business world that innovative companies increase its market value and become more competitive among its rivals. As a result business world is paying a great deal of attention to innovation and trying to understand vital capabilities which drive innovation.

In the areas of competitiveness, productivity growth, innovation competitiveness and economic performance, Intellectual Capital gained significant attention. It is this recognition of the critical value of organizational and individual knowledge that has spurred a great deal of interest in knowledge management (Cotey, 2000). Knowledge is increasingly regarded as an essential growth factor.

At this point the relation between knowledge, intellectual capital and innovation capability shall be explained in detail. The primary objective of this study is to answer this question: how can an innovation capability model based on intellectual

capital be developed. At the next phase the objective is to test this model and answer the research questions. This will let us to understand how innovation capability model constructs interacts with innovation capability.

1.2 Research Problem

The research problem addressed in this research is how an Innovation Capability Model based on intellectual capital can be developed.

The research area relevant for this problem is the management of innovation in organizations. In particular the research addresses the concept of an organization's 'innovation capability', that is the various capabilities an organization must be succeed in, in order to effectively manage the innovation process. The research outcome is a model that describes an organization's innovation capability.

Three specific research questions were developed:

Research Question 1. How "structural capabilities" area of the IC based innovation capability model contributes to organization's innovation capability and do the constructs defined under structural capabilities cover the whole necessary structural capabilities of innovation capability?

Research Question 2. How "human based capabilities" area of the IC based innovation capability model contributes to organization's innovation capability and do the constructs defined under human based capabilities cover the whole necessary human based capabilities of innovation capability?

Research Question 3. How "relationship capabilities" area of the IC based innovation capability model contributes to organization's innovation capability and do the constructs defined under relationship capabilities cover the whole necessary relationship capabilities of innovation capability?

1.3 Delimitations of Scope

Due to the case study methodology adopted and resources limitations, generalization of model is limited for organizations operating in different industries, of different sizes and with differing aims. Further research is needed to address wider applicability of this model.

This research supports limited types of innovations. For other types of innovation, (e.g business model innovation) the model shall be reconfigured with an extended literature review on these kind of innovations. Establishing an innovation capability assessment tool is beyond the scope of this research but with wider generalization of model, it can be used for assessing innovation capabilities of companies.

1.4 Outline of Thesis Chapters

The thesis is organized under seven chapters. Chapter 1 is introduction of thesis where background, research problem and delimitations are discussed. Chapter 2 provides results of literature review where key concepts are explained and definitions are made. In Chapter 3 a theoretical framework is build via literature review results. Chapter 4 defines the intellectual capital based innovation capability model. This model is based on the theoretical framework mentioned in chapter 3. Chapter 5 explains the methodology used for the research. In Chapter 6 findings and results are discussed. Chapter 7 is the conclusion chapter of the thesis. A list of references and several appendices are also included. Figure 1.1 below outlines the structure of the thesis.

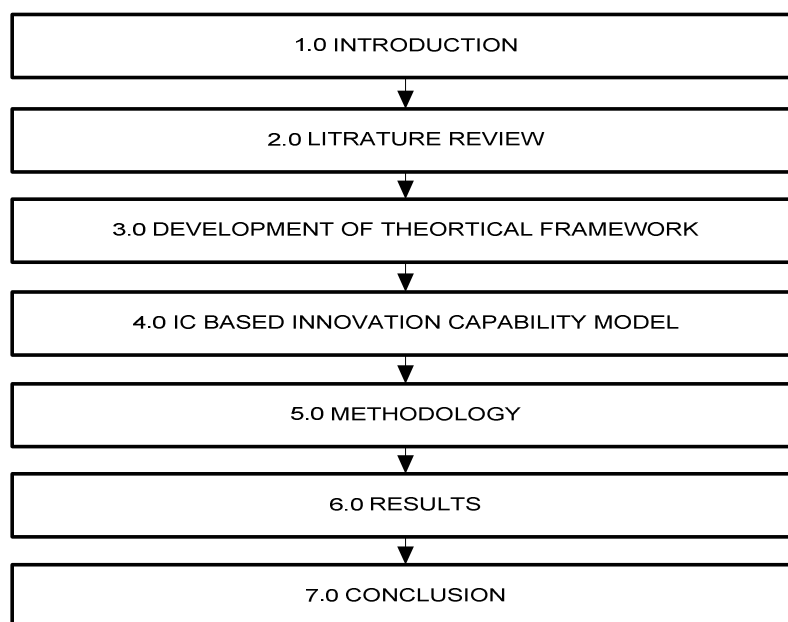


Figure 1.1. Outline of thesis structure.

2. LITRATURE REVIEW

Because this research focuses on managerial and organizational capabilities and endeavors to adopt an holistic approach to the management of innovation, it draws upon a wide base of literature sources including product and process development, strategic management, research and development ('R&D') and technology management, resource-based organizational theory, organizational learning, intellectual property and the like.

The following section, 2.1, introduces and defines key terms used in the remainder of the research. Section 2.2 summarizes the relevant literature on the constituent elements of organizational innovation capability and Section 2.3 introduces and summarizes literature on organizational assessment and change. Section 2.4 addresses the area of innovation assessment tools and finally, Section 2.5 develops the theoretical framework

2.1 Defining Innovation

Innovation has been studied in a variety of contexts, including in relation to technology, commerce, social systems, economic development, and policy construction. There are, therefore, naturally a wide range of approaches to conceptualizing innovation in the literature.

Fortunately, however, a consistent theme may be identified: innovation is typically understood as the introduction of something new and useful, for example introducing new methods, techniques, or practices or new or altered products and services.

Recently authors point out that invention - the creation of new tools or the novel compilation of existing tools - is often confused with innovation. Many product and service enhancements may fall more rigorously under the term improvement. Change and creativity are also words that may often be substituted for innovation. Then, we need to answer in what ways innovation is a different concept from others.

If we consider “invention”; it is an object, process, or technique which displays an element of novelty. An invention may sometimes be based on earlier developments, collaborations or ideas, and the process of invention requires at least the awareness that an existing concept or method can be modified or transformed into an invention. However, some inventions also represent a radical breakthrough in science or technology which extends the boundaries of human knowledge. Legal protection can sometimes be granted to an invention by the way of a patent protection.

Invention is often necessary for innovation, but insufficient in itself. Innovation requires bringing an invention to a market and its subsequent diffusion through a market implementation. An essential requirement for successful innovation is a deep understanding of the way individuals solve problems in their day-to-day lives. This is what is often referred to as "market insight," and it is the lack of this that leads to many inventions' failure.

Another point between invention and innovation is: Innovation does not have to be inventive. One example is the iPod, which as a standalone product is really not very inventive. MP3 players had been around for several years before the iPod. While there may be unique hardware and software aspects to the device, the fundamental invention of having a handheld MP3 player was not at all new.

What made the iPod truly innovative was its combination of aesthetic design, elegant ergonomics, and ease of use. Also, there was the creation of the iTunes software and website that enabled listeners to actually use their fancy iPod. It is the combination of all these elements that made the iPod truly innovative.

Another confusion is with the word “entrepreneurship”. Innovation is often seen as one aspect of entrepreneurship in the literature. For example, entrepreneurial attitudes and behaviors are described as consisting of three dimensions: innovativeness, risk-taking and proactiveness; where innovativeness is the seeking of creative, unusual, or novel solutions to problems and needs (Covin and Slevin, 1991; Morris, 1998). The drive and skill to commercialize a new venture, entrepreneurship does require an innovative idea; but the degree of innovativeness varies widely, entrepreneurs and innovators need not be the same; but mixture is possible.

Creativity is an important topic when innovation is being discussed. Innovation typically involves creativity, but is not identical to it: innovation involves acting on

the creative ideas to make some specific and tangible difference in the domain in which the innovation occurs. For example, Amabile et al. (1996) propose: "All innovation begins with creative ideas. We define innovation as the successful implementation of creative ideas within an organization". In this view, creativity by individuals and teams is a starting point for innovation; the first is necessary but not sufficient condition for the second.

For innovation to occur, something more than the generation of a creative idea or insight is required: the insight must be put into action to make a genuine difference, resulting for example in new or altered business processes within the organization, or changes in the products and services provided.

Through these varieties of viewpoints, creativity is typically seen as the basis for innovation, and innovation as the successful implementation of creative ideas within an organization (Amabile et al., 1996). From this point of view, creativity may be displayed by individuals, but innovation occurs in the organizational context only. It should be noted, however, that the term 'innovation' is used by many authors rather interchangeably with the term 'creativity' when discussing individual and organizational creative activity. As Davila et al. (2006) comment, "Often, in common parlance, the words creativity and innovation are used interchangeably. They shouldn't be, because while creativity implies coming up with ideas, it's the "bringing ideas to life" that makes innovation the distinct undertaking it is."

The distinctions between creativity and innovation discussed above are by no means fixed or universal in the innovation literature. They are however observed by a considerable number of scholars in innovation studies.

Some human societies formed enterprises that created new or improved artifacts, devised 'better' processes, developed new ways of selling and devised alternative models of organizing (Diamond, 1997). These enterprises were innovative—they found ways to exploit the latent potential of ideas.

Baumol, (2002) writes that innovation is: "the recognition of opportunities for profitable change and the pursuit of those opportunities all the way through to their adoption in practice".

If we look at the etymology of the word "innovation" we see the definition as: "1548, from L. *innovatus*, pp. of *innovare* "to renew or change," from *in-* "into" + *novus*

"new." However much of the current business literature blurs the concept of innovation with value creation, value extraction and operational execution.

As the unit of analysis in this research is the organization, then 'new' in this definition relates to the degree of 'newness' of the innovation to the organization where it has an internal focus or to its market, customers or competitors where it has an external focus. As long as the idea is perceived as new to the people involved, it is an 'innovation' even though it may appear to others to be an 'imitation' of something that exists elsewhere. (Van de Ven, 1986).

Embedded in these definitions is the notion that innovation can be managed. For example, Drucker (1994) argues that innovation is a core process for a firm; he suggests that: "in...a period of rapid change the best perhaps the only-way a business can hope to prosper, if not survive, is to innovate. This is the only way to convert change into opportunities. This, however, requires that innovation itself be organized as a systematic activity".

Innovation is a process where knowledgeable and creative people and organizations frame problems and select, integrate, and augment information to create understandings and answers (Teece, 2001). Hamel emphasizes the role of information technology as an enabler not only of product or process innovation, but also of what he calls business concept innovation (Hamel, 2002). Admittedly, organized information cannot substitute tacit knowledge, understanding and learning, which are the most important resources of the innovation process, but it can significantly enhance them by helping to fill existing knowledge gaps. Organizational knowledge gaps are the result of the discrepancy between the knowledge an organization has and the knowledge it needs for the solution of specific

In the language of innovation researchers, an innovation is a product or practice that is new to its developers and/or to its potential users. Innovation adoption is the decision to use an innovation. Innovation implementation, in contrast, is "the transition period during which individuals ideally become increasingly skillful, consistent, and committed in their use of an innovation. Implementation is the critical gateway between the decision to adopt the innovation and the routine use of the innovation" (Klein and Prusak, 1994). The difference between adoption and

implementation is fundamental: Individuals, teams, organizations, and communities often adopt innovations but fail to implement them successfully.

In this view, an innovation is not an innovation until someone successfully implements and makes money on an idea. Extracting the essential concept of innovation from these other closely linked notions is no easy thing.

The OECD defines Technological Innovation in the Oslo Manual (1995) as: Technological product and process (TPP) innovations comprise implemented technologically new products and processes and significant technological improvements in products and processes. A TPP innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation). TPP innovations involve a series of scientific, technological, organizational, financial and commercial activities. The TPP innovating firm is one that has implemented technologically new or significantly technologically improved products or processes during the period under review.

Very early he developed an original approach, focusing on the role of innovation in economic and social change. It was not sufficient, Schumpeter argued, to study the economy through static lenses, focusing on the distribution of given resources across different ends. Economic development, in his view, had to be seen as a process of qualitative change, driven by innovation, taking place in historical time. As examples of innovation he mentioned new products, new methods of production, new sources of supply, the exploitation of new markets, and new ways to organize business. He defined innovation as “new combinations” of existing resources.

Joseph Schumpeter defined economic innovation in 1934:

1. The introduction of a new good—that is one with which consumers are not yet familiar—or of a new quality of a good.
2. The introduction of a new method of production, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.
3. The opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before.

4. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.
5. The carrying out of the new organization of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position

From these definitions and arguments about innovation; in this research the definition which will be used for “innovation” is: “Result of a knowledge embedded process where it creates means of a new idea that brings business value”

2.2 Types of Innovation

The type of innovation is a common differentiator used in the literature. Innovation can be characterized by the outcome of an innovation process, often as either a product or process innovation. Other some terms used to distinguish the type of innovation are: business model innovation (Hamel, 2002), administrative innovation (Damanpour, 1991), organizational innovation (Huiban and Bouhsina, 1998) and marketing and management (Higgins, 1995). Pinchot and Pellman’s (1999) definition of innovation as “both the creating and bringing into profitable use of new technologies, new products, new services, new marketing ideas, new systems, and new ways of operating” incorporates both product (and service) and process (marketing, systems, operating) together.

Geoffrey Moore offers a typology of 15 innovation types in his book also described as “innovation vectors” in his book “Dealing with Darwin”.

Table 2.1. Typology of 15 innovation types

Zones	Types of Innovation	Culture Fit	Description
Product Leadership Zone	Disruptive Innovation	Product leadership	Upsetting an existing value chain using low-end offers that target "good-enough" customers, or by creating new markets with new forms of value
	Application Innovation	Product leadership	Developing new markets for existing products by combining them in novel ways and/or finding unexploited uses for them

Table 2.1. (Cont.) Geoffrey Moore offers a typology of 15 innovation types.

Product Leadership Zone	Product Innovation	Product leadership	Feature-battling – bring bringing relevant new features to market faster and better than competitors
	Platform Innovation	Product leadership	Repositioning a product feature into an enabling element for a broader group of industry participants
Customer Intimacy Zone	Line Extension Innovation	Customer Intimacy	Creating sub-categories in existing markets that address customer needs in more compelling ways
	Enhancement Innovation	Customer Intimacy	Improving existing offers in existing markets by modifying a single dimension that makes a difference for customers
	Marketing Innovation	Customer Intimacy	Differentiating the pre-sales interaction, not the product
	Experiential Innovation	Customer Intimacy	Differentiating on the basis of the customer experience, rather than the tangible product
Operational Excellence Zone	Value Engineering Innovation	Operational Excellence	Capturing the essence of an offer simply, and cost reducing every other element dramatically
	Integration Innovation	Operational Excellence	Pulling together disparate, separately managed components in a single product system
	Process Innovation	Operational Excellence	Redesigning the value-chain to a point that competitors are unwilling or unable to match
	Value Migration Innovation	Operational Excellence	Refocusing the offer anticipating where profits might migrate within the industry value chain
Category Renewal Zone	Organic Innovation	Category Renewal	Refocusing the business from a focus on a declining industry to a new industry with a brighter future
	Acquisition Innovation	Category Renewal	Buying or being bought in order to compete on the basis of greater scale, and/or business synergies
	Harvest and Exit	Category Renewal	Recognize the opportunity to liquidate and distribute accumulated earnings before they are eroded by deteriorating conditions

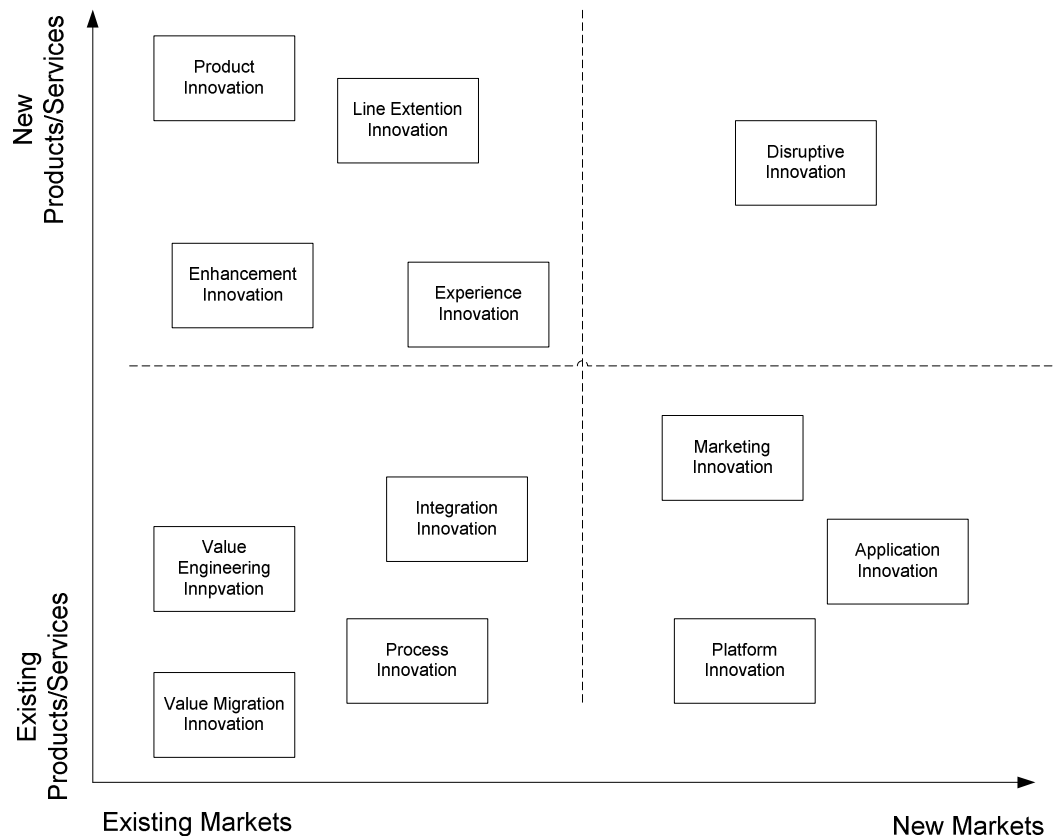


Figure 2.1. Categorizing Innovation according to Market – Product Renewal

Geoffrey Moore's typology of 15 innovation types can be categorized according to focus of innovation. Innovation may focus on market, on product or contrarily the way of serving the existing product at existing market.

Although there are many types of innovation identified most of the innovations fall into three main category of innovation. There are process, product and business model innovation.

2.2.1 Process Innovation

Process innovation involves the implementation of a new or significantly improved production or delivery method. "Process Innovation is the adoption of technologically new or significantly improved production methods. These methods may involve changes in equipment or production organization or both. The methods may be intended to produce new or improved products, which cannot be produced using conventional plants or production methods, or essentially to increase the production efficiency of existing products". (Oslo manual, 2nd edition OECD/Eurostat 1997).

A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. "... The implementation of a new or significantly improved production... method" involves the development of a new way to produce a product using a newly developed machine, a new method or the use of new software. The delivery methods are associated with the physical movement of the product from the factory floor to the end user, i.e. the logistics of the company. This includes any system that is implemented in improving the delivery of the product to the customer such as computer systems, tracking systems and any associated equipment.

Process innovation can and should happen at various levels within the organization as no organization can depend solely upon innovation occurring at one level only. Successful organizations have an innovation process working its way through all levels of the organization.

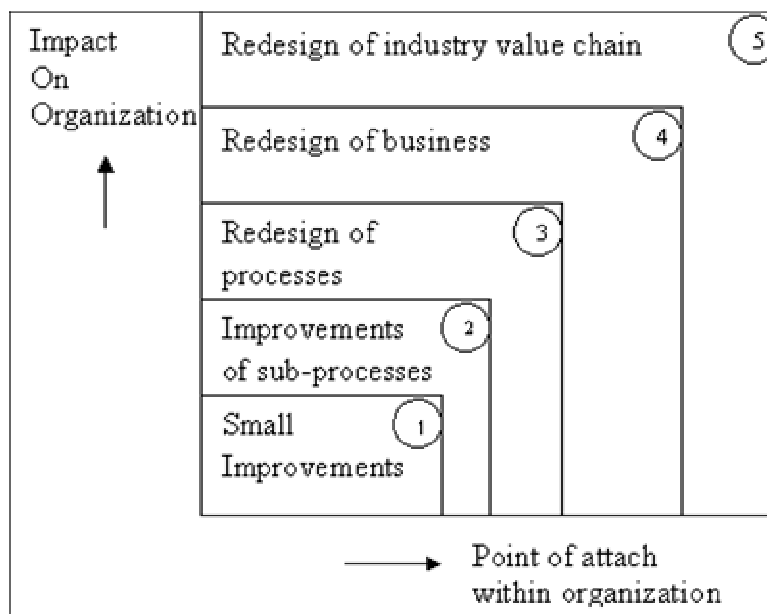


Figure 2.2. Levels of process innovation.

2.2.2 Product / Service Innovation

Incremental product/service innovation is oriented toward improving the features and functionality of existing products and services. Radical product/service innovation is oriented toward creating wholly new products and/or services. Product life cycles, in particular, have become shorter and shorter, causing business survival to depend on new product development and, increasingly, on the speed of innovation in order to develop and bring new products to market faster than the competition. Organizations direct greater attention to new product development, while maintaining and improving their existing products. Discontinuous products and services are increasingly likely with ever-faster new product/service development. Organizations are constantly on the lookout for discontinuous new products and/or services. Although product/service innovation and process innovation are not the same thing, they are often interconnected. For example, process innovation may be required to support product or service innovations. Also, it has been argued that organizational processes and structures oriented to incremental product innovation are not the same as those needed to foster and facilitate new product development. The current wisdom it is necessary to separate these activities and to introduce wholly new process innovations that will help promote and speed-up radical product innovation.

2.2.3 Strategy or Business Concept Innovation

Every company has a business model, whether they articulate it or not. At its heart, a business model performs two important functions: value creation and value capture. First, it defines a series of activities, from procuring raw materials to satisfying the final consumer, which will yield a new product or service in such a way that there is net value created throughout the various activities. This is crucial, because if there is no net creation of value, the other companies involved in the set of activities won't participate. Second, a business model captures value from a portion of those activities for the firm developing and operating it. This is equally critical, for a company that cannot earn a profit from some portion of its activities cannot sustain those activities over time. There can be real tensions between the aspects of a business model that create value and those that help to capture a portion of that value. A high-value proprietary technology, for example, easily earns a profit for the firm, if alternatives offer lesser value. But in many circumstances customers are reluctant

to buy such products (because of price, limited availability, or delivery or service issues). Yet making the technology more open, which makes it more appealing to customers, makes it harder to capture value from the offering. So these offsetting factors must be balanced.

It is, of course, possible to incrementally improve one's business strategy but Hamel (2000) contends that radical business concept innovation is now paramount. He claims that the current environment is hostile to industry incumbents and hospitable to industry revolutionaries. The fortifications that protected the industrial oligarchy have crumbled under the weight of deregulation, technological upheaval, globalization, and social change. What is now required to ensure organizational success is to continually revolutionize the basic organizational strategy, which progressively typically requires:

- Radically re-conceiving products and services, not just developing new products and services
- Redefining market space
- Redrawing industry boundaries.

2.2.4 Radical vs. Incremental Innovation

The degree of change an innovation results in, is another common aspect described in the literature. Innovations are often described as ranging from the incremental (often described as product extensions, continual improvement, total quality management and the like) through to radical (McDermott and O'Connor, 2002), breakthrough (Ahuja and Lampert, 2001), discontinuous (Rice et al., 1998; Tushman and O'Reilly, 2002), revolutionary (Abernathy and Clark, 1985; Rosson and Martin, 1985), or disruptive (Christensen, 1997). Foster and Kaplan (2001) describe three degrees of innovation – incremental, substantial and transformational and argue that “two factors determine the level of innovation: how new the innovation is and how much wealth it generates.” Likewise, Garcia and Calantone (2002) in their review of the literature, subdivide innovations into three similar categories based on degree – radical (12.5% of all innovations), really new (50%) and incremental (37.5%). Abernathy and Utterback (1978) argued that companies' innovative patterns occur in a consistent manner where radical product innovations are followed by incremental innovations, which in turn are followed by process innovations once a dominant

design is established. The degree of innovation is considered to extend along a continuum, either end of which are represented as:

- Incremental innovations – produce little change or result in a minor departure from existing practices (Damanpour, 1991; Ettlie et al, 1984);
- Radical innovations – produce fundamental change or result in clear departures from existing practices (Damanpour, 1991; Ettlie et al, 1984).

2.3 Key Driver of Innovation: Knowledge

2.3.1 Defining Knowledge

Before defining knowledge, two different terms “information” and “knowledge” shall be decomposed and interrelation shall be explained. This is necessary to proceed with the term knowledge and to explain the core driver of innovation.

While information entails an understanding of the relations between data, it generally does not provide a foundation for why the data is what it is, nor an indication as to how the data is likely to change over time. Information has a tendency to be relatively static in time and linear in nature. Information is a relationship between data and with great dependence on context for its meaning and with little implication for the future. Beyond relation there is a pattern. Pattern embodies both a consistency and completeness of relations which, to an extent, creates its own context. This pattern also has repeatability and predictability.

When a pattern relation exists with data and information, the pattern has the potential to represent knowledge. It only becomes knowledge, however, when one is able to realize and understand the patterns and their implications. The patterns representing knowledge have a tendency to be more self-contextualizing. That is, the pattern tends, to a great extent, to create its own context rather than being context dependent to the same extent that information is. A pattern which represents knowledge also provides, when the pattern is understood, a high level of reliability or predictability as to how the pattern will evolve over time, for patterns are seldom static. Patterns which represent knowledge have completeness to them that information simply does not contain.

The term knowledge is defined in the Oxford Dictionary and Thesaurus (1995) as: “awareness or familiarity gained by experience (of a person, fact, or thing)”, “persons range of information”, “specific information; facts or intelligence about something”, or “a theoretical or practical understanding of a subject”. Davenport and Prusak (1998) give a broader definition of knowledge: “Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of knower. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.”

2.3.2 Explicit vs. Tacit Knowledge

In their book *The Knowledge Creating Company*, Nonaka and Takeuchi (1995) presented a model of innovation processes, central to which is an epistemological distinction between two kinds of knowledge, tacit and explicit. Explicit knowledge is knowledge that is easy to articulate and express formally and in clear terms. Tacit knowledge, which is more important in creating innovations, is “personal knowledge embedded in individual experience and involves intangible factors such as personal belief, perspective, and the value system” (Nonaka and Takeuchi, 1995). Another fundamental point in this model is an “ontological” framework of four levels of “entities” that operate in knowledge creation: the individual, group, organizational, and inter-organizational levels. According to Nonaka and Takeuchi, knowledge is created and transformed in an ascending process, or spiral, from the individual level to the group and organizational levels, and finally between organizations. The dynamics of this model arise from the interaction between tacit knowledge and explicit knowledge. A “knowledge spiral” is grounded in four complementary types of knowledge conversion: from tacit knowledge to tacit knowledge, labeled socialization; from tacit to explicit knowledge, called externalization; from explicit to explicit knowledge, or combination; and from explicit to tacit knowledge, or internalization. Nonaka and Takeuchi claims that knowledge is constantly converted from tacit to explicit and back again as it passes through an organization. They say that knowledge can be converted from tacit to tacit, from tacit to explicit, or from explicit to either tacit or explicit knowledge as in Figure 2.3.

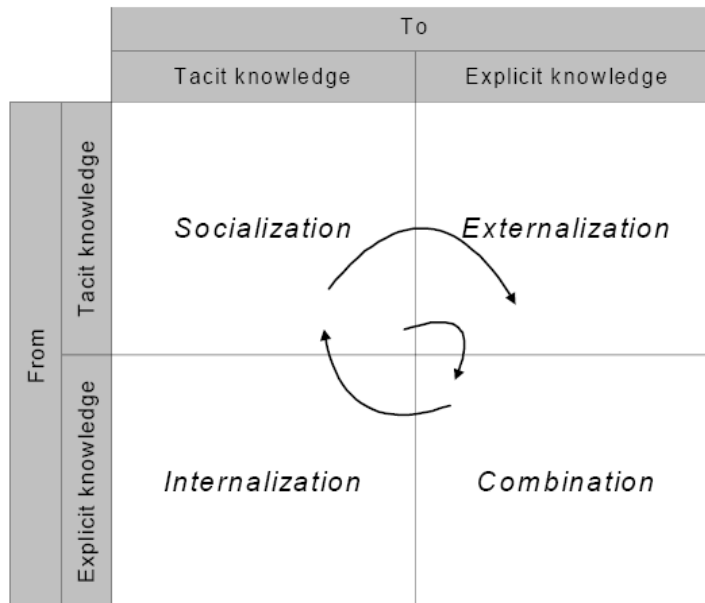


Figure 2.3.: Conversion of knowledge according to Nonaka and Takeuchi. We can imagine knowledge going through all conversion processes in a spiral form as it develops in an organization.

- **Socialization:** The knowledge creation spiral starts from socialization, sharing tacit knowledge and experiences at the group level. In this phase, a close interaction and collaboration within a group is needed. The aim of the socialization process is to create common understanding and trust within the group. Socialization means to transfer tacit knowledge to tacit through observation, imitation and practice, what has been referred to as “on the job” training. Craftsmanship has usually been learned in this way, where oral communication is either not used or plays a minor part.
- **Externalization:** The next phase, externalization, is the central one in knowledge creation. In this phase, tacit knowledge is explicated and conceptualized by means of metaphors, analogies, and concepts. In Nonaka and Takeuchi’s model, the basic source of innovation is tacit knowledge, which needs to be explicated in order to be transformed into knowledge that is useful at the levels of the group and the whole organization. Externalization means to go from tacit knowledge to explicit. Explicit knowledge can “take the shapes of metaphors, analogies, concepts, hypotheses or models”. This conversion is usually triggered by dialogue or collective reflection, but can also be the result of individual reflection, for example in a writing process.

- **Combination:** At the combination stage, units of already existing explicit knowledge are combined and exchanged. Combination is to go from explicit to explicit knowledge, that is, to combine and systemize knowledge from different sources such as documents, meetings, telephone conferences or bulletin boards. Systematizing this kind of explicit knowledge is to reconfigure it by sorting, adding, combining or categorizing the knowledge.
- **Internalization:** Finally, to have real effects in an organization, the explicit knowledge of the group or organization must be internalized by individuals and transformed into tacit knowledge and into action through “learning by doing.” Internalization is to take externalized knowledge and make it into individual tacit knowledge in the form of mental models or technical know-how. “Documents and manuals facilitate the transfer of explicit knowledge to other people, thereby helping them experience the experiences of others indirectly (i.e. 're-experience' them)”. After internalization, a new round of the knowledge spiral will begin.

2.3.3 Knowledge Management

Macintosh (1999) provides the following clear and concise definition of knowledge management: “Knowledge management involves the identification and analysis of available and required knowledge, and the subsequent planning and control of actions to develop knowledge assets so as to fulfill organizational objectives.” This definition is very similar to the one provided by Demarest (1997) that “...knowledge management is the systematic underpinning, observation, instrumentation, and optimization of the firm’s knowledge economies.” In its broadest sense, knowledge management is the collection of processes that govern the creation, dissemination and utilization of knowledge (Newman, 1996).

In one sense, knowledge management is an ancient skill that has been around since humans developed cognitive abilities. What is novel, according to Swanstrom (1998), is the focus on knowledge management as a "profession that concentrates on methods for managing and improving knowledge processes within a commercial enterprise to help it adapt and prosper."

Sveiby (2001) defines knowledge management as "the art of creating value from an organization’s intangible assets". Prusak (1996) said: "The only thing that gives an

organization a competitive edge ... is what it knows, how it uses what it knows, and how fast it can know something new;" in other words, how it applies knowledge management. For Koulopoulos (1997), knowledge management is "rooted in the idea that mobilizing an enterprise's intellectual resources is essential in breaking free from the enterprise's rigidly held ... suppositions about its competitive touchstones ... exposing it to compete based on innovation."

Knowledge management can be seen as a collective phrase for a group of processes and practices used by institutions to increase their value by improving the generation and application of Intellectual Capital (CIMA, 2005).

2.3.4 Knowledge as a Core Source of Innovation

It has been proposed in the literature that knowledge creation leads to continuous innovation, which in turn leads to competitive advantage (Nonaka and Takeuchi, 1995). Some researchers have made the link between innovation and knowledge at the strategic level. For example, differing innovation strategies product line extension, product platform development and new business creation have been linked with associated knowledge management strategies - leveraging existing knowledge, recombining and extending existing knowledge and importing or acquiring knowledge respectively.

Performance differences between organizations can be explained as a result of their different stocks of knowledge and their differing capabilities in developing and deploying knowledge (Choo and Bontis, 2002). One way of achieving superior performance is utilizing organizational learning for the development of core competencies, and translating them into new products and processes (Lei et al., 1996). Pavitt (1991) likewise related learning and competencies with his definition of learning as the adaptation and change of competencies. He identifies various means of learning: by doing, using, failing, studying, hiring, takeover and from competitors, and argues that, "personnel contact and discussions are the most frequent and effective means of communication and learning" (Pavitt, 1991).

Innovation is tied to knowledge. Innovation starts with knowledge, it elaborates that knowledge or generates new knowledge, and produces knowledge as the final outcome. Thus, knowledge is the engine of innovation. Furthermore, innovation is directly linked to people who realize new knowledge or extend existing knowledge.

Without such people there would be no innovation. People are the carriers of knowledge. Their culture and society is largely immaterial, although the importance of background is less strong for technological innovation than for non-technological innovation. If the influx of people from other cultures is too large, the role of people as carriers of knowledge is affected. Foreign researchers who develop knowledge will return to their home countries after some time. This means that knowledge will flow away, which creates problems regarding the continuation of education in the education-giving countries. As we will discuss, knowledge is not a free-floating commodity, as economists believe. Knowledge, without human beings, socially and culturally embedded, is not possible. Innovation is also a process. Besides creating and producing knowledge, it also requires that knowledge is transferred, available, accessible and usable.

It is the general baseline of all approaches to knowledge management that knowledge is more useful if it does not reside in the minds of individuals, but is applied and made available to others and that this is even crucial for the creation of new knowledge (Alavi and Leidner 1999). Therefore, several models for knowledge flow and knowledge lifecycles have been proposed that capture the dynamics of knowledge, knowledge transformation, and its relationship to the context (Nonaka and Takeuchi, 1995; Borghoff and Pareschi, 1998; Fischer and Ostwald, 2001).

It has been generally accepted in management and organizational studies that knowledge plays an important role inside business innovation, not only through its codified dimension but also through its tacit nature. Researchers from many disciplines have tried to describe the different domains through which knowledge can be defined as an important resource for promoting business innovation. Knowledge can be categorized in three domains. They are: users' community knowledge; organizational knowledge; and network knowledge. These domains refer to the distinctive types of knowledge in order to support the development of business innovation.

Users' community knowledge relates to knowledge contained in the interaction between individuals and products, the routines and practices formalized by individuals and groups, and the shared understanding and values negotiated among them (Bertola and Teixeira, 2002). It can be defined as the knowledge contained in everyday practices of individuals. This knowledge is developed through time based

not only on how individuals interact physically, conceptually, and emotionally with products, but on the cultural and social models that emerge and affect individual behavior and values.

Organizational knowledge relates to knowledge embedded in organizational routines, processes, and practices, as well as tacit and explicit knowledge possessed by employees (Bertola and Teixeira, 2002). Innovation is a task that depends upon the individual members and the collective knowledge of the organization. Here, organization is defined as a ‘community’ of people who share specific practices and values. The dialectical negotiation through time of distinctive skills, know-how, practices and values creates shared organizational routines that become socially accepted and adopted among its members. This process creates an organizational culture, in which its tacit elements—such as core competencies—can eventually be more important for fostering innovation than explicit ones.

Network knowledge relates to knowledge that is developed beyond the boundaries of an organization. It is the knowledge developed spontaneously, or through private and public policy, and diffused through networks of individuals (experts from specific disciplines or from multiple ones), communities (from specific segments or multiple ones), and the combination of both (Bertola and Teixeira, 2002). It is the knowledge that flows between corporations, outsourcing services such as suppliers and distributors, and research and educational centers. The main contribution of network knowledge to innovation processes is the continuous exchange of discoveries, one of the fundamental components for fostering innovation.

3. DEVELOPMENT OF THEORETICAL FRAMEWORK

3.1 Evolving of Knowledge Based View from Resource Based View

In this section, the theoretical framework is developed based on the literature and relations are explained. This theoretical framework is constituted to show how innovation capability can be developed based on intellectual capital and how knowledge and innovation capability is related.

Innovation capability, intellectual capital, firm's capability, knowledge based view and resource based view, these are popular terms used among both business world and literature. A number of works are published by researchers and academicians on these subjects. However most of them researched these subjects in their own context, some of them researched the relationship in pairs of two or three subjects. The interrelation of all subjects in each other is not addressed. The theoretical framework shown in figure 3.1. explains the interrelation of these subjects. Moreover it provides a basis for development of intellectual capital based innovation capability model.

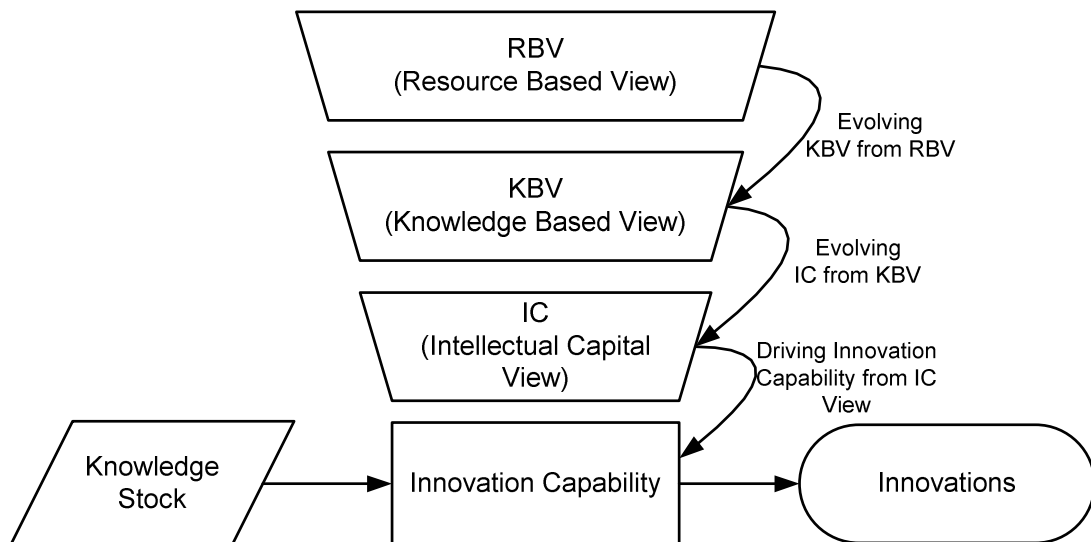


Figure 3.1. Theoretical Framework for Innovation Capability Model

To understand the interrelation of all subjects in each other, the constructs with relationships are explained below.

3.1.1 Resource Based View

Resource Based View of the Firm (RBV) focuses on the internal organization instead of the external environment. The roots of the RBV lie in the study of anti-trust implications of economics. The roots come from Ricardian and Pensorian economic studies. According to Penrose, a firm is beyond the simple production function, a firm can be described as an administrative structure which link and coordinates of activities of individual and groups of bundle of productive resources (Penrose,1959).

However, Penrose (1959) may have laid the seminal piece of work, suggesting that firm specific (heterogeneous) resources are the ultimate source of differentiation between firms. Penrose (1959) argued that a firm is "a collection of productive resources the disposal of which between different uses and over time is determined by administrative decision". She defined productive resources consisting broadly of tangible, human, entrepreneurial, and intangible things and skills. Each resource would also consist of a bundle of potential services (activities), which are combined to be used production and processes. Administrative framework used to coordinate and link the resources of the firm affects and limits greatly the growth of the firm.

RBV suggests that many resources used by firms are heterogeneous and inelastic in their supply, thus valuable resources can be the source of competitive advantage that may be sustainable. When the external environment is subject to rapid change, internal resources and capabilities offer a more secure basis for strategy than market focus. Resources and capabilities are the primary source of profitability. Resources can be seen as "tangible and intangible assets that firms use to conceive of and implement their strategies" (Barney, 2001). Resources are just about any assets, tangible or intangible that can be thought to be a strength or weakness for a firm. Resources can be in different kinds. For example there can be physical resources (tangible) like firm's plant, equipment, raw materials or human resources (intangible) like training, experience, intelligence, relationship of individuals or there can be organizational resources like formal reporting, controlling systems, business processes, routines, firm culture. Wernerfelt (1984) can be seen as the pioneer of the resource-based view in its current form. Wernerfelt argued that the firm's portfolio of product market positions is reflected by its portfolio of the resources it controls. Therefore competition could be seen also as competition between the resource positions held by firms.

RBV took off in the beginning of 1990's when it was empirically shown that intra-industry profit differences are actually greater than inter-industry ones, stating that firm-specific factors dominate over industry effects (Rumelt, 1991). The competing firms may have different bundles of resources even within the same strategic groups, and the differences may be persistent; but RBV also suggests that this may not always be the case - the resources may not always be unique, at least in ways that are strategically relevant (Barney, 2001). The resources a firm possesses are sticky in a sense that firms are stuck with what they've got, at least in the short term, for three reasons: complexity of the resources, some resources cannot be traded, and even if the resources can be bought, the firms end up paying full price for them (Barney 1986).

3.1.2 Capability Definition in Resource Based View Context

Grant (1991) notes the distinction between resources and capability as follows: Resources are inputs into the production process...they include items of capital equipment, skills of individual employees, patents, brand names, finance, and so on. But, on their own, few resources are productive. Productive activity requires the cooperation and coordination of teams of resources. A capability is the capacity for a team of resources to perform some task or activity. (Grant, 1991)

In the same manner, Amit and Schoemaker (1993) define resources as stocks of available factors that are owned or controlled by the firm, which are converted into final products or services. Capabilities, in contrast, refer to a firm's capacity to deploy resources, usually in combination, using organizational processes, to produce a desired effect. Hence, the presence of capability enables resources to begin to be utilized, and the potential for the creation of output arises. While resources are the source of a firm's capabilities, capabilities are the main source of its competitive advantage (Grant, 1991).

Capabilities of a firm are organizational structures and managerial processes supporting the firm's productive activity, and therefore not represented directly by the firm's balance sheet (Teece et al., 1997). They are "business processes" that provide value to the customer (Stalk et al., 1992), or high-level routines for producing outputs, where "routine" is a learned behavior that is repetitious and based partly on tacit knowledge (Winter, 2003). Therefore capabilities are general in

respect that they may enable production of a variety of products and they refer to the firm's ability to utilize its resources effectively. An example of a capability can be the ability to bring a product to market faster than competitors. As embedded in the routines of the organization, the capabilities are not easily documented as processes and can be thus difficult for competitors to imitate. In this study Grant's definition "...the capacity for a team of resources to perform some task or activity." will be used for the term capability (Grant, 1991).

3.1.3 Knowledge Based View

The knowledge-based view is an outgrowth of the RBV, viewing knowledge as the most strategically important resource of the firm - after all, to be able to work with and take the most out of resources the firm has, one needs to have knowledge about them to increase the prospects for success (Penrose, 1959). Further elaborated, the critical inputs in production (transforming of inputs into outputs) and the primary determinant of value is knowledge - even machines are embodiments of knowledge (Grant, 1996). Or, as Spender (1996) describes it: "So long as we assume markets are reasonably efficient and that competitive advantage is not wholly the consequence of asymmetric information about those markets or the stupidity of others, these rent-yielding capabilities must originate within the firm if they are to be of value. Since the origin of all tangible resources lies outside the firm, it follows that competitive advantage is more likely to arise from the intangible firm-specific knowledge which enables it to add value to the incoming factors of production in relatively unique manner."

Knowledge-based view of the firm suggests that knowledge is the most important resource of the firm, and it explains most of the differences in firm performance (Grant, 1996). Taking advantage of knowledge does not only mean knowledge creation or acquisition, but also application plays a key role. The ability to benefit and profit from the knowledge the firm has depends on how well the firm can replicate it for extended internal use (Teece et al 1997). Knowledge application requires that the members of the organization share all the relevant knowledge, and to be able to allocate resources effectively requires identification of the internal knowledge processes (Spender, 1996).

3.2 Intellectual Capital View

Intellectual assets are often intangible assets. They do not have a hard shape like property, for example, or plants and equipment, nor do they have obvious financial value, as do receivables and short-term investments. Indeed, intellectual assets have been characterized as hidden assets because they are sometimes difficult to identify and to assign an economic value. For example, a management process that provides a competitive advantage may be extremely valuable but it may be very difficult to assign a precise economic value to the process. This process could represent a key factor of success over competitors. As it is discussed in the knowledge based view different competitors possessing different competitive advantages in the market is the consequence of intangible firm-specific knowledge which is the foundation of intangible assets (Spender, 1996).

One way that has been used to uncover and derive the value of this hidden, intangible Intellectual Capital is to compare the market value of stock to its book value. In fact, the difference between a firm's market value and the replacement value of its physical and financial assets has been used as a definition of Intellectual Capital. Edvinsson and Malone (1997) argue that IC represents such a fundamentally new way of looking at organizational value that it will never be confined to playing an adjunct role to traditional accounting. They also assert that the presence and value of intangible assets is capable of accounting for the significant widening gap between companies' valuing of enterprises stated in corporate balance sheets and investors' assessment of those values. This market premium has also been used to measure Intellectual Capital. In general, knowledge-based businesses, which are made up largely of intellectual assets, have high market-to-book ratios.

According to Harrison and Sullivan (2000), Sullivan (1998) and Edvinsson (2002) interest in Intellectual Capital started in the early 1980s when it was realized that the firm's intangible assets were often the biggest determinant of profit for that enterprise. Sullivan is of the opinion that the Intellectual Capital movement originated from the view of Penrose, Rumelt, Wernerfelt and Teece, which is known as the Resource-Based View (RBV) of the enterprise and the intangible assets of the know-how organization as addressed by Sveiby.

3.2.1 Defining Intellectual Capital (IC)

Klein and Prusak (1994) define Intellectual Capital as "intellectual material that has been formalized, captured and leveraged to produce a higher-valued asset." They distinguish between intellectual material - "free-floating brainpower" - and Intellectual Capital, which is "packaged useful knowledge." A memo, a database, a mailing list or an idea are all intellectual material, but until it has been captured and put into action it is not capital or an exploitable asset.

Sullivan (2000) is of the opinion that almost everyone agrees that Intellectual Capital includes a range of knowledge, wisdom, ideas and innovation. For an organization to exploit its intellectual materials and manage its Intellectual Capital it needs to locate these in one of the following: employees, structures or customers. In this taxonomy Intellectual Capital comprises human capital, structural capital and customer capital. Understanding these distinctions is vital if knowledge is to be properly managed.

According to Edvinsson (2002) Intellectual Capital is the ability to transform knowledge and intangible assets into wealth creating resources. Saint Onge (in Edvinsson, 2002) describes Intellectual Capital as the output of accelerated learning at organizational level and Bontis (1998; 1999) elaborates on this viewpoint by describing it as the total stock of knowledge in an organization. He goes further by saying that it can be seen as the stock unit of organizational learning where the latter is portrayed as the flow of knowledge in the organization and that this flow will be enabled through the management of knowledge.

In all definitions intellectual capital is seen as a source of value extraction, wealth creation and innovation where innovation itself is a kind of wealth creation and value extraction. For the purpose of this study, Edvinsson's definition for Intellectual Capital "...ability to transform knowledge and intangible assets into wealth creating resources" Edvinsson (2002) will be used. This can be through the skills, expertise and knowledge of its employees, with the intangible assets imbedded in the organization and through all the stakeholders, which will have an influence on the operations of the enterprise.

3.3 Intellectual Capital Models

A few selected approaches and models, which are well established, widely recognized and extensively cited by other authors, will be discussed. The following Intellectual Capital models are used and cited by various authors and consultants:

3.3.1 The Skandia Intellectual Capital Value Scheme

Leif Edvinsson is widely acknowledged as one of the world's leading experts on Intellectual Capital. He was appointed as the first Director of Intellectual Capital at Skandia, an internationally operating Swedish insurance company. Skandia made an alternative taxonomy familiar.

The Skandia Insurance Company in Sweden creates an initial model for defining the different categories of Intellectual Capital (figure 3.2). In this model market value is divided into financial capital and Intellectual Capital. The latter is further subdivided into human capital and structural capital. Structural capital encompasses customer capital and organizational capital and the latter process capital and innovation capital (intellectual property and intangible assets).

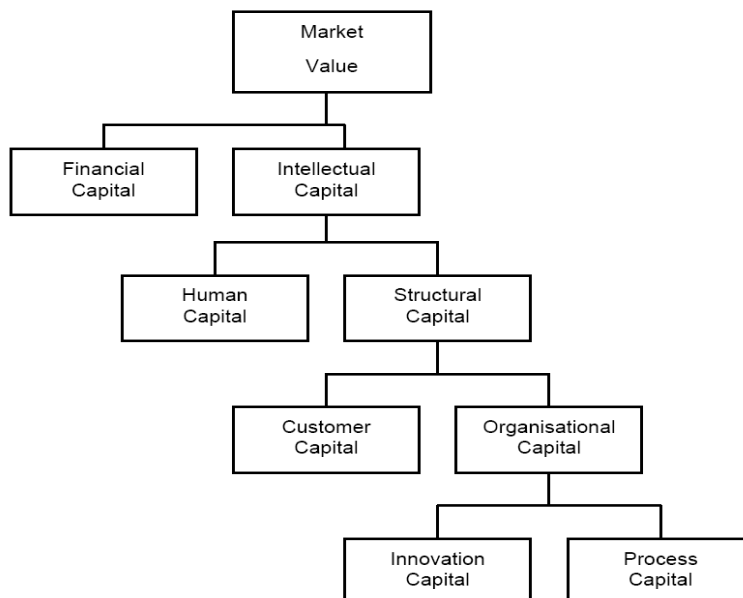


Figure 3.2. The Skandia Intellectual Capital Value Scheme.

3.3.2 Brookings model

Another, slightly different distinction has been suggested by Brookings (1996). According to her, Intellectual Capital is formed by:

- Market assets (or customer assets): all market related intangibles, including brands, customers, customer loyalty, distribution channels, backlog, and so on.
- Human-centred assets: skills and expertise, problem-solving abilities, leadership styles and abilities and everything that is embodied by the employees.
- Intellectual property assets: know-how, trademarks and patents, and any intangibles that can be protected by copyright.
- Infrastructure assets: all the technologies, processes and methodologies enabling an organization to function (Brookings, 1996).

HUMAN CAPITAL	RELATIONAL (CUSTOMER) CAPITAL	ORGANIZATIONAL (STRUCTURAL) CAPITAL	
		Intellectual Property	Infrastructure Capital
· Know how · Education · Vocational qualification · Work-related knowledge · Occupational assessments · Psychometric assessments · Work-related competences · Models and frameworks · Cultural diversity	· Brands · Customers (names, purchase history) · Customer loyalty · Customer penetration and breadth · Company names · Backlog orders · Distribution channels · Business collaborations (joint ventures) · Licensing agreements · Favorable contracts · Franchising agreements	· Patents · Copyrights · Design rights · Trade secrets · Trademarks · Service marks · Trade dress	· Management philosophy · Corporate culture · Management processes · Information systems · Networking systems · Financial relations · Corporate strategies · Corporate methods · Sales tools · Knowledge bases · Expert networks and teams · Corporate values

Figure 3.3. A taxonomy of the elements of Intellectual Capital in four classes.

3.3.3 Sveiby's Model

Karl Erik Sveiby is chief executive of the consulting company “Sveiby Knowledge Management” and one of Scandinavia’s largest publishing companies in the trade press and business press sector. The range of building blocks forming Intellectual Capital, as conceived by Sveiby (1997), comprises three components, and the taxonomy presented has also three dimensions (see figure 3.4).

Intangible Assets		
External structure	Internal Structure	Employee competence

Figure 3.4. Sveiby's taxonomy of Intellectual Capital

According to Sveiby (1997) the individual components of Intellectual Capital are defined as follows:

Employee competence: It involves the capacity to act in a wide variety of situations to create both intangible and tangible assets. Individual competence cannot be owned by anyone or anything except the person who possesses it.

Internal structure: It includes patents, concepts, models and computer and administrative systems. The internal structure is created by the employees and is generally owned by the organization.

External structure: It refers to relationships with customers and suppliers, brand names, trade marks, and the organization's reputation or image. Some of these assets can be considered legal property, but investing in the external structure is regarded as not possible with the same degree of confidence as investments in the internal structure.

3.4 Driving Firm's Capability from Intellectual Capital View

Capability is the capacity for a team of resources to perform some task or activity (Grant, 1991). Capabilities of a firm are organizational structures and managerial processes supporting the firm's productive activity, and therefore not represented directly by the firm's balance sheet (Teece et al 1997). In balance sheet terms, intellectual assets are those knowledge-based items that the organization owns and will be able to produce future stream of benefits from them. They are the "debits" or individual items that comprise intellectual assets on the balance sheet, whereas Intellectual Capital is the total stock of balancing "capital" or knowledge-based equity ("credits") that the organization possesses. Ideally, the total value of intellectual assets should be equal to the total Intellectual Capital (Lynn, 1998). In other words capabilities (equities) are embedded in intellectual capital on the balance sheet of the firm.

From this point of view there are two approaches can be derived. Firstly, while discussing IC as a “knowledge based equity” we shall remember that capabilities are underpinned by knowledge according to Knowledge Based View of the firm (Teece et al., 1997). Therefore, organizations that seek to improve their capabilities need to identify and manage their knowledge assets. The perspective that knowledge assets represent the foundation of organizational capabilities explains the growing interest in knowledge management as an evolving discipline and approach to improve business performance. Although the management literature provides plentiful insights into knowledge management practices only little has been documented about the assessment of organizational knowledge assets. Given that it is difficult to manage something that is not being measured, organizations require frameworks to measure their knowledge assets. Managers need tools that help organizations in defining key performance indicators for those knowledge assets that are underpinning the strategic key capabilities of the organization.

Secondly, while discussing capability as the “capacity of a firm to covert resources into services and products, it shall be mentioned that capabilities, refer to a firm’s capacity to deploy resources, usually in combination, using organizational processes, to produce a desired effect. Hence, the presence of capability enables resources to begin to be utilized, and the potential for the creation of output arises. While resources are the source of a firm’s capabilities, capabilities are the main source of its competitive advantage (Grant, 1991).

Organizational capabilities are repeatable patterns of action utilized by assets to create, produce and/or offer products to the market. Capabilities are regarded as an important special category of intangible assets because they determine the way a firm uses its tangible and intangible assets (Sanchez, 2001). Capabilities are a firm’s capacity to deploy resources, usually in combination, using organizational processes, to affect a desired goal (Amit and Schoemaker, 1993). A capability is, in essence, a routine, or a number of interacting routines (Grant, 1991). An attribute of organizational capabilities is that they are collective and cross-functional. The roots for sustainable success are the capabilities – the requisite abilities and routines – an organization possesses, cherishes and grows. Clarity with regard to the core capabilities a company require for success is an important building block to create a focus approach for the development of intellectual capital.

Intellectual capital growth, from a strategic perspective, is however not only about the core capabilities an organization possesses, but also about the access a firm has to the capabilities of alliance partners. This creates the basis for an extended enterprise where the repertoire of capabilities a firm can leverage includes both owned and non-owned.

3.5 Defining Innovation Capability from Intellectual Capital Perspective

Several authors have referred to the term ‘innovation capability’ in the literature. For example, Burgelman et al. (1998) describe innovative capabilities as the “...comprehensive set of characteristics of an organization that facilitate and support its innovation strategies”. Zien and Buckler (1997) highlight that “innovative companies, regardless of differences in industry and geographic culture, share a set of characteristics, qualities and behaviors that differentiates them from other less innovative companies.”

Among the definitions above made by the respectful academicians about the term “capability” Grant’s definition will be used as the foundation for further definition of “innovation capability”. Grant says capability is the capacity for a team of resources to perform some task or activity” (Grant, 1991). From this point, preliminary definition of “Innovation Capability” can be made. The preliminary definition is “Capacity of ability to utilize innovation resources to perform innovation tasks and activities and to renew existing capabilities”, in other words innovation capability is “the ability to transfer the assets into innovations”.

The ability to acquire and utilize knowledge effectively is argued to be critical for the firm’s innovation activities and performance (Cohen and Levinthal, 1990). As the innovation paradigm has changed from being discovery-based to being centrally learning-based, the way in which knowledge processes are managed within and between firms has emerged as a major theme in recent researches. The definition of innovation made previously is “Result of a knowledge embedded process where it creates means of a new idea that brings business value”. We shall also remember that capabilities determine the way a firm uses its tangible and intangible assets (Sanchez, 2001).

From this point it can be said that innovation capability covers knowledge embedded processes and abilities where knowledge and intangible assets are utilized for the sustainable success. Innovation is the only sustainable source of growth and in a long term perspective it is important for the state to keep on sustaining large firms' innovative efforts. Innovation efforts have to be sustainable to keep up with the competitive advantage. So the innovation capability is very valuable where it creates continuous results.

It was mentioned above that knowledge assets represent the foundation of organizational capabilities (Teece et al., 1997). According to Edvinsson (2002) Intellectual Capital is the ability to transform knowledge and intangible assets into wealth creating resources where innovation is also recognized as a wealth creating resource. This ability describes the ability to innovate. It can be seen that resources of innovation are hidden among the intangible assets which include knowledge based assets (Intellectual Capital) of the firm.

This perspective leads us to a more mature definition of "Innovation Capability". Innovation Capability is "the ability to utilize intellectual capital assets to perform innovation tasks and activities and to renew existing capabilities for sustainable results".

4. INTELLECTUAL CAPITAL BASED INNOVATION CAPABILITY MODEL

4.1 Innovation Capability Models Review

A review of the literature aimed at identifying an instrument that would assist organizations to better understand and improve their management of corporate entrepreneurship and innovation revealed that there are few tools designed to do this.

Several innovation capability frameworks operate at the industry or geographical unit of analyses (Bross, 1999; European Commission, 2001; Mairesse and Mohnen, 2002; Porter and Stern, 1999; Walker et al 2002; Watanabe et al 2001). These typically measure and compare ‘innovation agents’, for example intellectual property output or research and development (R&D) expenditure, in order to draw conclusions about the effectiveness of countries or industries to innovate.

Such frameworks offer little assistance to the individual organization wishing to improve their innovation capability. In addition, some research has pointed out the limitations in using such agents. Bienayme (1986), for example, talks of researchers who have “confused R&D and innovation.” In his view, analysis based on R&D investment is useful for little more than to “account for an expenditure of money, while innovation results in a tangible product or an efficient service satisfactory to a customer” (Bienayme, 1986).

There are many innovation capability models that operate at the organizational level that also use similar indicators or agents of innovation as a means to determine innovation performance of firms, rather than assess innovation capability (Cordero, 1990; Frigo, 2002; Hauser, 2001; Kaplan and Norton; 1992; Kuczmarski, 2000; Tipping et al., 1995; Voss; 1992). Again, these may assist organizations in providing a comparison about certain inputs (for example, R&D investment) or outputs of innovation (patent statistics and the like), and therefore could be related to the effectiveness of their innovation capability. However, they don’t provide organizations with an understanding of what organizational capabilities contribute to

convert these inputs into outputs and how these organizations might begin to make improvements.

Assessment tools also exist to measure organizations' environments or cultures with the aim of determining how conducive these environments may be for entrepreneurial or innovative activity. These typically address some aspects of the internal environment literature referenced above and ignore other factors included in the areas of strategic management or innovation competencies.

Generally, the few tools are able to address the innovation capability at the organizational level. Most of organizational level assessment tools focus on R&D and technology management rather than innovation in general (Geisler, 2002) or address some of the enablers of innovation omit other important areas, for example organization culture, customers or market understanding.

Indeed, there has been a little research in the literature for a more general perspective on innovation as opposed to the often isolated views on individual aspects such as technological innovation, innovation diffusion, innovative cultures etc..

Few tools define clearly whether they are designed to address all types of innovation, for example, product, process, business model and administrative. In addition, none were found that address all degrees of innovation, from incremental through to radical. Models that fail to address the difference between radical and incremental innovation management overlook one of the most important aspects of research on corporate innovation that has emerged in the last decade.

Three Innovation Capability Assessment instruments that represent the most comprehensive and robust in the literature are described in greater detail in order to provide a deeper understanding of the strengths and weaknesses of the current state of art in this area.

Chiesa et al. (1996) present an innovation capability audit based on a process model of technical innovation. The underlying premise is that success in innovation is related to achieving better practice in the constituent management processes, which in turn leads to increased competitiveness. The model includes four core processes: concept generation, product development, process innovation, and technology acquisition. Supporting these core processes are three enabling processes: the deployment of human and financial resources, the effective use of appropriate

systems and tools, and senior management leadership and direction. This assessment instrument appears to be the most comprehensive of those in the literature, its focus is on technical innovation only and has been applied only on manufacturing firms in the United Kingdom.

Another innovation capability framework is proposed by Burgelman et al. (1988) that is based on five aspects of innovation capabilities: (1) understanding the technical environment; (2) understanding the industry; (3) understanding the culture (4) understanding the organizational structure and; (5) the strategic management capacity. Again, the focus is firmly on technology management with no apparent consideration of the customer or their needs. Also innovation is seen narrowly as product or service development, and there is no indication whether this framework has been tested.

The final assessment model to be discussed is WAVE Innovation Capabilities Audit (Bubner, 2001). Here the author contrasts better practice in six 'foundation' capabilities of 'well-managed' organizations, with six innovation capabilities that include:

- Leadership,
- Strategy for innovation,
- Fostering innovation via the external environment,
- Internal environment for innovation,
- Innovation production process and
- Maintenance and measurement of innovation.

This instrument sets out to provide a holistic approach to innovation management and is apparently aimed at a range of organizations. For this reason, it appears the most promising of the Innovation Capability instruments identified in the extant literature. There is little published literature, however, as to its effectiveness in improving organizational innovation performance in practice. In summary, there have been previous attempts to develop models aimed at measuring and improving innovation performance, few, if any, have addressed all the aims of this research for the following reasons:

- A focus at the industry- or country-level unit of analysis rather than organizational level;
- A focus on measuring performance ‘agents’, such as patent production, rather than management capabilities that would more easily enable improvement;
- No focus on impact of the intellectual capital on innovation capability.

4.2 Building Innovation Capability through Intellectual Capital Approach

The researches discussed above show us that determining innovation capability need further and deeper focus on enablers of innovation capability. Enablers of innovation capability lie under “Intellectual Capital” approach. The emergent part of innovation management is the creation of an organization that has the right combination of resources in place so that new ideas emerge and succeed on a regular basis. If we look at the roots of innovation, we see that the roots of innovation are made up primarily of intellectual capital. This phrase in a broader sense, is used to describe a portfolio of intangible value drivers that fall into three categories which are

The ICM Group (1999) defines Intellectual Capital as knowledge that can be converted into profit. Intellectual assets are specific knowledge to which the organization can assert an ownership right and represent the source of innovations that firms commercialize.

In order to facilitate emergent innovation, leaders need to actively manage the intellectual capital of the corporation. Intellectual capital management ensures that the company hires and retains good people, creates an environment that is conducive to collaboration and nurtures a high value external network with right process to utilize these aspects of resources.

One company that is especially good at this approach to intellectual capital management is SAS, which in 2005 had its 29th straight year of revenue growth and profitability. Three things that SAS does to unite innovation and hardnosed management include helping employees do their best work by keeping them intellectually engaged and removing distractions, creating processes for making managers responsible for sparking creativity and engaging customer and creative partners in order to deliver superior products

It shall be point out that Intellectual Capital is formed by intangible assets (also called knowledge based assets) (Edvinsson, 2002; Stewart, 1997; Sveiby, 1997; 2001) and Sullivan (2000) states that by the mid-1990s two separate, but related, schools of thought about the management of Intellectual Capital had emerged;

The knowledge-centric and brainpower-orientated path, where the focus was on the creation and development of the organizations' knowledge. The role of Intellectual Capital was primarily viewed from a value creation paradigm. Followers of this school were Stewart, Edvinsson and Sveiby.

The economic and resource-orientated path, where the focus was on how to create profits from the organizations' unique combination of Intellectual Capital and tangible resources. The role of Intellectual Capital is primarily viewed from a value extraction paradigm. Early pioneers of this school were Itami, Teece and Sullivan.

This view of Sullivan is supported by Roos et. al. (1997) where they express the opinion that Intellectual Capital can be seen as a strategic view which will focus on creating and using knowledge, indicating the relationship between knowledge and value creation. Organizational learning, creativity and innovation support this creation of knowledge. The leverage of knowledge is supported through managing it, developing core capabilities and unlocking intangible assets.

These views show us how innovation capability model can be build through intellectual capital approach. As discussed earlier, intellectual capital is formed by human capital, structural capital and relationship capital. This model will be in a preliminary form, which will be tested during case study and if necessary modifications will be carried out according to result of case study. Preliminary version of IC based innovation capability model is shown in figure 4.1 and how constructs of model are gathered to constitute this model is explained in sections below.

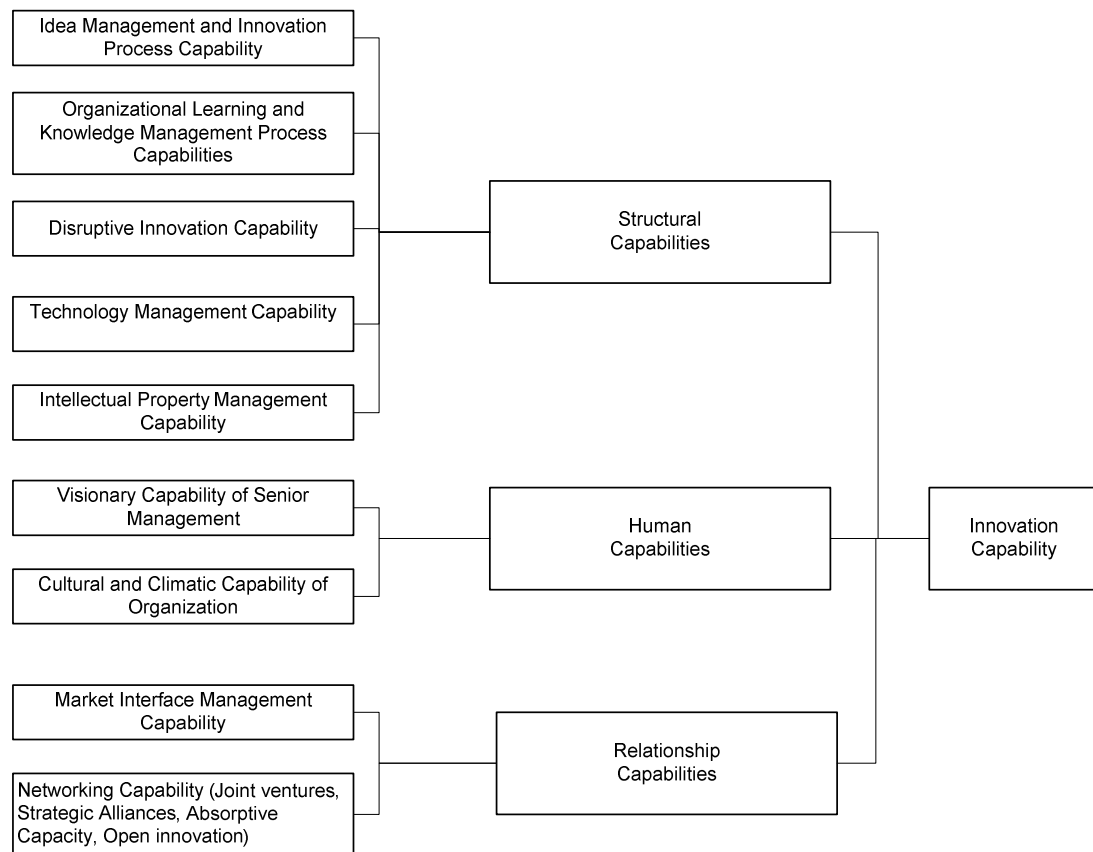


Figure 4.1. Preliminary Version of IC based innovation capability model

4.3 Structural Capabilities

The first category of innovation capability enablers to be discussed is the ‘structural capabilities’. As it is described in previous sections structural capital consists of systems and work processes that leverage competitiveness (Allee, 1998b). These include information technology, communication systems, concepts and models of business operations, knowledge based processes, databases and documents, as well as trademarks, patents and copyrights and other ‘packaged’ knowledge that needs legal protection.

According to Bontis (1998) structural capital contains the mechanisms and structures of the organization that assist employees in contributing to business performance. Stevenson (1995) sees structural capital as “those things that turn individual know-how into the property of the group”. The purpose of managing this accumulated knowledge of employees is then to increase the sharing of it and to transform it into a corporate asset. So structural capability also includes the ability of running accumulated knowledge to turn into corporate asset. Stewart (1997:108) calls this

"the knowledge that doesn't go home at night". According to Bontis et. al. (1999) structural capital includes organizational elements such as infrastructure assets related to technologies, methodologies, and processes that enable the organization to function, which in turn enables the organization to create value in the commercialization process. Secondly it also includes renewal and development activities with a focus on research and development, business processes and intellectual property rights, which all contributes to the launching of new products and services. The library and information services of an organization can also be seen as part of its structural capital. These enablers posses and explain the capabilities under structural view of organization.

Knowledge is scattered throughout the organization, to be useful it needs to be managed. As structural capabilities, corporate knowledge may be looked at in terms of flows. (Stewart, 1997). Knowledge databases are ambitious attempts to gather corporate-wide information and convert it into organizational knowledge. What kind of knowledge do organizations stock as structural capability? Corporate Yellow Pages are maps that show where the knowledge of the organization is located. They are a means of connecting inquirers with experts, saving time and preventing the reinvention of the wheel. Stocking lessons learned is another way of increasing structural capital by providing experiences and stories rather than rules as a checklist of what went right or wrong with previous projects. Competitor intelligence databases help organizations to organize knowledge about suppliers, customers and competitors. In fact, Johnson (1998) asserts that "one of the most compelling reasons to use knowledge management is that of competitive intelligence". Davenport (1997) warns that placing procedure manuals is not what creating a knowledge base all is about. He says, "let's use the technologies that have sparked the rise of knowledge management to store and disseminate real value-added, insight-laden, wisdom-giving knowledge".

The structural capabilities can also help to speed up knowledge flows and increase productivity. An electronic network is an example of structural capability along which knowledge flows. By making knowledge available throughout the organization, structural capital can substitute for organizational structure.

According to Bontis et. al. (1999) structural capital represents the knowledge that is embedded within the routines of the organization. These routines which are part of

structural capabilities allow firms to create the special context in which tacit and explicit knowledge interacts. Organizational routines are the organization's genetic material, some explicit in bureaucratic rules, some implicit in the organization's culture. The interaction between explicit and tacit knowledge is evolutionary in that the choices made by individuals are selected according to their utility in a specific historical and economic reality, and eventually embedded in organizational routines which then shape and constrain further individual choices (Nelson and Winter, 1982).

According to the Skandia Intellectual Capital Value Scheme innovation capital must also be seen as a subset of structural capital. This is, however, also closely interrelated with human capital, as the human intellect is a prerequisite for innovation, creativity and inventiveness. Demarest (1997) says that innovation begins with the construction of a new kind of knowledge within the organization and that this knowledge is based on the idea of not repeating the mistakes of the past. This construction of new kind of knowledge and innovation process its self are parts of structural capability of the organization.

The sub areas reviewed in this category are listed as:

- Organizational Learning and Knowledge Management Capability
- Idea Management and Innovation Process Capability
- Technology Management Capability
- Disruptive Innovation Capability
- Intellectual Property Management

4.3.1 Organizational Learning and Knowledge Management Capability

While knowledge and resources are considered essential ingredients to firm survival, capabilities represent the firm's capacity to act. As mentioned before, firm behavior, the direct consequence of a firm exercising its capabilities, results in action that is observed externally and internally. Since knowledge is not itself measurable, we only infer it through an organization's actions. Different actions can be ascribed to different capabilities. Thus a specific constellation of actions represents a specific set

of capabilities inside the firm and implies the existence of specific knowledge that is required to exercise these capabilities.

The knowledge management activities cover all the necessary steps from knowledge creation to knowledge exploitation. They represent the activities involved in manipulating knowledge and changing the state of knowledge. The knowledge management activities are seen as creating flows to and from the firm's stock of knowledge. The stock of knowledge is seen as the repository of knowledge in the firm and the stock is the result of the accumulation of knowledge assets over time (Dierickx and Cool, 1989; Decarolis and Deeds, 1999). The stock of knowledge can only be changed through adjusting the flows to or from it and while the flow of knowledge into the stock can be adjusted quickly the stock will only change gradually over time. The ability to use this stock of knowledge is the "knowledge management capability" of the firm.

Both two schools of thought indicated that intellectual capital contains knowledge based assets where knowledge assets are resources for innovation. This conclusion is supported by the researchers of innovation paradigm. Innovation studies have emphasized the extent to which the innovation process involves the integration of external knowledge with the existing organization (Cohen and Levinthal, 1990; Leonard-Barton, 1995; Powell, 1998; Wu et al., 2002). For example, Mullen and Lyles (1993) suggest that continuous organizational learning will improve the efficiency and effectiveness of a firm's innovation. Since, innovation will strengthen a firm's competitive advantage, knowledge is the key that combines organizational learning and innovative activities.

Past knowledge-based theories of the firm generates three main critical capabilities which consist of sub-process capabilities. These critical capabilities are: knowledge development, knowledge distribution and knowledge use. These three capabilities are not completely independent of each other.

The first innovation capability is knowledge development where the firm creates, acquires and subsequently captures new knowledge. The second knowledge related innovation capability is knowledge (re)combination, where knowledge-based resources from the stock of knowledge in the firm is being combined and integrated in order to form organizational capabilities. The third innovation capability is

knowledge use, where the firms existing and already integrated knowledge resources are being used in the value creating activities of the firm. Knowledge recombination is similar to the concept of “combinative capabilities” coined by Kogut and Zander (1992). Kogut and Zander (1992) see a combinative capability as the organizational processes that take place in order to create new applications and innovations using the firms existing stock of knowledge. Kogut and Zander (1992) finds that the key to changes in the capability base of the firm is based on recombination of the firms existing knowledge resources and technologies. In connection with the thoughts about innovation capabilities and their relation to innovation it is necessary to emphasize that not all of the different innovation outcomes can be related to intentional knowledge management or knowledge creation strategies. Burgelman (1983) demonstrated that autonomous behaviors can be a significant source of strategic renewal in companies. This indicates that one of the key challenges associated with developing a knowledge management strategy in a firm is to secure that new and potentially relevant knowledge is captured, its potential understood, and the resulting opportunities are pursued. Organizational capabilities are changed through the influence of innovation capabilities. Based on this conceptualization of innovation capabilities it can be argued that knowledge recombination and integration in relation with

4.3.1.1 Knowledge Development

Knowledge development is concerned with the development of new organizational knowledge in the firm. Emphasis is given to formalized knowledge development, e.g. formal projects, attempts, and programs to develop new knowledge. Knowledge development includes knowledge creation, acquisition, capture and articulation capabilities. (Nielsen, 2006)

The creation capability is the capacity to combine knowledge with knowledge and knowledge with resources to produce output that exceeds the value of the sum of the inputs that are required to generate the output. Probably the strongest argument so far posited in the KBV is the firm’s advantage in knowledge creation. Firms exist as alliances between knowledge creating entities (Spender, 1996) or to protect the creative process (von Krogh et. al., 1994). Loasby (1998) contends that firms outperform markets by building "reserves" of capabilities, which can be deployed to

exploit new market opportunities. Nahapiet and Goshal (1998) claim that firms are conducive to higher levels of social capital than markets and are therefore better at creating and sharing intellectual capital. Kogut and Zander (1992) look at firms as a social community of voluntaristic action in which knowledge is learned, produced and commercially applied. Firms exist because they outperform markets in organizing the combination of knowledge. And, their boundaries are defined by the degree to which knowledge conversion takes place at a higher rate (Nonaka et al, 1999) or by the ability to resolve agency problems among individual knowledge creators (Spender, 1996). Perhaps only in relation to creation capabilities do researchers make an explicit theoretical link to performance. The combination of knowledge and resources allows the firm to develop new knowledge, which gives it the capacity to produce better products and services. Thus, competitive advantage emanates from ownership of knowledge assets and the ability to combine them with other assets to create value (Teece, 1998).

Another important source of new knowledge for a firm is the acquisition of knowledge from external partners. Knowledge acquisition has in many industries become a competitive necessity as no company can be expected to develop all the necessary knowledge inside the firm (Leonard-Barton, 1995). Knowledge acquisition can be seen as representing a flow of knowledge from external stocks of knowledge into the firm. Knowledge acquisition is often not a straightforward task, among other things, due to the nature of knowledge (Van Gils and Zwart, 2004; Szulanski, 1996) as well as the relationship between the sender and receiver of the knowledge in question (Szulanski, 1996). Finally, the acquirer can also lack a sufficient level of absorptive capacity thereby inhibiting the acquisition process (Szulanski, 1996; Cohen and Levithal, 1990). It can be expected that absorption of unrelated knowledge will require more effort because the receiving organization lacks absorptive capacity (Cohen and Levithal, 1990; Zahra and George, 2002). As such, the absorption of new knowledge from external sources can also create opportunities for new knowledge creation in the firm because the firm will need to develop the knowledge necessary to embrace the new external knowledge. Knowledge creation or acquisition in isolation is not a sufficient condition deriving value from new knowledge. Knowledge creation needs to be supplemented by other key knowledge management activities manipulating the created knowledge

Even though the importance of tacit knowledge has been emphasized as a major source of new knowledge and innovation, the full potential of new knowledge can only be realized through articulation and capture because these activities are necessary if knowledge is going to be transferred (Boisot, 1998) or made available to other parts of the organization (Zollo and Winter, 2002). Furthermore, Boisot (1998) has asserted that articulating and codifying knowledge is central in connection with realizing the full value creating potential of the knowledge. The proper level of articulation and capture can be discussed as a high level of knowledge articulation makes it easier to transfer knowledge to the potential users in the organization. However, if knowledge is codified it can also, with ease, be transferred to other organizations thereby quickly eliminating any competitive advantage emerging from the application of the knowledge (Boisot, 1998). Finally, knowledge capture is also seen to encompass activities aimed at identifying and describing the knowledge resources in the company thereby producing meta-knowledge – that is knowledge about what is known in the organization and by who, but without articulating the knowledge itself. This form of knowledge articulation is often the result of knowledge mapping and capturing processes. As such, the knowledge capture will normally result in knowledge being moved from the individual or group level to the organizational level as well as being described (Hansen et. al., 1999).

A key challenge in connection with knowledge capture is to secure the capture of relevant, reliable, and valuable knowledge as not all knowledge can be expected to be relevant and valuable. Therefore, knowledge capture will also include some kind of evaluation of the knowledge to be captured. However, this paper will not address the actual evaluation of knowledge in any detail, but the author will maintain that it is an important task that needs to be given attention. Knowledge capture is necessary if the created knowledge is going to be included in the stock of knowledge and knowledge capture can be a way of overcoming the problems of sticky organizational knowledge (Szulanski, 2003). However, it should be noted that knowledge capture can include both knowledge personalization and codification strategies (Hansen et. al., 1999). Knowledge personalization entails reliance on the development of meta-knowledge typically in the form of “who knows what” in the organization. In this situation the stock of knowledge will contain meta-knowledge. The knowledge codification strategy relies on the careful codification and storage of

knowledge in the firm. Here the stock of knowledge will contain, e.g. blueprints, descriptions of operation procedures and so forth (Hansen et. al., 1999). As such, knowledge capture does not necessarily lead to full knowledge articulation if the knowledge personalization strategy is chosen. The result of knowledge capture is the inclusion of the knowledge into the firms stock of knowledge.

4.3.1.2 Knowledge Distribution

Second key knowledge management capability is capability of distributing knowledge to the focal unit in the organization. The focal unit is the organizational unit where the knowledge is needed. Knowledge distribution includes the activities of knowledge assembly and sharing.

A key knowledge management capability is to identify and assemble the necessary knowledge-based resources as the innovations of the firm will rest on several knowledge-based resources. Knowledge assembly is a key process in connection with development or renewal of an organizational capability as this activity includes the staging and assembly of the resources and knowledge-based resources that are going to be integrated in the pursuit of an organizational capability. Knowledge assembly can be seen as the deliberate activities in the firm aimed at locating, evaluating, selecting and activating the knowledge resources necessary for developing and delivering a new product, service or developing an organizational capability. Knowledge assembly deals with assembling the needed complementary knowledge resources needed for a successful commercialization of the product (Teece, 1986). Knowledge assembly can also create awareness in the firm about the need to develop new organizational knowledge and it can therefore be the input that triggers knowledge creation as the assembly activities can also lead to the identification of voids in the knowledge resources of the firm.

Without knowledge sharing the firm cannot be expected to reap the full competitive advantages from its investments in knowledge creation and capture (Argote and Ingram, 2004). Knowledge sharing has two different outcomes. Firstly, knowledge sharing and transfer is associated with transferring captured knowledge emerging from the knowledge creating activities directly into to the knowledge integration activities in the company. This is the case when the knowledge is created in response to a specific request or demand. Secondly, new knowledge can be transferred from

the stock of knowledge in firm to knowledge integration activities. This is the case when already known organizational knowledge is being activated through knowledge assembly. Knowledge sharing therefore involves transfer of knowledge between different entities in the organization. IT systems can provide great assistance in finding and retrieving knowledge; the knowledge map can also be kept in such a system allowing its computer assisted use. The second possibility is search for relevant knowledge in an electronically realized knowledge repository. However, knowledge sharing is not a straightforward task as illustrated by Szulanski's finding that often knowledge will be "sticky", limiting its transferability. Szulanski (1996) found that knowledge sharing is inhibited by three major factors; lack of absorptive capacity of the recipient, causal ambiguity concerning the knowledge itself, and an arduous relationship between the sender and the recipient. Szulanski also found that motivational factors only played a minor role in connection with the transferability of knowledge. The findings from Szulanski indicate that successful knowledge sharing requires more than just transferring knowledge between the sender and the receiver. Therefore, a key challenge is to facilitate effective knowledge sharing in the organization, e.g. through the formation of absorptive capacity and a culture that supports knowledge sharing.

4.3.1.3 Knowledge Use

Knowledge use capability is necessary for utilization the usage of knowledge where knowledge shall be applied through leveraging it or exploiting it. Knowledge use includes knowledge leverage and knowledge exploitation activities.

Knowledge use, knowledge leverage entails the search for new ways to exploit the integrated knowledge-based resources of the firm in as many ways and in as many competitive arenas as possible (Hamel and Prahalad, 1994; Wang and Ahmed, 2004). Research has demonstrated that the creation of new customer value using the existing knowledge bases of the firm is a significant source of innovation and competitive advantage in many industries (Kim and Mauborgne, 1999, 2004). The activities of knowledge leverage can also include the establishment of strategic alliances in order to combine resources and forces with other companies (Van Gils and Zwart, 2004).

The performance of a firm is dependent on the ability to exploit its integrated knowledge resources in order to create and deliver products and services to its

customers utilizing its organizational capabilities. Knowledge exploitation includes the activities of utilizing the organizational capabilities by embedding the knowledge in a salable product or service, reproducing it, and releasing it to the market. The knowledge-based theory of the firm posits that the major source of competitiveness rest in the ability to apply knowledge and not in the ability to create new knowledge perse (Grant, 1996). No firm can survive in the long run unless the knowledge it creates is exploited in one way or the other. Knowledge exploitation can also be a source of new knowledge in itself as the exploitation of knowledge in the marketplace or in organizational processes will create experiences that lead to the formation of new knowledge.

4.3.2 Idea Management and Innovation Process Capability

Innovation comprises product and process development, the production itself as well as the successful exploitation of new ideas (Specht et al., 2002; Rogers, 1998). Innovation occurs in the development of new scientific approaches and theories (scientific domain) and in enhancing the business processes (new production models, new marketing campaigns). Independent of the application domain, innovation is a knowledge-intensive process, where knowledge of different types is applied and created in the various activities of the process. In the INNOVANET project a six phase model describing the innovation process as well as a related Innovation Knowledge Life Cycle have been developed as a conceptual basis for the development of an R&D Roadmap on Innovation Support.

INNOVANET is an EU funded accompanying measures project aims at examining the state of the art as well as promising future directions in effective innovation support. Special focus in this project is on Information and Knowledge Technologies. INNOVANET will provide a Science & Technology roadmap that aligns technological capabilities with true business needs of key knowledge intensive industries and identifies emerging research areas that contribute to the vision of improved systematic innovation and scientific discovery support.

Considering the wide variety of possible innovation forms and application domains, generalizations are difficult. However, on an abstract level it is possible to identify six basic phases. They can be described in the innovation process model whose phases are common to most innovation processes. These phases are: Problem

identification phase, ideation phase, approach development phase, operationalization phase and exploitation phase.

The identified problem is considered as the starting point for the innovation process. Systematically, two forms can be distinguished: Proactive forms (trend setting, recognition of market opportunity, need creation, identification of research opportunity) and Reactive forms (open problem in production or processes, changed requirements, reaction to changed environments) (Pérez-Bustamente, 1999).

The type of problem and context determine the choice of an adequate form to describe a problem. If innovation, for example, is done in a team more explicit forms of problem description are required. Validation checks the adequacy of the description with respect to the targeted problem as well as the novelty of the problem. Further, a first estimation about the feasibility and the relevance of the problem has to be conducted to reduce the risk of investing resources into further steps of the innovation process.

Developing the central idea for the innovation, the ideation phase is in the core of the innovation process. There are several systematic ways to discover ideas for the solving of the problem like analogy, data mining, paradigm shift and luck. They all involve the exploration and/or selection of related knowledge and the focus on relevant knowledge. The exploration can include the search for similar problems, solutions to similar problems, applicable theories or practices, etc. The idea has to be formalized and described so that it can be negotiated and submitted to a validation process against different factors like adequacy for the problem, novelty and feasibility.

Approach Development is the first step towards solidifying the idea towards an implemented solution by a formal description. In addition, a conceptual model for the implementation may be developed, which describes the planned operationalization of the approach on a conceptual level. This phase takes two knowledge objects as input, the problem description and the description of the idea. The first set of activities in this phase involves the identification of a useful approach for conceptually describing the implementation of the idea. This involves exploration, selection, application and creation of related knowledge in terms of approach, conceptual model, and formalisms for the description of both. Both the approach and the conceptual model

have to be validated, like for adequacy, novelty, and feasibility of operationalization before the whole approach can be considered a valid input for the operationalization phase.

In Operationalization the developed approach is transferred into an operational form. The kind of operationalization depends highly on the application area. For software this means implementation. In product development this may be building a first prototype. In each case, operationalization is quite resource consuming making the validation in the preceding approach development phase a crucial activity. The validation activity in Operationalization checks the adequacy of the operationalization with respect to the approach/conceptual model. The operationalization itself as well as the validation activity also tests feasibility of the developed approach with respect to production and other forms of exploitation.

In addition to the validation activities in each phase there is also a separate evaluation phase that evaluates the results produced during the innovation process. In order to assure representativeness and validity of the evaluation results for the application context, the evaluation requires careful planning and a targeted design of experiments and analysis. The choice of evaluation criteria and methods depends on the type of the innovation results and the intended application area. Possible criteria are usability, user satisfaction, performance with respect to efficiency or effectiveness, etc.

Exploitation is an integral part of innovation. This does not have to be commercialization, although this is the most important form. The invention can also be integrated into a product or system for its improvement. Exploitation may also mean changing existing business or production processes according to innovation results in order to achieve better or more cost-effective performance. In the scientific area, innovations can also be exploited by disseminating the ideas via publication.

Another common structure for commercialization of innovation commonly described in the literature is corporate venturing. In fact, corporate venturing is often explicitly mentioned in definitions of 'corporate entrepreneurship'. For example, in synthesizing the extant literature and producing comprehensive definitions for many innovation-related terms, Sharma and Chrisman (1999) define corporate entrepreneurship as both strategic renewal and corporate venturing efforts Likewise

Jennings (1994) defines corporate entrepreneurship as product and/or market development achieved via organizational innovation, organizational structure or corporate venturing.

Corporate venturing is the process by which innovation outcomes are transformed into new businesses and, by doing so, allowing companies to develop competencies not available in existing mainstream businesses (Burgelman, 1984). Corporate venturing is often managed as a separate, autonomous division within an organization. Indeed, having separate units is often recommended especially when the ventures are based on radically different technologies thus helping to eliminate conflicts with existing units (Zahra et al., 1995).

4.3.3 Technology Management Capability

The literature highlights that the management of both technological and technical aspects of products, processes and services is critical for effective innovation performance (Atuahene-Gim, 1996; Bower and Christensen, 1995; Christensen, 1997; Drucker, 1985; Foster, 1986; Radnor, 1986). These are commonly represented in the literature as research and development (R&D) and information technology (IT), and technical, financial or engineering competencies. The effective deployment of such technological resources helps to build sustainable competitive advantage, which in turn leads to enhanced financial performance (Porter, 1985). The management of the technical aspects of organizations that are not considered 'high technology' (often service organizations, for example) is also considered to be technology management. 'Technology' is often described in the literature as the means adopted by an organization of converting ideas, material and labour into goods or services (Chesbrough, 2003; Miles and Snow, 1978). Granstrand (1999) defines technology as a special kind of knowledge whose particular characteristics include it being linked with artifacts (e.g. material, products), with science and a practical purpose, as well as it having a high degree of code-ability (e.g. formulae, drawings, models etc). In this sense, the mathematical formula that guides a financial services product is a piece of technology in the same way that the design of an automotive might be. This is consistent with other descriptions in the literature of technology having both a 'hardware' aspect, the material or physical object, and a 'software' aspect, consisting of the information base for the instrument (Rogers, 2003). Firm performance can benefit from the creation and commercialisation of technology (Zahra et al., 1995),

however there should be alignment between the business strategy and the technology strategy (Zahra and Covin, 1993). When such alignment is achieved, an organization can capitalize on its technological investments and capabilities to create competitive advantage. Conversely, focus on technological competencies to the exclusion of market and business strategies, can result in ‘technological myopia’ and inferior financial performance (Zahra and Covin, 1993).

In a study of successful Japanese innovating firms, Granstrand (1999) highlights their technology management as consisting of ‘acquisition’ strategies that consider various options including internal R&D, acquisition of technological companies, joint ventures and collaboration, purchasing licenses, technology scanning (for example, competitor intelligence), as well as ‘exploitation’ strategies that consider internal exploitation (for example, product and process innovation), creation of firms, joint ventures, technology selling or licensing.

More specifically, Granstrand (1999) highlights several common features of successful technology strategies including: synergistic product/technology diversification - utilising technologies in multiple ways to take advantage of economies of scale and scope and speeding technological transfer and commercialization; ‘speed to market’ through exploratory R&D, incremental learning, concurrent engineering (overlapping both the stages and functions of a commercialization process, as well as the development of subsequent product generations), sense of urgency, global marketing; and ‘speed to technology’ through technology scanning, experimentation, acquisition, central R&D, internal and external technology transfer and communication.

Technology transfer is the process by which “technological innovations are exchanged between individuals and organizations, such as those who conduct R&D on one hand, and those who put technological innovations into use on the other hand” and can include both hardware objects and information: “because technology is essentially knowledge, ‘transfer’ is essentially communication of that knowledge (and its subsequent use) from developers to implementers” (Van de Ven and Rogers, 1988).

Christensen (1997) differentiates between sustaining technologies that “foster improved product performance” and disruptive technologies which lead to products

that are “...typically cheaper, simpler, smaller and frequently more convenient to use.” Foster (1986) stresses the importance in implementing the right strategic choices manifesting in “...100% and 500% differences in technical productivity between competitors because one made the right technological choice and the other did not.”

4.3.4 Disruptive Innovation Management

Disruptive innovations “change the game”. They attack an existing business, and offer great opportunities for new profit growth. Only radical innovations lead to growth. Lettice and Thomond (2002) define disruptive innovation as: “A successfully exploited product, service or business model that significantly transforms the demand and needs of an existing market and disrupts its former key players”. Damanpour (1996) defines it as “. . . those that produce fundamental changes in the activities of an organization and represent a large departure from existing practices”, and Leifer et al. (2001): “A radical innovation is a product, process or service with either unprecedented performance features or familiar features that offers significant improvements in performance or cost that transform existing markets or create new ones. Brown (2003) considers disruptive innovation as something that changes social practices, the way we live, work and learn. It requires breaking conceptual frameworks, reframing the problem and going to the very roots of it.

Rice et al. (1988) outlined the following unique characteristics of radical innovations that impact their management:

- Long-term (typically ten years or longer);
- Highly uncertain, unpredictable;
- Sporadic, with many stops and starts, deaths and revivals;
- Non-linear; e.g., idea generation is not only a front-end activity but occurs throughout the process;
- Stochastic-key players come and go, priorities change, exogenous events are critical;
- Contextdependent-history, e.g., experience, corporate culture, personalities, and informal networks are important; and

- An extended front end to the stage-gate process, with extensive exploring and experimenting, probing and learning rather than targeting and developing.

The more radical the innovation, the more difficult it is to estimate its market acceptance and potential. The increasing complexity and market dynamics create a substantial knowledge gap between theory and practice. Many companies are not organized to give new ideas a chance, to recognize trend breaking points in the market, to adapt quickly to changing market circumstances, or to cause market changes in the first place.

Christensen (1997) gives several explanations as to why organizations incumbent in markets based on established technologies have difficulty in initiating disruptive changes. These reasons include: organizations being dependant upon existing customers and investors for resources and thereby potentially overlooking new, emerging technologies from non-traditional competitors; new technologies initially generating only small markets that don't solve the growth needs of large, established companies; and as the ultimate use of new technologies is not known in advance, traditional market analysis and forecasts are not appropriate as these markets don't yet exist.

A characteristic of these radical innovation projects is the methods undertaken to test market potential. More traditional market research methods such as written surveys, focus groups, or concept tests were changed for more experimental (rather than analytical), hands-on approaches designed for market learning more than market evaluation and a reliance on past experience to assess the value of the technology to the market (Rice et al., 1998). Such methods included the use of simple, early prototypes to aid in gaining support internally, involving potential future customers or 'lead users' over extended trial periods, and presentation of data at professional conferences to gauge community and potential customer interest (von Hippel, 1986).

Rice et al. (1998) also highlight differences in organizational structures based on the degree of innovation. They point out that radical innovation seem s to work best, especially in the highly uncertain 'fuzzy front end' of the process, when it is separated from ongoing business activities. They explain this as resulting from the conflict in goals within an operating unit, whose focus is typically on short-term

profitability , in contrast to the longer-term, uncertain benefits but immediate cost impact of radical innovation projects.

4.3.5 Intellectual Property Management

The management of intellectual property ('IP'), that is, intangible assets that can be legally protected, is another important element of the corporate innovation and entrepreneurship literature (Adler et al. 1992; Dunn and Baker, 2003; Elton et al., 2002; Granstrand, 1999; Kline and Rivette, 2000; Lev, 2002; Sullivan, 2000).

Intellectual property consists of patents, copyrights, trademarks, licenses, designs, artistic works and trade secrets (Sullivan, 2000), and traditionally has been considered as a process extending from generation of the intellectual property, followed by obtaining legal protection, maintaining the protection through to finally its disposal or expiration. More recently, however, researchers have observed that entrepreneurial organizations go beyond generating and protecting intellectual property and extend into exploiting this as additional sources of revenue (Elton et al., 2002).

Indeed, Chesbrough (2003) argues companies should be both active buyers and sellers of IP and that few organizations take full commercial advantage of their own IP beyond using it in their own business.

The use of intellectual property to create competitive advantage can occur through various means. Granstrand (1999) describes several examples including using patents as a marketing instrument to demonstrate technical superiority, preventing imitation by competitors by keeping the product or process technology secret (a 'trade secret') or using patent protection to effectively create a temporary monopoly situation. In addition, advantage might be created by licensing the technology to other producers Kline and Rivette (2000) suggest that companies can use their intellectual property to improve performance "...by establishing a proprietary market advantage, improving financial performance, and by enhancing overall competitiveness." Along with the protection of traditional intangible assets via product patents and the like, they discuss efforts by some corporations to protect business models as well as stressing the importance of strategically managing intellectual property.

The literature in economics and management on IP strategies is generally limited and is typically given from a legal rather than a management perspective (Granstrand,

1999). Granstrand (1999) stresses the importance of the IP strategy being aligned with technology and corporate strategies, and describes various defensive and offensive strategic approaches to IP including: patenting to block competitors from pursuing certain research directions ('fencing') or patenting over the life cycle of a product from the basic technology, to the product itself, to the production process.

4.4 Human Based Capabilities

The second category of innovation capability enablers to be discussed is the 'human based capabilities' category. Human capital is the foundation of intellectual capital perspective, a primary element to perform intellectual capital's functions. It refers to such factors as employees' knowledge, skill, capability, and attitudes in relation to fostering performances which customers are willing to pay for and the company's profit comes from. In addition, such knowledge and skill are contained in the employee's head, i.e. the head is the carrier of knowledge and skill. If an intellectual employee does not serve the company, the knowledge and skill in his/her head cannot be activated, let alone converted into market value.

Human based capabilities may be considered as the brainpower of employees that is useful to the enterprise, or the capabilities that provide solutions to customers. Human capability is the enabler of innovation through individual capabilities, knowledge, skills, experience and problem-solving abilities of the people in an enterprise. Human capabilities grow in two ways: • when the enterprise uses more of what people know, and when more people know more things useful to the enterprise.

Roos et. al. (1997) describe human capital as the soul of the organization. According to Bontis (1998) it is the individual tacit knowledge that exists in the organization. Hudson (in Bontis, 1998) describes human capital as the combination of four factors at an individual level:

- Genetic inheritance
- Education
- Experience
- Attitudes to life and business.

Bontis et.al. (1999) goes further and identifies three types of resources:

- Competencies based on skills and knowledge
- Attitudes as reflected in the motivational level within the enterprise and the management's quality of leadership
- Intellectual agility as the ability of people in the firm to innovate, adapt and cross-fertilize.

Bontis (1998) also sees human based capabilities as a source of innovation and strategic renewal and says that the essence of human capital lies in the sheer intelligence and ingenuity of staff members. Using more of what people know requires minimizing mindless tasks and bureaucracy.

Opportunities should be created for making private knowledge public and tacit knowledge explicit. Informal as well as electronic networks, relationships, forums and communities of practice are all important in eliciting what people know and putting it to work within the organization. Getting more people to know more things that are useful to the organization involves finding and enhancing those talents that are assets and not just low-level skills.

Sullivan (2000) describes human based capability as know-how, skills, experience and institutional memory about topics of importance to the enterprise. It is the capability to develop solutions to customers' problems and creates value for the organization through the application of available knowledge and skills in order to create products and services for them.

Hines (2000) also agrees with these definitions by defining human capital as the combined knowledge, skills, innovativeness and ability of the organizations individual employees to meet the task at hand. This will include intangibles such as the organization's values, culture and philosophy. Human based capabilities have an important influence on the development and exploitation of the structural and relationship capabilities of the firm.

The sub areas reviewed in this category are listed as:

- Visionary Capability of Senior Management
- Cultural and Climatic Capability of Organization
 - Communication

- Behaviors
- Rewarding and Recognition
- Autonomy and Empowerment
- Organizational Leadership
- Recruitment and Training

4.4.1 Visionary Capability of Senior Management

The importance of taking a strategic approach to innovation has been described in the literature (Kanter, 1985; Kuratko, 1993). Strategic entrepreneurship has been described as integrating the entrepreneurial (i.e., opportunity-seeking actions) and the strategic (i.e., advantage-seeking actions) to create wealth (Hitt et al., 2001). Organizations have been described as ‘innovators’ when, rather than endeavoring to adapt to the environment, they instead avoid much of the competition by operating in relatively unexploited areas of the market (Miller and Friesen, 1978). Other similar descriptors have been used to describe such firms, for example, Miles and Snow’s (1978) ‘prospectors’ and Mintzberg and Water’s (1985) ‘entrepreneurial firms’.

An innovation strategic plan outlines the development path along which key capabilities will evolve, translates the mission and objectives into short- and long-term goals and allocates resources (Adler et al., 1992). In addition, it may suggest multiple areas that innovation or technology strategies can focus on including defining a mix of basic research, applied research and development, emphasizing product or process innovation, distinguishing between incremental and radical innovation (Adler et al., 1992), and indeed, whether to innovate or imitate (Higgins, 1995). Miles et al. (2000) likewise suggest management make strategic decisions on whether to pursue primarily product versus process innovation.

Much of the research on the strategic management of innovation has concentrated on organizations that have pursued product innovation strategies (Cooper, 1990; Mahajan et al., 1990; Tufano, 1992; Urban et al., 1997). This overlooks other aspects organizational innovation, such as administrative or process innovations, that have less obvious but at least as important potential benefits as product innovation. Indeed such innovations may be of greater value to organizations, as “...process and

organizational innovations are less visible to competitors and therefore more difficult to imitate” (Zahra, 1993).

The link between an organization’s innovation strategy and vision is also discussed in the literature. Miles et al. (2000) point out the need for the strategy to be aligned to an overall organizational objective or vision. They argue that a strategic vision should be communicated by senior management that covers both content (e.g., the scope of the firm’s efforts) and the processes necessary to achieve this (e.g., the entrepreneurial actions and the means to promote such actions). Alexander (1989) argues that high performing organizations require a clearly communicated organizational vision. Efforts that are aligned to an organization’s vision and strategy are more likely to achieve success as they are seen as a means of actualising an organization’s mission. Van de Ven (1986) argues that effective leadership is critical in creating a cultural context that supports innovation as well as the strategies, structure and systems that facilitate innovation.

An innovation strategy is a strategy that promotes the development and implementation of new products and services (Robbins, 1996). Covey (1993) claims that the origin of creativity and innovation lies in a shared vision and mission, which are focused on the future. Furthermore, the vision and mission of a creative and innovative organization are also customer- and market-oriented, focusing on solving customers' problems among other things.

An example of a vision that emphasizes creative and innovative behavior is: “Our company will innovate endlessly to create new and valuable products and services and to improve our methods of producing them” (Lock and Kirkpatrick, 1995).

It is also important that employees should understand the vision and mission (which support creativity and innovation) and the gap between the current situation and the vision and mission to be able to act creatively and innovatively. Judge et al. (1997) describe successful innovation as chaos within guidelines; in other words top management prescribes a set of strategic goals, but allows personnel great freedom within the context of the goals.

Organizational goals and objectives reflect the priorities and values of organizations and as a result may promote or hinder innovation (Arad et al., 1997). Hall (cited in Arad et al., 1997) found that personal and organizational goals that emphasize

quality rather than effectiveness improve the levels of innovation. It appears that reflecting the value of purposefulness in the goals and objectives of organizations has an influence on creativity and innovation. Arad et al. (1997) mentions that, apart from a few research studies, sufficient research about the effects of organizational and individual goals and objectives has not yet been done.

4.4.2 Cultural and Climatic Capability of Organization

Closely allied to the concept of climate is culture. Culture is the pattern of arrangement or behavior adopted by a group. Organizational culture refers to deeply held beliefs and values. Culture is therefore, in a sense, a reflection of climate, but operates at a deeper level. Whereas climate is observable in the practices and policies of the organization, the beliefs and values of culture are not visible at that level but exist as cognitive schema which governs behavior and actions.

Day (1994) suggests that market orientation is a cultural element of organizations that can enhance business performance. He observes that, “a market-driven culture supports the value of thorough market intelligence and the necessity of functionally coordinated action directed at gaining a competitive advantage.” Slater (1997) connects a strong market orientation to innovation, highlighting that “successful innovation is the product of a market oriented culture coupled with entrepreneurial values.”

4.4.2.1 Communication

An organizational culture that supports open and transparent communication, based on trust, will have a positive influence on promoting creativity and innovation (Barret, 1997; Robbins, 1996). Teaching personnel that disagreement is acceptable, since it offers the opportunity to expose paradoxes, conflict and dilemmas, can promote openness in communication. At the same time personnel must feel emotionally safe to be able to act creatively and innovatively and should therefore be able to trust one another, which in turn is promoted by open communication. An open-door communication policy, including open communication between individuals, teams and departments to gain new perspectives, is therefore necessary to create a culture supportive of creativity and innovation (Filipczak, 1997; Frohman and Pascarella, 1990; Samaha, 1996).

4.4.2.2 Behaviors

Values and norms that encourage innovation manifest themselves in specific behavioral forms that promote or inhibit creativity and innovation. The way in which mistakes are handled in organizations will determine whether personnel feel free to act creatively and innovatively. Mistakes can be ignored, covered up, used to punish someone or perceived as a learning opportunity (Brodtrick, 1997). Tolerance of mistakes is an essential element in the development of an organizational culture that promotes creativity and innovation. Successful organizations reward success and acknowledge or celebrate failures, for example, by creating opportunities to openly discuss and learn from mistakes (Ryan, 1996; Tushman and O'Reilly, 1997). An organizational culture in which personnel are encouraged to generate new ideas, without being harmed, and where the focus is on what is supported instead of on what is not viable, should encourage creativity and innovation (Filipczak, 1997). Fair evaluation of ideas will also support and encourage creativity (Amabile, 1995). Several authors; Arad et al. (1997), Lock and Kirkpatrick (1995) and Samaha (1996) indicate that an organizational culture that supports a continuous learning orientation should encourage creativity and innovation. By focusing on being inquisitive, encouraging personnel to talk to one another (e.g. to clients within and outside the organization to learn from them), keeping knowledge and skills up to date and learning creative thinking skills, a learning culture can be created and maintained. Taking risks and experimenting are behaviors that are associated with creativity and innovation. A culture in which too many management controls are applied will inhibit risk taking and consequently creativity and innovation (Judge et al., 1997). The assumption that risks may be taken as long as they do not harm the organization will not encourage personnel to be creative and innovative by experimenting and taking risks (Filipczak, 1997).

It is important that a balance should be reached in the degree to which risk taking is allowed. This can be achieved by spelling out expected results, assigning the responsibility of monitoring and measuring risk taking to someone in the organization, creating a tolerant atmosphere in which mistakes are accepted as part of taking the initiative, regarding mistakes as learning experiences, and assuming that there is a fair chance of risks being successful. Research by NyÈstrom (1990) indicates that the most creative and innovative departments in an organization regard

competitiveness as an important aspect of their culture. According to Read (1996), competitiveness in organizations has shifted to the creation and assimilation of knowledge. In creating a culture of competitiveness managers should reach out to internal and external knowledge, encourage debating of ideas, create an environment in which constructive conflict will lead to information flow, support projects based on information flow and actively manage the choice of organizational design. Support for change is a value that will influence creativity and innovation positively (Arad et al., 1997; Eyton, 1996; Glor, 1997; Johnson, 1996; Tushman and O'Reilly, 1997). Managers can create a culture that supports change by looking for new and improved ways of working, creating a vision that emphasizes change and revealing a positive attitude towards change (Arad et al., 1997; Tushman and O'Reilly, 1997). An example of a culture in which change is supported is to expect personnel, when stating their annual objectives for the year, to indicate how they intend changing their work methods. Tolerance of conflict and handling conflict constructively are values that support creative and innovative behavior in organizations (Mumford et al., 1997; Robbins, 1997; Judge et al., 1997). When there is conflict between different ideas, perceptions and ways in which information is processed and evaluated, the process of handling conflict should be handled constructively to promote creativity and innovation. Understanding different individual thinking styles and training personnel in the process of constructive confrontation will create a culture supportive of creativity and innovation.

Managed risk taking and failure tolerance is a common theme within the cultural aspects of innovation research (Farson and Keyes, 2002). The importance of organizations creating a culture where managed risk taking is supported and new ideas are explored is highlighted (Howell and Higgins, 1990), as is having a culture that promotes 'controlled experimentation' to test new ideas rapidly (Huber, 1984; Peters and Waterman, 1982). Jennings and Lumpkin (1989) compared entrepreneurial and conservative financial service firms for a number of variables and their findings showed that the former differ significantly from the latter in displaying participative decision making, higher reliance on specialized personnel, participative construction of performance objectives and in providing rewards for risk taking and failure tolerance.

4.4.2.3 Rewarding and Recognition

Another theme relating to the management of people is the use of incentive mechanisms to stimulate entrepreneurial behavior (Christiansen, 2000; Day et al., 2002; Jennings and Lumpkin, 1989; Miles et al., 2000; Pinchot and Pellman, 1999). The traditional organization doesn't typically reward or even encourage entrepreneurial behavior (Miles et al., 2000). Reward and recognition initiatives generally focus on current performance because measurement of the tasks that drive it - the exploitation of existing competencies- is much easier than measuring the exploratory nature of innovative activities that contribute to future growth (Day et al., 2002). This is despite the reluctance of individuals to share tacit knowledge required for innovation without suitable incentive structures (Leonard and Sensiper, 2002).

Behavior that is rewarded reflects the values of an organization. If creative behavior is rewarded, it will become the general, dominant way of behaving (Arad et al., 1997). The problem is that many organizations hope that personnel will think more creatively and take risks, but they are rewarded for well-proven, trusted methods and fault-free work. Personnel should also be rewarded for risk taking, experimenting and generating ideas. Intrinsic rewards like increased autonomy and improved opportunities for personal and professional growth may support the innovation process (Shattow, 1996; Amabile and Gryskiewicz 1987). It is also important to reward individuals as well as teams (Tushman and O'Reilly, 1997). Management should be sensitive to which methods of reward and recognition will inspire personnel in their specific organization to be more creative and innovative (Tushman and O'Reilly, 1997). An organizational culture that promotes creativity and innovation should allow employees time to think creatively and experiment (Shattow, 1996). In organizations where creativity and innovation are encouraged, personnel are, for example, allowed to spend 15 percent of their time on generating new ideas and working on their favorite projects. Emphasis on productivity and downsizing, which leads to more pressure on employees to work harder, is not conducive to creativity and innovation in organization (Filipczak, 1997).

4.4.2.4 Autonomy and Empowerment

The concept of empowerment of individuals within the entrepreneurial organization has also been often researched (Burpitt and Bigoness, 1997; Hurt and Teigen, 1997; Walton, 1985; Zien and Buckler, 1997). The most important aspect for organizations in developing an entrepreneurial capacity is that workers at all levels of the organization must have the opportunity and freedom to utilize these capacities and that "...this freedom of opportunity must be pushed well down into the organization" (Miles et al., 2000).

Freedom as a core value in stimulating creativity and innovation is manifested in autonomy, empowerment and decision making. This implies that personnel are free to achieve their goals in an automatic and creative way within guidelines described as "chaos within guidelines" by Judge et al. (1997). Personnel therefore have the freedom to do their work and determine procedures as they see fit within the guidelines provided. Management should also believe in personnel and encourage them to be more creative by allowing them more freedom, in other words empowering them instead of controlling them (Judge et al., 1997). The literature study revealed that the degree to which employees have freedom and authority to participate in decision making in solving problems determines the level of empowerment, which is positively related to the level of creativity and innovation in an organization (Arad et al., 1997). The speed of decision making can also promote or inhibit creativity and innovation. Tushman and O'Reilly (1997) claim that cultural norms which lead to quick decision making (e.g. that speed is important and that the work rate is fast) should promote the implementation of innovation.

4.4.2.5 Organizational Leadership

It has been argued that little innovation can occur without a visionary leader who is able to overcome internal and external obstacles and be prepared to accept responsibility for failure (Morris and Sexton, 1996). Various entrepreneurial aspects have been suggested as being important for leaders including promoting an entrepreneurial capability, encouraging the development of innovations that might threaten the firm's current business model, keeping the organization's boundaries broad enough to encompass promising opportunities, being prepared to question the

current dominant logic focus and linking entrepreneurship and strategy (Covin and Slevin, 2002).

Howell (2005) states that 90 per cent of raw ideas never go beyond the idea-generator's desk. Only 3 per cent of the remaining 10 per cent obtain sufficient backing to become projects with less than 1 per cent being commercially launched. She argues that one reason for the high failure rate of new ideas is their failure to attract a champion. Dedicated champions, Howell states, are pivotal to innovation success and thus must be supported in their efforts and integrated into the mainstream of organizational activity. Glynn (1996) points to the existence of "innovation champions" who have the social, political or interpersonal knowledge to influence the acceptance of innovative change. Championing innovation must become a norm in organizations and not an episodic event that relies on happenstance and a strong-minded individual expending large amounts of effort.

There has also been significant research into the role that 'champions' play in promoting innovation within the organization by displaying a range of characteristics and behaviors including technical competence, knowledge of the market, drive and aggressiveness, influence and political astuteness, risk taking and innovativeness and the like (Chakrabarti, 1974; Hauschildt and Kirchmann, 2001; Howell and Higgins, 1990; Maidique, 1980). Rice et al. (1998) describe the initial recognition of an opportunity as a creative, cognitive act that requires linking disparate bits of information together. They observed that it was first-line managers rather than senior managers who recognized such opportunities. This necessitated the need for champions such as technical champions, project champions, senior management champions, and business unit champions for giving early validation to the value of the technology, overcoming internal resistance and providing access to scarce resources.

4.4.2.6 Recruitment and Training Capability

A primary characteristic of innovative companies is that they "love talent and know where to find it", and they typically put much thought and effort into the recruitment process. Fostering group cohesiveness requires paying attention to the recruitment process to ensure social "fit" beyond technical expertise, and also about carefully integrating new individuals through a well-designed socialization program. There are

at least three useful guidelines that leaders can draw on when it comes to recruiting and motivating creative talent:

1. Hire individuals with a range of abilities and interests (what they like to call “bandwidth” at Microsoft).
2. Hire people with a variety of backgrounds and personalities.
3. Involve peers heavily in the selection process.

Innovation may be a key to success, but advanced worker skills are often seen to be essential to innovation. Training is the primary method used by firms to improve skill levels. Baldwin and Johnson (1996) confirm the close connection between training, labor skills, and innovation. Using the survey on growing small and medium-sized enterprises, several different innovator types of firms are identified—comprehensive innovators, those making use of both inside and outside sources for their innovations, those focusing on R&D, and those relying on outsiders for innovation. When comprehensive innovators are divided into quartiles on the basis of their innovativeness, some 80% of firms in the top quartile are found to have a training program; only 36% of the bottom quartile have one. More-innovative firms in both goods and services are more likely to upgrade worker skills with training programs.

4.5 Relationship Capabilities

The last category of innovation capability enablers to be discussed is the ‘relationship capabilities’ category. The role of network capabilities in innovation orientation of the firms gained the importance from the end of 70’s when the questions arose as to whether to support the research process and production in-house or to buy from the outside (Rosenberg, 1990). Eventually innovation orientation has been focused on customer needs and has the potential to create new markets and affect the customers’ behavior. The inevitable changes in customer needs and wants and the existence of the time lag in the product/service development process and its release resulted in the stronger focus on collaboration, cooperation in networks to yield competitive advantage. According to Allee (1998a), relationship capital is made up of business relationships, customers, suppliers and strategic

partners - and is measured in the breadth, depth and quality of those relationships. It also includes brand recognition and goodwill.

Bontis (1998) says the essence of relationship capital consists of the knowledge imbedded in the relationships external to the firm. It also consists of available marketing channels and the relationship with external stakeholders such as suppliers, customers, alliances, local communities, industry associates, shareholders and others. Relationship capital therefore contributes to the market and customer orientation of the organization. An externally orientated capability of gathering intelligence, which enhances the flow of knowledge in the organization through formal processes and systems and informal tacit knowledge-based processes, forms the basis of relationship capital. These tacit knowledge processes assist employees and managers to gather and distribute information. External information sources form the basis for stimulating internal innovation related to the development of products and services for customers (Bontis, 1999). Internal relationships focus on the creation of value, and external relationships are concerned with the extraction of value (Sullivan, 2000). There is some congruence here with Sveiby's Intangible Assets Monitor, where the external structure indicators deal largely with measures of relationship capital, such as the "devoted customers ratio" and the "satisfied customer index" (Sveiby, 1999).

Knowledge of how to collaborate accumulates over time through experience, reflection and interpretation (Lorenzoni and Liparini 1999). Learning from collaboration is found in the empirical work to be a function of a firm's access to knowledge and its possession of the capabilities for utilizing the relationships and knowledge established (DeSanctis et al., 2002). The evidence found in the review shows that a firm's competence of managing networks can differ substantially, and Networks can be shaped and deliberately designed to meet the firm's innovation needs. The evidence reported links a firm's networking competence and management with its innovative capacity. The degree to which firms learn about new opportunities is a function of the extent of their existing participation in networks (Powell et al., 1996).

The sub areas reviewed in this category are listed as:

- Market Interface Management Capability
- Networking Capability

- Joint ventures and Strategic Alliances
- Role of Partner diversity
- Role of Suppliers
- Role of Science Partners
- Absorptive Capacity
- Open Innovation

4.5.1 Market Interface Management Capability

The interaction of the firm with its external environment, which is the ‘management of the market interface’, emerged as the first of the innovation competency categories of relationship capabilities. This primarily involves interaction with customers, in the innovation process. Much research has focused on the relationship of customers with the innovative organization (Bailetti and Litva, 1995; Brunner, 2001; Flint, 2002) the generation and distribution of market intelligence and in particular, the integration of the customer at all stages throughout the innovation process (Dahan and Hauser, 2002).

Kohli and Jaworski (1990) define market orientation, as “the organization-wide generation of market intelligence that pertains to current and future customer needs, distribution of intelligence across departments, and organization wide responsiveness.” Other authors have expanded upon this definition to include a broader focus on the market (e.g. competitors) rather than just customers (Narver and Slater, 1990; Jaworski and Kohli, 1996). In this light, competitor orientation becomes a component of market orientation and means that an organization understands both the current strengths and weaknesses and the longer-term capabilities and strategies of current and potential competitors (Aaker, 1988; Narver and Slater 1990; Porter, 1980, 1985).

In a study of 113 forest products business units of a major western corporation Narver and Slater (1990) conclude that market orientation is an important determinant of business profitability and that a degree of market orientation is beneficial in any market environment. Although some research has shown that the relationship between market orientation and business performance is to a limited extent dependent upon the environmental conditions in existence, market orientation

as a strategy has long-term effects where environmental conditions are often transient (Slater and Narver, 1994).

Customers should play an active role in the innovation process and are capable of identifying novel ideas for development (Von Hippel, 1978). A systematic study of practices leading to commercial success in innovation also illustrates the important role of understanding users' needs and engaging them in the innovation process (Freeman 1982). Ragatz et al., (1997) shows that customers are considered to be the most important partners during incremental innovation (Biemans 1991; Bruce and Rodgus 1991). Other studies highlight that the linking of marketing and technical activities early in the innovation process enables products to be developed with full awareness of the customer's needs (Biemans 1991; Bruce and Rodgus 1991). Moreover, too much emphasis on technical excellence or marketing can lead to innovations that are too highly priced or over-engineered (Walsh et al., 1988). Such network relationships with customers are viewed to be important

Conway (1995), in his study of 35 successful innovations, finds that customers are crucially important at the idea generation stage of the innovation process. Companies that state they received essential information from customers are more successful with technological innovation and have greater commercial success (Conway, 1995). Despite this evidence of the value of business customers in the innovation process, more detailed empirical study shows that customer involvement tends to be useful at the beginning, in terms of idea generation, but is less so during the developmental process where the manufacturer tends to lead (Biemans 1991; Bruce and Rodgus 1991; Conway 1995; Gemünden et al., 1992).

In summary, the importance of networking with business customers is confirmed and is shown to offer many benefits. The nature of the value of networks with key customers needs to be treated with some caution. Such networking relationships appear to be ideal for promoting incremental innovation and customers can usefully help innovators identify market opportunities. The extent to which customers actively contribute to the innovation process is less clear, as the evidence points to this being driven by the innovating firm balancing market awareness with technical feasibility.

4.5.2 Networking Capability

As products become increasingly modular and knowledge is distributed across organizations (Baldwin and Clark, 2000), firms recognize an increasing requirement to collaborate with other firms both formally and informally (Fischer and Varga, 2002). Indeed, the place of innovation is no longer the individual or the firm but, increasingly, the network in which a firm is embedded (Powell et al., 1996). Many scientific and technological breakthroughs result from numerous contributions of many actors working in networks (Bougrain and Haudeville, 2002), and the standards necessary for a technology to function across different markets depend increasingly on networks of firms (Munir, 2003). Networking behavior is identified as significantly boosting the innovation output and competitiveness of firms in a diverse range of industries (Ahuja 2000; Powell et al., 1996). The innovation benefits of networking identified by the literature include: obtaining access to new markets and technologies (Grandori and Soda, 1995); speeding products to market (Almeida and Kogut, 1999); pooling complementary skills (Eisenhardt and Schoonhoven, 1996; Hagedoorn and Duysters, 2002) and acting as a key vehicle for obtaining access to external knowledge (Cooke 1996; Powell et al., 1996).

Many authors have published research on the importance of pursuing external sources of financial and social capital, knowledge and technologies in order to complement in-house competencies, to learn and to gain competitive advantage. Recently, Chesbrough (2003) has argued that the ‘closed innovation paradigm’ that existed for most of the 20th century, and was predicated primarily on internal research and development (R&D) efforts, is no longer sustainable. This is due to a variety of factors including: the increased mobility of highly experienced, educated and skilled people; the growing presence of venture capital specialising in the conversion of research ideas into commercializing companies; decreasing ‘time-to-market’ and product life cycles, and globalization of competition.

Options for developing external linkages range from networks and strategic alliances through to joint venture arrangements and merger and acquisition activity. Hoskisson and Busenitz (2002) present a comprehensive framework outlining the most appropriate mode of entering new areas that take advantage of entrepreneurial

opportunities relating to the degree of market uncertainty and the degree of learning required.

Cooper (2002) describes the way alliances may be used at different phases of venture creation. Other authors talk about the ability of firms to learn from each other i.e., their ‘absorptive capacity’ and the implications of having capabilities that are too dissimilar (Cohen and Levinthal, 1990). Rice et al. (1998) highlight the widespread use of alliances for a variety of purposes including manufacturing, application development, market probing, and joint development of technology in disruptive innovation projects. Suitable partners include other large firms, universities, government laboratories, and small high-tech firms. Suppliers have also been highlighted specifically as strategic alliances partners characterized by open information-sharing, co-location of supplier design personnel, and joint future technology planning (McDermott and Handfield, 2000; Walter, 2003; Zirger and Hartley, 1996).

4.5.2.1 Strategic Alliances

Ireland et al. (2002) cite numerous sources of value creation possible through the pursuing of alliances including “scale economies, the effective management of risk, cost efficient market entries and learning.” In addition, they note that alliances help partners “to minimize transactions costs, cope with uncertain environments, reduce their dependence on resources outside their control, and successfully reposition themselves in dynamic markets.” These advantages are also associated with innovation.

The role of strategic alliance has been significantly increased with growth of competition in business markets. The explosion in the number of alliances is associated with gaining access to new markets, products, partners’ resources and expertise more quickly and at lower costs to achieve mutual benefits and to improve the competitive advantage of all involved parties (Lambe et al., 2002; Drago, 1997). Forming strategic alliances firms aim to reduce the duplication of resources and efforts and to decrease the environmental and internal organizational uncertainty (Burgers et al., 1993; Drago 1997). While environmental uncertainty characterizes the demand and market turbulence, the organizational uncertainty is related to

scarcity of resources and lack of information and knowledge required for successful operation (Drago, 1997).

Networks are critical not only for accessing knowledge to create in-house innovations, or for the diffusion of technological innovation, but they are equally important for learning about innovative work practices that other organizations have developed or adopted (Biemans, 1991; Erickson and Jacoby, 2003). They influence this in a number of ways. First, by enhancing access to knowledge – promoting awareness and early adoption of innovations and, secondly, by promoting social interaction, generating trust and reciprocity that is conducive to knowledge transfer (Almeida and Kogut, 1999).

Two major reasons to explain why business-to-business networks form. The first focuses on the resource requirements of firms where they are induced to form network relationships with other firms as a way of obtaining access to technical and/or commercial resources they lack (Ahuja, 2000; D'Cruz and Rugman, 1994; Staropoli, 1998). From this perspective, the availability of opportunities to form relationships tends not to be viewed as a constraint. The second argues that opportunities to form links tend to reflect prior patterns of inter-firm relationships (Ahuja, 2000). A firm's ability to develop network relationships with other firms is consequently based on its existing relationships and network capability (Cooke, 1996; Granovetter, 1985; Kash and Rycroft, 2000).

4.5.2.2 Role of Partner diversity

The value of diverse partners for innovation is demonstrated in Kaufmann and Tödtling's (2001) empirical research, and the conclusions drawn in this study are also supported by Perez Perez and Sanchez's (2002) work on technology networks in the Spanish automobile industry and Romijn and Albu's (2002) work on small high-technology firms in the UK. These studies show that innovation is influenced by many actors both inside and outside the firm, and that the most important partners are from the business sector – customers first (33.5% of firms), and suppliers second (21.9% of firms) (Kaufmann and Tödtling 2000, 2001). Studies on partnering also show that the willingness of firms to co-operate outside these 'direct' relationships is rather limited. For example, co-operation with universities occurs for only 8.9% of firms in Kaufmann and Tödtling's work. In contrast, however, research in Germany

highlights significant national differences with respect to involvement with research institutes and universities, and illustrates the importance of scientific partners in some industry sectors (Gemünden et al., 1992, 1996; Ritter and Gemünden, 2003). The type of partner firms engaged in networking appears to be related to the type of innovation occurring (Freel, 2003; Kash and Rycroft 2000, 2002). For example, incremental innovators rely more frequently on their customers as innovation partners (Biemans, 1991), whereas firms that have products new to a market are more likely to collaborate with suppliers and consultants (Baiman et al., 2002; Ragatz et al., 1997). More advanced innovators, and the development of more radical innovations, demand more interaction with universities (Hausler et al., 1994; Liyanage 1995).

In conclusion, the evidence shows that the innovation process, particularly complex and radical innovation processes, benefits from engagement with a diverse range of partners which allows for the integration of different knowledge bases, behaviours and habits of thought. Formal and informal communication between people with different information, skills and values increases the chance of unforeseen novel combinations of knowledge, which can lead to radical discoveries. More risk-averse firms, however, tend to link their innovation activities and networking relationships to customers, because knowledge of clients' demands reduces the risk of failure for the innovating firm. Innovation is no less valuable but is more incremental, and productivity gains are more modest. This suggests a direct relationship between type of networking activity and innovation type (e.g. radical or incremental). All the studies highlighted in this section also show that firms that do not network possess much lower levels of competence in innovation (e.g. Gemünden et al., 1992; Ritter and Gemünden, 2003).

4.5.2.3 Role of Suppliers

It is found that the effective integration of suppliers in new product development processes can effect the drive of innovation. The integration of suppliers in the innovation process has been highlighted as one of the factors leading to frame-breaking innovation (Kaufmann and Tödtling, 2001; Perez Perez and Sanchez, 2002; Romijn and Albu, 2002).

The value of including suppliers in new product development innovation has been widely when examining management practices, including suppliers in the buyer's development team is the largest single differentiator between the least and most successful innovation efforts (Ragatz et al., 1997). The degree of involvement of suppliers tends to depend on the nature of projects (Harryson, 1997). Open and direct communication between companies, however, is identified as the critical success factor during supplier interactions in new product development processes (Harryson, 1997; Lincoln et al., 1998; Perez Perez and Sanchez, 2002; Ragatz et al., 1997). Interestingly, it is also noted that companies that network effectively with suppliers also invest more in research and development, because they require an infrastructure in which to frame collaborative behavior (Perez Perez and Sanchez, 2002). In summary, the supply chain literature on networking behavior and innovation shows that supply relationships are one of the most important networking arrangements affecting innovation performance and productivity (e.g. Lincoln et al., 1998). Such relationships can be managed if firms are committed to collaboration, skilled in managing network relationships and are prepared to invest in research and development (Lamming et al., 2002).

4.5.2.4 Role of Science Partners

While the review focuses principally on business to business networks, science partners do play an important role as independent network brokers and intermediaries within business networks, and this is explored by the study.

The important role of informal personal relationships in networks outside the market interface is also evident in the wider evidence on science partners (Kaufmann and Todtling, 2001; Verspagen 1999). As well as direct benefits of interaction between science and industry, science partners provide an important role as intermediaries within networks (Bougrain and Haudeville, 2002).

The evidence on science partners shows that they contribute to innovation networks, usually through informal-personal networks (Bower and Keogh, 1996) and that their contribution is important in enabling firms to develop thinking that steps outside their particular business system (Liyanage, 1995). Science partners also act as brokers or intermediaries within networks, enabling different business systems to communicate by generating trust between different parties in their common role as

neutral agents (Hausler et al., 1994). The evidence demonstrates that science partners tend to be most important where the innovation is relatively radical in orientation (Ebadi and Utterback 1984; Fritsch 2001; Verspagen 1999).

4.5.2.5 Absorptive Capacity

Cohen and Levinthal (1989) define absorptive capacity as “firm’s ability to “identify, assimilate and exploit knowledge from the environment”. The ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. This capability a firm's absorptive capacity and suggest that it is largely a function of the firm's level of prior related knowledge.

The ability to exploit external knowledge is thus a critical component of innovative capabilities. Prior related knowledge confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends. These abilities collectively constitute what it is called a firm's "absorptive capacity."

4.5.2.6 Open Innovation

In recent years, several factors have continued to erode the underpinnings of closed innovation. One factor was the growing mobility of highly experienced and skilled people. When people left an organization/company after working there for many years, they took a good deal of that hard-won knowledge with them to their new employer although the new employer didn't have to pay any compensation to the previous organization for that training.

“Open Innovation” is a paradigm that assumes firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Under open innovation, both external and internal ideas are used to create value, and internal mechanisms are defined to claim some portion of that value. Open innovation assumes that internal ideas can also be taken to market through external channels, outside the current businesses of the firm, to generate additional value. Ideas can also start outside the firm's own labs and can move inside. Open innovation allows the recovery of overlooked innovations. Now there's a greater chance the projects will find value in a new market or be combined

with other projects, because everything is more open and flexible. According to Dr. Chesbrough, “Not all the smart people work for us. We need to work with smart people inside and outside the firm. External R&D can create significant value; internal R&D is needed to claim some portion of that value. We don't have to originate the research to profit from it. Building a better business model is better than getting to market first. If we make the best use of internal and external ideas, we'll win. We should profit from others' use of our knowledge, and we should buy others' knowledge whenever it advances our own business model.”

Many industries are in transition to open innovation: automobiles, biotechnology, pharmaceuticals, healthcare, computers, software, communications, banking, insurance, and consumer packaged goods, even military weapons and communication systems are examples.

5. METHODOLOGY

5.1 Case Study Methodology and Justification for Qualitative Research

Once the research problem of the thesis is defined, a research methodology, which has a potency to explicate and validate this question, has to be selected. Hence, this section describes the case study research method and justifies its use in this research.

A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context (Yin, 1994). It focuses on “understanding the dynamics present in a single setting” (Eisenhardt, 1989). While case studies have been used in a wide variety of academic fields, and often as a teaching device (Perry, 1998), it is only relatively recently that the case study methodology has become recognized as a legitimate and comprehensive research method (Yin, 1994). While case study research can be used for both theory development and testing, it is essential that some element of theory development is included as part of its design (Yin, 1994). The outcome of theory building from case studies may be concepts, a conceptual framework, or possibly a mid-range theory (Eisenhardt, 1989).

The selection of a research method depends upon several variables including the type of research question, the control the researcher has over behavioral events and the focus on contemporary as opposed to historical phenomena (Yin, 1994).

While ‘case study’ and ‘qualitative’ are terms often used interchangeably (Yin, 1994), the reality is that for case study research, data may be qualitative or quantitative or both (Eisenhardt, 1989).

The issue of whether to adopt qualitative or quantitative data collection means is one that is much debated and discussed in research literature (Eisenhardt, 1989; Miles and Huberman, 1994; Parkhe, 1993; Yin, 1994). Qualitative data are grounded, rich descriptions and explanations of processes collected within their local contexts (Miles and Huberman, 1994). Quantitative data collection usually involves fitting varying perspectives and experiences of people into predetermined response categories to which numbers are assigned (Paton, 1990). While the latter allows the

measurement, comparison and parsimonious presentation of large samples of responders, it is also criticized as not very effective in understanding processes or the significance that people attach to actions and in generating theories (Easterby et al., 1991). Indeed it has been argued that quantitative data on their own are not capable of capturing the complexities of the ‘messy’, subtle phenomena of organizational behavior (Parkhe, 1993).

Qualitative data, on the other hand, is raw experience that has been converted into words (Huberman and Miles, 1994). The data comes in the respondent’s own words typically based on observation, interviews, or documents and carried out close to a local setting for a sustained period (Sykes, 1991). As Miles and Huberman (1994) highlight, qualitative data can be used to generate or revise conceptual frameworks. Moreover “innovation capability” is not a deeply discovered area of management literature. Before making quantitative analysis, deeper researches based on qualitative analysis shall be carried out.

There were at least three reasons for adopting a qualitative case study methodology for this research:

- Qualitative methods favor model building rather than model, theory testing and verification (Tsoukas, 1989). The collected data is used to confirm or disconfirm theory rather than being tested for generalizability (Perry et al., 1999). Conversely, in the early stages of theory development where phenomena are not well comprehended, the use of quantitative research methods can lead to inconclusive findings (Parkhe, 1993);
- Qualitative methods focus on naturally occurring, ordinary events embedded in their contexts (Miles and Huberman, 1994). The need to understand the phenomenon can best be achieved by getting “physically and psychologically closer to the phenomena” through the intimacy of interviews (Perry et al., 1999); and
- The ability of case studies to allow the researcher to understand the complex relationships between categories identified during the research (Perry et al., 1999).

5.2 Case Selection

Once the research methodology, the type of data to be collected, then choice of single versus multiple cases shall be discussed. There is a need to decide prior to any data collection whether a single or multiple cases design will best address the research questions. Yin (1994) outlines three situations when case study approaches are most appropriate including:

- Testing a well formulated theory;
- When the case is unique or describes an extreme situation; or
- While it is revelatory in nature.

However the focus of this research was testing a model formulation build on a detail literature review, doing more than one case study would increase the accuracy of results.

Eisenhardt (1989) argues that “random selection of cases is neither necessary, nor even preferable.” Therefore organizations were deliberately selected in such a way as to “increase the chances of covering the range of issues, phenomena, types of individuals and so on” (Sykes, 1991).

For selection the cases, three criteria were taken into consideration. Firstly, organization shall be recognized as one of the most innovative companies in their market, secondly the company shall be giving importance to innovative efforts among its organization; thirdly the company shall be supporting this kind of research with an open communication.

5.3 Participant Selection

The actual individuals chosen to participate in the research was also an important factor that needed to be considered once case organizations had been selected. There was typically a ‘case study sponsor’ who was the initial contact point in the organization and who continued throughout the study to assist with logistical matters and important communications. Potential participants were selected through discussion with the sponsor and then communicated and asked if they were willing to participate. Each participant was given an overview of the study details and made aware of the voluntary nature of their participation.

Participants were invited based on their involvement in innovation-related activities. Participants included in research were from the departments like marketing, human resources, R&D, information technologies, operational management and technical support where applicable.

5.4 Structure of Case Study Research

The initial phase of this research involved developing a theoretical model including constructs relevant to the management of innovation from the corporate entrepreneurship and innovation literature as described previously. The initial theoretical model formed the basis at the first phase of the empirical study. To determine the constructs of the model, 9 main exploratory questions organized under three key areas based on intellectual capital view; structural capabilities, human based capabilities and relationship capabilities (see appendix B).

This preliminary model was then further developed and modified after the exploratory case studies as an iterative process where it is based on both the empirical data collected and the extant literature. The modified model is discussed in chapter 7. After the completion of the exploratory cases, final changes were made and the model became the finalized as “Intellectual Capital Based Innovation Capability Model”. This modified model consisted of 10 main exploratory questions under the three original key assessment areas, with each assessment question consisting of between 2 and 9 related sub areas (see appendix C). The use of related sub area topics facilitates clarifying and contextualizing the main exploratory questions. The sub area topics allowed for a greater understanding of the main exploratory questions to be answered, which in turn allowed participants to better understand how the underlying concept might be relevant in their organization’s context. The content of the sub area topics was based on details of the main construct identified based on literature review. The final version of the capability model questionnaire showing all 10 main exploratory questions and supporting sub topics is included in appendix C.

The primary aim of the model was to highlight an organization’s enablers of innovation, to assess strengths and weaknesses in areas critical to innovation performance and to articulate the missing capabilities for organizations searching for higher innovation performance.

Case study research is often characterized by the frequent overlap of data collection with data analysis (Eisenhardt, 1989). During the workshops, details of issues and discussions between participants were recorded separately to observations and analysis to provide clarity to the researcher, and in keeping with the principles of action research (Dick, 1997). Data collection and analysis occurring simultaneously allows an added flexibility, well suited to research involving theory building and data collection instrument modification (Eisenhardt, 1989).

At the conclusion of the field work, after finishing all interviews, an evaluation of the result was carried out via means of an interview with the case study sponsor. The interview was a confirmatory interview focused on the findings from the interviews and check the information gathered from the participants. Additionally insights relating to possible opportunities for improvement among capability areas were also discussed at this interview.

5.4.1 General Questions

In order to accurately collect the defining characteristics of the case study organization for later case analysis, a questionnaire was prepared and used during an initial interview at the case study. This questionnaire is called general questionnaire and provided in Appendix A. With the help of this questionnaire general view of the company is captured. The initial interview is made with the sponsor of this research in the company. General questions were asked to the sponsor who also has a manager rank at the company. These general questions include issues like organization's current strategic objectives, number of employees, organizational structure etc.

5.4.2 Interview and Data Collection Approach

A number of interviews were conducted at the exploratory case study as an initial step in the theory-building process (Perry, 1998). These interviews involved relevant management and began with unstructured questions aimed not to lead the participant to some predetermined destination but rather, to capture the participant's perceptions. These perceptions are of interest because they provide triangulation data about the 'real' world outside the participant and the interviewer (Perry, 1998).

The assessment categories emerging from the literature are initially ignored and begun by asking broad questions and, following Perry's (1998) advice, invited the

participant to tell the story of their experience with innovation. Other researchers have likewise recommended that initial questions be almost ‘content-free’ to ensure that responses didn’t occur because the questions created a self-fulfilling prophecy (Dick, 1990).

A standard format was followed for each interview. The questions became more specific, or detail, upon the research problems as the interview progresses. To provide this, some detail questions were also included in the interview guide to ensure that the model constructs and sub topics of constructs from the analyzed literature are addressed. Data were collected via interview notes.

6. RESULTS

6.1 Case Study Overview

As mentioned before, in this exploratory case study, organizations were selected which give importance to innovation initiatives and efforts. The selected organizations' importance ranking were based on their communicative statements on their websites related to innovation, their mission and value statements and to the extent that their innovativeness is recognized by the market.

First case is recognized as one of three innovative companies in the world. The company has been studied in several researches related to innovation. The company has a variety of products in variety of markets. This company has a branch office located in Turkey. In Turkey, about half of employees work at sales and marketing operations. Although the company is very innovative worldwide, it is interesting to see in what extents of innovation efforts are enabled and operated in the branch.

Second case is the one of the largest household appliances producer in Europe. Company has innovative in-house technology and cutting-edge R&D activities, the strong global brands, high-capacity production plants, and sales and marketing functions. Company has changed its shell since 1990s and evolved form a licensed producer to pioneer technology developer. Company recognized as the one of the most innovative companies in Turkey.

Third case is one of the biggest telecommunication companies in Europe. Company increases the productivity of the enterprises with its mobile communication solutions and offers innovative products and services to its corporate subscribers using the new design opportunities made possible by its infrastructure. Its achievements so far have been recognized with numerous national and international awards and prizes. This company also recognized as the one of the most innovative companies in Turkey. Company is also entered the INFO Tech 100.

Data collected during cases led to additional assessment area being added to the preliminary Innovation Capability Model. After determining the area to be added, the extant literature about that area was reviewed to ensure sufficient evidence existed to

support the inclusion. The following sections analyze the results of each of the research questions

6.2 Findings for General Questions

6.2.1 Findings for General Questions at Case 1

There isn't a overall strategy for products and markets, as a result of diversity of markets which company active in, every product marketed has its own product lifecycle and its marketing objective is managed accordingly. There isn't a specific measurement instrument used for measuring the ability to innovate but there are aggressive sales goals leading sales and marketing team leads business units to innovate. There isn't specific innovation budget (investment) run by Turkey branch office, the investments are management by main headquarters. The organizational structure is formed by business units. These business units market different group of products. There are procedures and policies established for the intellectual property management. The policy requirements are understood by the employees. More than 50 innovation projects run by Turkey branch in a year. Percentage of new products/services(innovations) created in last four years contribute to total sales is monitored.

6.2.2 Findings for General Questions at Case 2

Current strategic objective of company is to be the one of the biggest ten brand allover the world. To achieve this objective company focuses on both growth based and product differentiation strategies. Company does not have a tool for assessing its ability to innovate, company is very self confident about their ability to manage innovation. There are innovation related strategic goals traced by company, these goals are integrated to the balanced scorecard and to a drill down objective tree. Last year company invested about 1,1% of their annual income to the R&D efforts. More than 11.000 people employed by the company. Organizational structure of the company is based on business units but the R&D is centralized. Company has well documented intellectual property strategy statements and high patenting performance. Hundreds of small and big innovation projects run by the company in last three year.

6.2.3 Findings for General Questions at Case 3

As competition increased in the market, company has a focus on product differentiation. Company uses international consulting firms to assess their ability to manage innovation. Company has new service/product related strategic goals. Company has more than 5000 employees. Organizational structure is functional. The percentage of new products/services to the total revenue is about 15%.

6.3 Research Question One

First research question is: How “structural capabilities” area of the IC based innovation capability model contributes to organization’s innovation capability and do the constructs defined under structural capabilities cover the whole necessary structural capabilities of innovation capability? Findings regarding to first research question at cases are written below. Field notes taken during the case study summarized under every main question of the related capability area (see App. B).

6.3.1 Findings for Research Question One at Case 1

SC.Q1 How effective is the management of R&D, technology and technical information in supporting innovation?

However Turkey branch office does not have a R&D department or expenditure, branch has a part of global R&D strategy of the company. Global-wide the company has a well structured technology management model. In the foundation of this model there is a technology forum. This forum consists of departments and committees which integrates business and R&D labs. The departments are named according to the scope of technology. Technical committees lead the change in the area of technical developments which leads to variety of innovations. There is an interesting aspect about the effectiveness of this structure. After a technological invention which is targeting a specific consumer need, if it does not work, company finds other usage areas of this technology and applies it successfully with the help of technology forum structure.

SC.Q2 How effective is the management of intellectual property in supporting innovation?

There is an effective management of intellectual property; company gets globally more than 500 patents in a year. They work with lawyers to protect the patented products. Turkey branch office has applied for 2 industrial product patents in last three years. The process for patenting is well structured. Firstly, a department at Europe headquarters reviews these applications and forwards it to the main headquarters. There is a department at the main headquarters which controls and directs these patent applications, if the application is worth for patenting then rest of process is managed by this department.

SC.Q3 How effective is the management of disruptive innovation in supporting innovation?

The disruptive innovation attempts are managed via R&D labs all over the world. But contrarily disruptive innovations can be initiated by an innovative idea via leveraging an existing technology. As a part of R&D strategy, company invests in radical innovative efforts, mostly in technological development area.

SC.Q4 How effective is management of ideas for innovation initiatives and the innovation process itself in supporting innovation?

There isn't a specific creativity technique used among the employees. But in the social life among the employees, they discuss the ideas and share knowledge about their business, this also stated as a key driver of new idea generation which leads to innovation projects.

After generation of an idea, to realize it all aspects including risks are discussed and communicated to the top management where necessary.

The innovative ideas are mostly generated by marketing and sales teams. The marketing meetings with cross business units allow the attendees to share the ideas in a structural way and these ideas are pre-evaluated at these meetings. Deeper evaluation is conducted at specific meetings. At this point the idea is begun to be managed as a project until it is launched as a new product or as a new market (usage area) of an existing product. If it is a new product (or is a modification on a product) the sourcing department runs the project. Before handling the project over to sourcing department, the project leader makes the risk analysis and pre-feasibility analysis and assesses the market need, defines product specification very clearly. Sourcing department has a responsibility to establish the connection with related

technology center of company. Sourcing department finds the answers to all questions related to project and realizes the demand. After execution of project the results are shared with the related bodies. This structure shows us a powerful idea generation and innovation process supporting innovation and innovation initiatives.

SC.Q5 How effective is learning and knowledge management initiatives in supporting innovation?

The marketing meetings, projects its self are good examples of organizational learning among the company. To increase the usage of information a mobility program was executed by information technologies department. With the help of this program sales team collects the information including product penetration; surveys etc. from dealers (from site) and transfer it to the database. Before this mobile capability, the company used to conduct non structural meetings after site visits where the company suffers the lack of information gathered. This project increased the effectiveness of information share allow the branch to use these information in searching new opportunities and these opportunities lead company to innovative ideas for markets.

The CRM infrastructure allows company to share market information, opportunities and ideas among the business units. This infrastructure has a high usage rate. More over, other software is used for product specifications and product data sheets. Marketing and sales team has an access to these data. This data is vital for decision making. Both organizational learning efforts and knowledge management initiatives are not run under a program but being applied effectively among the company.

6.3.2 Findings for Research Question One at Case 2

SC.Q1 How effective is the management of R&D, technology and technical information in supporting innovation?

Their R&D meets global standards for technology and product development and focuses on products that are environment-friendly (recover, recycle, reuse, and low energy consumption), ensure comfort and customer satisfaction (smart, quiet, practical), are affordable and comply with standards of the future. The R&D activities of company are carried out by the R&D Directorate at company headquarters and by Product Development Management in plants. Having taken note of changing market and competitive conditions since the late 1980s, the company

decided to move towards creating its own products and technology. In line with this goal, company increased its engineering strength, invested in human resources, established partnerships, and used its own laboratory capabilities to get quick results. The results of these investments include the ability to design and produce its own products and to take advantage of opportunities in the expanding market. The current R&D efforts are focused on product development and their outputs are commercial products that provide a competitive edge. Today, this company has a great R&D investment and well structured R&D department. 550 people is working at R&D department of the company. This company's technology development model includes all related parties into technology creation process. These parties include universities, governmental research labs and other external inventors. Cooperation with these parties is very extensive. All technologies and researches related to product spectrum and project portfolio all over the world are searched, evaluated and utilized where it is necessary. This seems a vital capability for the firm. More over internal human resources and R&D labs are also very qualified which also strengthens the technology management capability.

SC.Q2 How effective is the management of intellectual property in supporting innovation?

Company is the patent leader of Turkey. The Company is proud to own 13% of the patents issued in Turkey and 45% of the international patent applications filed by Turkish companies with the World Intellectual Property Organization in the past three years. Thus far, the company has registered more than 300 patents and received 34 international awards. The Company confirmed its leadership in patents in 2006 with 136 patent applications and has Turkish Patent Institute awards. Company realized the importance of safeguarding intellectual property not to experience any illegal usage of new developed products and technologies.

SC.Q3 How effective is the management of disruptive innovation in supporting innovation?

However company has innovation rewards and new product rewards, disruptive innovation efforts are not handled with a different focus. Product and technology portfolio are told to be mature and disruptive innovation efforts are not put and managed separately. This seems to be limiting to achieve disruptive innovations.

SC.Q4 How effective is management of ideas for innovation initiatives and the innovation process itself in supporting innovation?

While assessing the technology management capability of the company we see the product-technology roadmaps as the heart of innovation process. Another important component of this system is new idea generation and project management. During roadmap preparation process customer connected groups including technical and marketing groups bring their accumulated knowledge to this platform. At this platform, participants not only communicate and share their knowledge but also they take a part at original and innovative idea generation sessions. Most critical inputs of these sessions are new technology trends, customer feedbacks, competition analysis, customer and vendor demands. Teams gathered from different departments focus on specific problems, use systematic tools and generate new ideas. At these studies not only common methods like benchmarking, brain storming but also function analysis and TRIZ are used. After knowledge sharing and idea generation session prioritization discussions take a place. Projects are prioritized and project portfolio is formed as the output of these discussions. After evaluation, granted innovation ideas are put into roadmaps and short term and long term projects are prepared to realize these innovation ideas. Beside these efforts new innovation initiatives are also handled according to project portfolio roadmap. New idea generation is supported among the company. Suggestion system works as a funnel where new ideas put and evaluated. This suggestion system is integrated and not only workers but also customers, vendors, consultants, suppliers external inventors are included to idea processing system.

SC.Q5 How effective is learning and knowledge management initiatives in supporting innovation?

There is a collective knowledge management initiative, knowledge gathering and sharing through team studies and roadmap preparation is important part of innovation process. While new projects are being realized specialists are attended to project meetings. Among these studies tacit knowledge is utilized. In the past average work period was 2 years, but it has changed and this helps to keep and increase tacit knowledge stock. More over explicit knowledge is utilized through a comprehensive IT infrastructure. All technical information and study results are kept, accessed and transferred on this infrastructure. Project manuals preparation of which is a must at

the end of the project includes project specific results and information. Projects for TPM, 6 Sigma and product development are good places for gaining experience though experimenting. This is good example for collaborative learning.

6.3.3 Findings for Research Question One at Case 3

SC.Q1 How effective is the management of R&D, technology and technical information in supporting innovation?

R&D and common technological efforts of company shall be explained differently. These common technologies and technical capabilities hold by company set the infrastructure for any product service or marketing campaign. These technologies are solid and managed extensively. Common technology of company developed based on 2 components applications and hardware. Internal technology development mostly focused on developing these common technologies.

On the other hand there are certain R&D efforts begun at the company. Now these efforts are managed by a separate corporate venture. The R&D projects are carried out in cooperation with governmental agencies.

SC.Q2 How effective is the management of intellectual property in supporting innovation?

In most of the cases new service/product is not protected via patents. This is due to characteristic of service/product. But recently company's new venture has been working on new technologies and R&D intellectual property management becomes more important for the company.

SC.Q3 How effective is the management of disruptive innovation in supporting innovation?

However company has innovations not only new to national market but also to global market, disruptive innovation efforts are not handled with a different focus. This is a result of risk perception of senior management and pressure of competition on profit margins. This seems as a dilemma faced by company.

SC.Q4 How effective is management of ideas for innovation initiatives and the innovation process itself in supporting innovation?

Most of the innovative ideas are created by a service/product management department and marketing department. These innovation initiatives are analyzed by related departments and evaluated according to feasibility study. After evaluation if the initiative is accepted a project plan is prepared. There is also another system for ideas generated by different departments of company. The system is intranet based and consists of common phases with mentioned above. The system works like a funnel and after collection of ideas they are processed by related committee members and evaluated. After evaluation if the initiative is accepted a project plan is prepared by related department.

SC.Q5 How effective is learning and knowledge management initiatives in supporting innovation?

There is a very collective effort at marketing service/product departments in order to increase organizational learning. This collective effort includes most of the aspects of knowledge management. Knowledge is collected from market conferences, fair visits, and company meetings. This knowledge is shared and communicated among related departments. Discussion sessions are held by these departments. There is also a central department collecting news about new developments from national and international resources, this information is distributed and comments on these news are communicated. There is a collective learning effort among sales, marketing, product/service management and third parties. After launch of a new product/service, performance of project is evaluated and lessons learned are made explicit on the project document.

6.3.4 Result of Findings for Research Question One

In all cases R&D and technology development efforts are vital part of innovation capability. It is observed that what makes R&D practices stronger is the linkage with the idea generation and innovation initiatives. Intellectual property management protects company's rights and incomes for the innovation created. While intellectual property management is an essential capability for production industries it is not very applicable for service industries. At service sector intellectual capital management becomes very important if there is a technology development is included to the innovation. Disruptive innovation is a special type of innovation that needs special attention. At last two cases disruptive innovation focus is not strong. But it seems a

missing point of their view to innovation. Disruptive innovation efforts can bring extraordinary returns to company but this is not well realized by both companies. At the third case company faces a dilemma about risk taking and being pioneer. Case 3 is conservative about investing on possible disruptive innovations due to risk perception. Case 2 indicates that they are in a mature market which driven by well known technology which I feel it is a wrong perception. Disruptive innovations disrupt the current market with a new value proposition and this is why it is called disruptive innovation. It may not be quite frequent but disruption is possible for most of the markets. On the contrary at the first case company is very focused on searching for disruptive innovations. This also let company to create new markets. It shall not be forget that their disruptive innovation efforts are managed by centers outside of Turkey. Turkish companies need more attention for disruptive innovations. At all three cases idea generation is supported among company. Idea generation, collection and evaluation systems are in place. Moreover it is integrated to innovation realization process. Another common practice is to handle these evaluated and approved ideas as projects until they are commercialized. At the second case some creativity techniques are also used in idea generation. Organizational learning and knowledge management processes importantly support innovation. For the service sector innovation initiatives are more experimental and an organizational learning loop takes place after every launch of new service. It was observed that project documentation is commonly used at all cases. These documentations are also inputs and outputs of organizational learning and good examples of explicit knowledge. Explicit and tacit knowledge is gathered and shared at all three cases and an IT infrastructure is used to manage explicit knowledge at case organizations.

6.4 Findings for Research Question Two

Second research question is: How “human based capabilities” area of the IC based innovation capability model contributes to organization’s innovation capability and do the constructs defined under human based capabilities cover the whole necessary human based capabilities of innovation capability? Findings regarding to first research question at cases are written below. Field notes taken during the case study summarized under every main question of the related capability area (see App. B).

6.4.1 Findings for Research Question Two at Case 1

There are 2 main questions regarding to human based capabilities area (see Appendix B). Field notes taken during the case study summarized under every main question of the related area. These summaries of findings are listed below.

HC.Q1 How effective is the visionary capability of senior management in supporting innovation?

The strategic approach related to innovation is set globally. Company locates the strategy on innovation capability. Global goal of company is to make %30 of sales revenue from products developed last 4 years. Innovation is in the essence of company mission and vision. Senior management of branch executes the mission and vision of global. Not only senior management but also all sub management levels support innovative initiations. The important point here is that, there isn't specific innovation goal (number, revenue etc.) set for business units at branch office. However there isn't any specific innovation goal set for the branch, the sales objectives are very aggressive and in order to achieve it business units innovate. This strikes attention to another structural capability area which is not mentioned in the preliminary innovation capability model. This capability is "targeting and monitoring capability" of company.

HC.Q2 How effective is the cultural and climatic capability in supporting innovation?

At the company, the recruiting efforts are focused on identifying the best possible talent, and they look for individuals who can add his/her value to the job and share the commitment to innovation and excellence.

"Diversity" is the key word for the company, from their point of view diversity is a part of every job. All departments can create practical solutions. To find the opportunity is a different aspect of motives in employees' mind. Empowerment is important among the company. This gives the freedom to employees to achieve their goals. There is an expression called "to charge the course" used among the employees. This explains the leadership attributes of people. Company expects the employee to solve the problem or at least create the solution alternatives. Mistakes of employees are handled in a mature way and it is seen as an opportunity for improvement and for taking necessary action not to repeat it. There isn't extra rewarding system for white collars; they are paid a premium if they exceed their

goals. There is an open door policy in action which is an indicator of open communication as a part of culture. The culture in the company creates the innovative environment. These cultural and climatic characteristics of company are dominant to the cultural aspects of individuals.

6.4.2 Findings for Research Question Two at Case 2

HC.Q1 How effective is the visionary capability of senior management in supporting innovation?

Senior management set the vision for R&D and invested on this subject. It was like changing the shell for the company. The change shows the visionary capability of the senior management. It shall not be forget that the force lead the senior management in this way was the competition begun in the country and aim of having a market share in foreign countries. Senior management continues to support innovation and put a vision of being one of the biggest 10 brand all over the world.

HC.Q2 How effective is the cultural and climatic capability in supporting innovation?

Culture and Climate of company diversifies according to department and type of work. New recruited white collar employees are encouraged for project leadership. All employees are encouraged for new idea generation via planned and non planed awarding. Project environment has a different atmosphere, people are more open for communication and free than they are at their functional jobs. This atmosphere diffuses though internal network and establishes needed environment for innovation initiatives. On the other hand for recruitment and training, company see creativity as an attribute which white collar developers has to possess.

6.4.3 Findings for Research Question Two at Case 3

HC.Q1 How effective is the visionary capability of senior management in supporting innovation?

Increase in competition lead senior management to focus more on innovation efforts. Senior management started to pay more attention to innovative initiatives in last year and hired an international consulting company to assess the innovation capability of the company. A gap analysis was presented to the top management by this consulting company. This let senior management to prepare a road map to fill these gaps.

Although top management has expectations from innovation initiatives, they are not very ambitious about taking risk to invest on radical innovations.

HC.Q2 How effective is the cultural and climatic capability in supporting innovation?

The culture of company covers most of the elements needed for supporting creative and innovative atmosphere. Company encourages idea generation through suggestion system. People whose has remarkable suggestions are rewarded and recognized via award ceremonies. But company is working to improve open communication and suggestion system does not seem enough to support for new ideas. As a result a study for “company values” has outcomes to draw attention on these two issues. New values of the company include these two aspects. About autonomy and freedom, there are different practices observed. In new service/product development and marketing there is more autonomy and freedom observed than other departments. Idea generation and innovation efforts are not a part of individual performance measurement.

6.4.4 Result of Findings for Research Question Two

Visionary capability is vital for innovation efforts. In all cases senior management plays an important role at innovation efforts. Investing on innovation efforts which we can see in all cases is a good indicator of visionary capability. In all three cases it was observed that cultural atmosphere in the company is an important aspect of innovative environment. However there is little difference, in all cases companies care about empowerment and leadership practices. At case 2 these practices are more limited to project environment. Last two cases have to improve their open communication practices. Rewarding and recognition is used by all companies. Mistakes handling is more mature and seen as opportunity for improvement at case 1 and at case3.

6.5 Findings for Research Question Three

Third and the last research question is: How “relationship capabilities” area of the IC based innovation capability model contributes to organization’s innovation capability and do the constructs defined under relationship capabilities cover the whole necessary relationship capabilities of innovation capability? Findings regarding to first research question at cases are written below. Field notes taken during the case

study summarized under every main question of the related capability area (see Appendix B).

6.5.1 Findings for Research Question Three at Case 1

There are 2 main questions regarding to relationship capabilities area (see Appendix B). Field notes taken during the case study summarized under every main question of the related area. These summaries of findings are listed below.

RC.Q1 How effective is the management of the market interface in supporting innovation activities in supporting innovation?

The strength of company comes from market interface management capability. The company is highly market oriented. Different marketing departments are working integrally. They share the cross objectives. Both dimensions (market and product) are considered to maximize the sales objectives. Moreover there are market oriented business developers. They match the possible opportunities with the existing products of the company. Sales teams and marketing specialist share and communicate market needs, market opportunities continuously. Meetings held cross functionally to create the synergy where creative ideas come from. The time spent on the site stated as an important aspect of idea creation and innovation.

RC.Q2 How effective is the use of external networks and alliances in supporting innovation activities?

Technology forums discussed before plays a great role in R&D roadmap of company. These forums and technical communities underneath include suppliers and science partners. But the branch is a sales focused office and does not possess supplier relationship.

6.5.2 Findings for Research Question Three at Case 2

RC.Q1 How effective is the management of the market interface in supporting innovation activities in supporting innovation?

Market interface management is executed at different areas. But all of these areas are connected to innovation process value chain. Vendor feedbacks, customer demands, observations at fairs, market trend researches are inputs in this value chain. product management, marketing and sales teams work together, gather and share the

knowledge gained from market. Company also has effectively running a call center where customer feedbacks are processed and conveyed to the marketing and product management.

RC.Q2 How effective is the use of external networks and alliances in supporting innovation activities?

Open innovation is not a method used by company; this method is not very applicable to this type of sector. On the other hand there is an intensive collaboration with universities and governmental research agencies. Projects are carried out with these research institutes. Moreover if there is a technology needed during development of a product and if it is not a core technology, company collaborates with the parties having this technology in their portfolio. Additionally researches related to their targeting technologies are tracked sensitively and if this kind of research found an alliance is made with the researchers. Utilizing the network and establishing alliances and collaborations are seem to be very important part of innovation efforts of the company.

6.5.3 Findings for Research Question Three at Case 3

RC.Q1 How effective is the management of the market interface in supporting innovation activities in supporting innovation?

Company has an intensive customer interaction interface and managing it effectively. Customer experience insights and feedbacks are collected at different level and dimensions. These are both routine and content specific efforts. Marketing is conducting most of researches where service/product development is also integrated. Focus groups are effectively used to retrieve insights from market and service/product experience. These efforts support generation of new service/product ideas. Another channel to collect this feedback is call center of the company. But this channel does not seem well utilized.

Market interface management is extremely important for the company, customer expectations and experiences are changing very fast in the market, to track these possible changes management of market interface carried sensitively.

RC.Q2 How effective is the use of external networks and alliances in supporting innovation activities?

Usage of external networks and alliances is very important aspect of supporting innovation initiatives for the company. Company has great integration with third parties. Everyone with an idea of new business related to core business of company is welcome by the company. These entrepreneurs are asked for a business plan and if this plan is acceptable for the company, cooperation agreement is established then the business plan is supported in financial and technical terms. In most cases new business idea generation of these entrepreneurs continue after realization of their enterprise. Company continuously uses this source of innovation. More over contest among these third parties are held by the company in order to force them to generate new business ideas. Another focus area of the company has recently emerged. Here the goal is to encourage university student to realize their projects subject to core business area of the company. At these projects students will be able to use the technical infrastructure of the company. This is a good example of open innovation.

6.5.4 Result of Findings for Research Question Three

Market interface management plays important role at innovation efforts. In all three cases it is connected to the innovation process. The most importantly sharing knowledge gained from market, communicating market needs, collecting insights at different dimensions and levels, researches act as a fuel and their contribution to innovation is very valuable. Use of external networks and alliances has different applications at cases, this is due to the conditions specific to every case. In the last case company is focused on integration with third parties and external entrepreneurs, in the second case company focused on intensive collaboration with universities and research institutes. The first case was carried out at the branch office and has little access to the network of global company but the global company uses a complex network and uses it extensively at the innovation efforts, especially for radical innovations which bring out high business value.

6.6 Additional Findings

6.6.1 Knowledge as a key driver

It was mentioned previously that knowledge creation leads to continuous innovation, which in turn leads to competitive advantage (Nonaka and Takeuchi, 1995). We see in the first case study that there is a collaborative effort for feeding the front lines

(sales and marketing teams) with the information gathered from site. This allows the teams to realize needs of customers and opportunities in the market. In Supporting, a collaborative organizational learning takes places interrelation with the different business units. This learning process is good example for socialization knowledge process (Nonaka and Takeuchi, 1995). Another good example of socialization process takes action between customers and sales team. Customer who uses the products and learns the product comes with new ideas or needs about the product. The knowledge about usage of product is transferred to the sales team which is another kind of knowledge transfer. Socialization is important to sustain the power of tacit knowledge on innovation. It was found that the idea generation process has the main ingredient as tacit knowledge. During the interviews, people stated that they generate ideas when they are able to find the uncovered demand or realize the interconnection between problem and solution. Explicit knowledge is mostly used for searching the applicability of new idea among the company. Explicit knowledge also acts as catalyst in the idea generation process because it provides an elimination ability not to unleash unvalued ideas going through innovation process.

Number of the innovations created by the first company is under market innovation type. This type of innovation is result of knowledge leveraging. That means finding new ways to use the existing integrated knowledge-based resources of the firm. Literature review has demonstrated that the creation of new customer value using the existing knowledge bases of the firm is a significant source of innovation and competitive advantage in many industries (Kim and Mauborgne, 1999, 2004). For example, different business units in the branch are able to find different usage areas of existing products by discussions on in other words, by structural and non-structural knowledge socialization process.

6.6.2 Adding “Targeting and Monitoring” Capability Area to the Model

The targeting and monitoring capability area was added at the conclusion of the exploratory case study. The strategic management of innovation shall include tracking key factors that enable effective innovation performance. Addition of this capability area to the model is discussed in chapter 7.

The measurement of progress against innovation is another area highlighted in the literature (Geisler, 2002; Hauser, 1996). For example, Kuczmarski (2000) argues that

one of the reasons executives and managers are reluctant to encourage innovation and risk taking in their organizations is due to “a lack of any metrics relating to return on innovation.” He recommends firms use two types of metrics: innovation performance metrics that measure growth, and innovation program metrics that measure program management and control. Zien and Buckler (1997) found that corporate wide innovation metrics were central to all companies in their study of 12 global innovative firms. Other research has highlighted that organizations using innovation metrics (for example, the proportion of revenue contributed by new products) are typically in the minority.

7. CONCLUSION

7.1 Conclusion about Research Questions

In this section conclusive comments about the findings are discussed and a revised version of the theoretical model is presented.

All three research questions aim to determine the relevance of capabilities driving the sustainable innovation capability based on intellectual capital. Specifically, it is asked: What areas of organization capability based on intellectual capital does an innovation capability model need to include? The original analysis of the extant literature led to the creation of 9 main capability areas under three dimensions of intellectual capital. This 9 capability areas including several sub topics were turned into specific questions (see appendix B). This questionnaire was used to find answers to research questions and to confirm the relevance of the constructs of model during the case study.

After testing the model during the case study, it was seen that every capability area is at least very relevant and very important for innovation capability. However all capability areas has certain roles when utilizing innovation capability of the company, some of them have different implementations and some practices may differ case to case according to dynamics of markets. If we begin with first capability area, R&D and technology management capability can produce valuable innovations if it is linked with other capability areas. Especially in case2 we saw that integration of technology management capability and market interface management capability creates a synergy and utilizes innovation capability. This approach is applicable for not only mentioned capability areas but also for all capability areas of model. Moreover case2 is more focused on technological innovations and they have one of the best practices on this issue. Intellectual property management capability is more important when there are patentable products or technologies. As it is linked to technology production case2 also has one of the best practices among industry. It can not be excluded from model because any company may need to protect their product

or technology for some time; companies have to be careful and agile on this issue. As a result this capability also applies for case3 type organizations. Disruptive innovation is a special type of innovation which has be handled separately. We saw the importance of this area very clearly at case1. However there are good worldwide examples in industries of case2 and case3 this area is under utilized by these companies because of the reasons mentioned at section 6. Idea generation it self is a great source of innovation and this source shall be continuously utilized for a sustainable innovation capability. Case2 is focused on creativity techniques in idea generation and this is one of the best practices in Turkey. Idea generation and innovation process can't be separate. Innovation process is the backbone of innovation capability as it was observed in every case. It holds and integrates all capability areas. It is a general view in all cases that sharing tacit knowledge and explicit knowledge feeds the stock of knowledge among company and it is an important aspect of organizational learning. Especially tacit knowledge is driving sources of idea generation and innovation. Organizational learning helps organizations to understand the determinants of created value via products services or processes and figure out new business value needs for the market.

It was underlined in all cases that senior management support is vital for sustainability of innovation efforts. Senior management's role on creating innovative environment and supporting innovation initiatives is very important. Innovative environment supported with corporate culture is necessary to utilize human resources towards innovation efforts. All elements of this culture mentioned at model shall be focused and improved where necessary to establish the corporate culture according to dynamics of company. Case2 also shows us that extending this culture may be hard when blue collars are involved.

Market interface management allows company to sense the market. Sensing gives inspiration for innovative idea generation. Moreover collecting and sharing of data gathered from market helps organization to build tacit knowledge stock which also may turn innovations later. In all cases companies do not want to miss any feedback useful for new products or services. Use of external networks may change case by case as mentioned in section 6 but it is an important part of innovation capability. Not only internal resources but also external resources shall be utilized for innovation initiatives.

There was another observation made during the first case study. The business units has both their own sales objectives and cross sales objectives. Cross sales objectives aims turning product group focus to market focus where there is sales potential. Both internal and crossed objectives create pressure on sales and marketing teams. This pressure forces teams to work more close and to think about different market opportunities together. This approach produces innovative initiatives. This addresses an interesting capability area which is not very mentioned among the literature. The capability is called “targeting and monitoring capability”. After adding this capability area to the model, we achieved the modified IC based innovation capability model as shown in Figure 7.1. Additional capability area is shown in a dashed box.

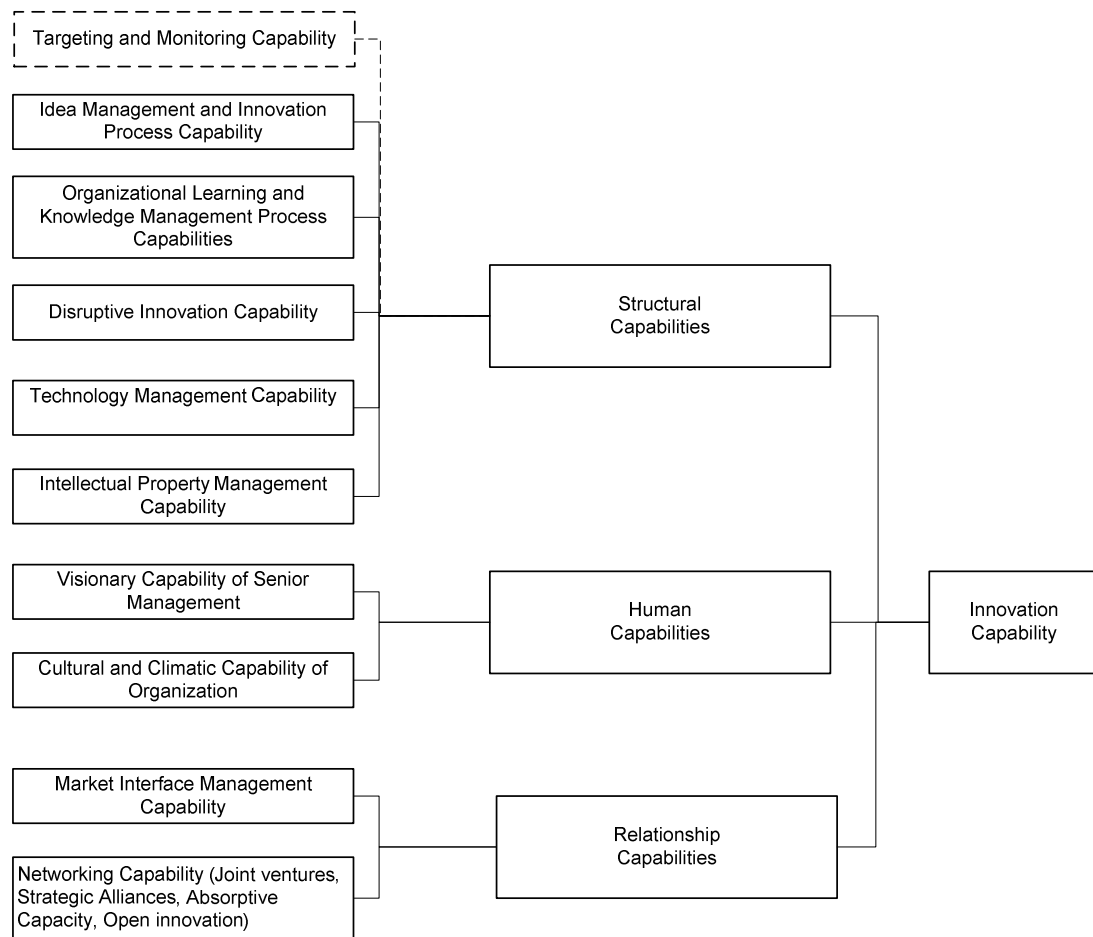


Figure 7.1. Modified IC Based Innovation Capability Model

Another additional finding of the research was the effect of knowledge to innovation capability. As it is discussed under additional findings section, knowledge is the core input for innovation capability. It shall not be forget that technology itself presents a stock of applied knowledge; it is in the category of explicit knowledge. The second

type of knowledge is tacit knowledge which sticks to the individual's mind and mentioned as source of innovation (Nonaka and Takeuchi, 1995). During the first case study it was observed that innovators use both. Innovator generates the innovative idea with the help of tacit knowledge but stock of applied knowledge of organization (explicit knowledge) draws the boundaries of solutions created in minds. . It was also noticed that tacit knowledge is need to shape the raw idea and to successfully commercialize the good idea to an innovation. Explicit knowledge of company can be characterized as dough and to make the cake (innovation), then a recipe (tacit knowledge) will be needed

7.2 Limitations

This research employed only three distinct cases which limits the overall ability to generalize the results for the whole population of organizations. The model shall be studied in different sectors and different sized organizations to achieve a wider generalization. Model may work differently in different sectors and different constructs may be added as a result. Additionally, this research focused **on limited types** of innovations. For other types of innovation, (e.g business model innovation) the model shall be reconfigured with an extended literature review on these kind of innovations.

7.3 Further Research

This research was carried out using a primarily inductive, qualitative methodology. Further research adopting a quantitative research approach would be beneficial for understanding the effect of constructs on both innovation performance and organizational performance. Moreover after this research a statistical generalization can be achieved.

After removal of limitations mentioned under limitations section with a more comprehensive research, an innovation capability assessment instrument can be developed. This innovation capability assessment model can rate the organizations ability to innovate.

Further research could use the Innovation Capability model in combination with multi-variate analysis approaches aimed at testing relationships between the

applicability of the model and various other contingent variables such as the organization's environment and strategy.

Finally, the process undertaken to develop the Innovation Capability model could be adopted by other researchers to develop assessment instruments aimed at improving other organizational capabilities.

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APPENDICES

Appendix A: General Questions Used During Case Study

Table A.1 General Questions

General Questions
G.1 How would you describe your organization's current strategic objectives? e.g. cost-based, product differentiation, niche, growth-based, survival etc.
G.2 Do you currently use any method of assessing your organization's ability to manage innovation? Are there any innovation-related strategic goals?
G.3 What is the current budget/level of investment for innovation?
G.4 How many staff/employees does the organization have?
G.5 How would you describe the organizational structure? e.g. functional, business units, hierarchical etc
G.6 Does the organization have corporate, innovation (NPD), marketing, R&D/technology and intellectual property strategy statements, objectives policies and procedures or guidelines?
G.7 How many innovation projects are currently in progress?, What are the innovations marketed in last three years?
G.8 What percentage do new products/services(innovations) contribute to total sales revenue?

Appendix B: Specific Questions of Preliminary Model Used During Case Study

Table B.1 Preliminary Model Specific Questions

Assessment questions	Sub Area Topics
Key Capability Area: Structural Capabilities	
1. How effective is the management of R&D, technology and technical information in supporting innovation?	▪ R&D and Technology strategy ▪ Technology scanning, acquisition and transfer, ▪ R&D management
2. How effective is the management of intellectual property?	▪ IP strategy, ▪ IP systems and processes, ▪ IP capture, protection, leveraging, exploitation
3. How effective is the management of disruptive innovation?	▪ Aggressive technology/ R&D strategy ▪ Long pay-back periods ▪ Alternative organizational structures
4. How effective is management of ideas for innovation initiatives and the innovation process itself?	▪ Creativity techniques, group and individual creativity ▪ Idea generation, collection and evaluation ▪ Product/ Service development ▪ Stage-gate processes, Risk Management ▪ Innovation processes ▪ Corporate venturing
5. How effective are learning and knowledge management initiatives in supporting innovation	▪ Organizational Learning ▪ Knowledge Management Processes
Key Capability Area: Human Based Capabilities	
1. How effective is the visionary capability of senior management?	▪ Strategic approach ▪ Timing e.g. first to market, fast follower ▪ Strategic alignment (mission, vision) ▪ Senior management support

Table B.1 (cont.): Preliminary Model Specific Questions

2. How effective is the cultural and climatic capability?	▪ Leadership, champions ▪ Support for new ideas ▪ Reward and recognitions initiatives ▪ Individual performance measurement ▪ Recruitment and Training ▪ Autonomy and Empowerment (freedom) ▪ Open communication ▪ Mistakes handling ▪ Participation in decision making
Key Capability Area: Relationship Capabilities	
1. How effective is the management of the market interface in supporting innovation activities?	▪ Market trends, Environmental scanning ▪ Customer and supplier integration ▪ Customer needs analysis, Competitor analysis ▪ Market orientation
2. How effective is the use of external networks and alliances in supporting innovation activities	▪ Joint ventures and strategic alliances ▪ ‘Open’ innovation, networks ▪ Absorptive capacity ▪ Role of Partner diversity ▪ Role of Suppliers ▪ Role of Science Partners

Appendix C: Specific Questions of Modified Model

Table C.1 Modified Model Specific Questions

Assessment questions	Sub Area Topics
Key Capability Area: Structural Capabilities	
1. How effective is the management of R&D, technology and technical information in supporting innovation?	▪ R&D and Technology strategy ▪ Technology scanning, acquisition and transfer, ▪ R&D management
2. How effective is the management of intellectual property?	▪ IP strategy, ▪ IP systems and processes, ▪ IP capture, protection, leveraging, exploitation
3. How effective is the management of disruptive innovation?	▪ Aggressive technology/ R&D strategy ▪ Long pay-back periods ▪ Alternative organizational structures
4. How effective is management of ideas for innovation initiatives and the innovation process itself?	▪ Creativity techniques, group and individual creativity ▪ Idea generation, collection and evaluation ▪ Product/ Service development ▪ Stage-gate processes, Risk Management ▪ Innovation processes ▪ Corporate venturing
5. How effective are learning and knowledge management initiatives in supporting innovation	▪ Organizational Learning ▪ Knowledge Management Processes
6. How effective is management of targeting and monitoring in supporting innovation?	▪ Targeting ▪ Monitoring of objectives
Key Capability Area: Human Based Capabilities	
1. How effective is the visionary capability of senior management?	▪ Strategic approach ▪ Timing e.g. first to market, fast follower ▪ Strategic alignment (mission, vision) ▪ Senior management support

Table C.1 (cont.): Modified Model Specific Questions

2. How effective is the cultural and climatic capability?	▪ Leadership, champions ▪ Support for new ideas ▪ Reward and recognitions initiatives ▪ Individual performance measurement ▪ Recruitment and Training ▪ Autonomy and Empowerment (freedom) ▪ Open communication ▪ Mistakes handling ▪ Participation in decision making
Key Capability Area: Relationship Capabilities	
1. How effective is the management of the market interface in supporting innovation activities?	▪ Market trends, Environmental scanning ▪ Customer and supplier integration ▪ Customer needs analysis, Competitor analysis ▪ Market orientation
2. How effective is the use of external networks and alliances in supporting innovation activities	▪ Joint ventures and strategic alliances ▪ ‘Open’ innovation, networks ▪ Absorptive capacity ▪ Role of Partner diversity ▪ Role of Suppliers ▪ Role of Science Partners

Appendix D: Case study questionnaire

Organisation name: _____

Date: _____

Participant name (optional): _____

Instructions for completion: please select the answer that best applies for each of the 9 questions below. Please add any comments where appropriate.

a. How effective is the management of R&D, technology and technical information in supporting innovation?

Comments: _____

b. How effective is the management of intellectual property?

Comments: _____

c. How effective is the management of disruptive innovation?

Comments: _____

d. How effective is management of ideas for innovation initiatives and the innovation process itself?

Comments: _____

Figure D.1.: Case study evaluation instrument

e. How effective are learning and knowledge management initiatives in supporting innovation

Comments: _____

f. How effective is the visionary capability of senior management?

Comments: _____

g. How effective is the cultural and climatic capability?

Comments: _____

h. How effective is the management of the market interface in supporting innovation activities?

Comments: _____

i. How effective is the use of external networks and alliances in supporting innovation activities

Comments: _____

Figure D.1 (cont.): Case study evaluation instrument

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