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THE IMPACT OF KNOWLEDGE MANAGEMENT CAPABILITIES ON NEW PRODUCT DEVELOPMENT AND COMPANY PERFORMANCE

(An Application of Structural Equation Modeling - SEM)

by

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ABSTRACT

Managing knowledge is a critical challenge for organizations while it is a major potential for gaining competitive advantage. Managers want to understand how to manage and measure their knowledge based assets better. This empirical study confirms and improves a framework which proposes a link between knowledge management enablers (KME) and knowledge creation process (KCP). The present model introduces improvements on the process-oriented perspective of knowledge by using the knowledge creation model and a framework reported in the literature by adding business strategies (BS) and market dynamism (MD) to the model. As an inter-mediator, new product development (NPD) is accepted.

Ten enablers are used in the study: collaboration, trust, learning, participating in boundary spanning structures, direction and performance information, centralization, formalization, t-shaped skills, IT support, and IT quality. KCP has four factors of socialization, externalization, combination, and internalization. KME and KCP found to have an impact on perceived company performance (PCP) through new product development capabilities (NPDC).

The questionnaire is applied to IT sector in Turkey and 294 responses from 93 different companies are collected. Then data is evaluated in SPSS and AMOS for structural equation modeling. The findings confirmed the proposed relationships. SEM analysis enabled to observe new relationships that are non-linear, like Business Strategies have impact on KME, socialization, NPDC and financial performance. Learning and IT have impact on all four factors of KCP. Mutual trust has relationships with NPDC and qualitative performance in addition to socialization and externalization. Formalization has a negative impact on externalization.

This research provides a SEM model that both the confirmed and the simplified model can be referred by academicians. Concerning the limited resources for any company, the proposed model enables managers a tool that can be used for seeking sound strategies to manage which enablers and knowledge creation modes they should focus on.

Keywords: knowledge management, knowledge management enablers, new product development capabilities, knowledge creation, organizational performance, structural equation modeling.

ÖZET

Bilgi yönetimi işletmeler için yönetilmesi gereken bir meydan okuma olduğu kadar rekabet avantajı sağlama adına da büyük bir potansiyeldir. Yöneticiler, bilgi bazlı varlıklarını nasıl daha iyi ölçüp yönetebileceklerini bilmek isterler.

Bu tez, bilgi yönetimi kolaylaştırıcıları, bilgi yaratma süreci, yeni ürün geliştirme yetkinliği ve algılanan şirket performansı arasındaki ilişkileri ortaya koyan teorik bir modelin oluşturulması ve yapısal eşitlik modelleme yöntemi ile analiz edilmesini içermektedir. Çalışmada, bilgi yaratma modelini baz alan bilginin süreç odaklı perspektifi geliştirilmekte ve literatürde yer alan bir modele, iş stratejileri ve pazar dinamikleri de eklenerek daha kapsamlı yeni bir model oluşturulmaktadır.

Araştırma, Türkiye'deki Bilişim Teknolojileri şirketlerine dönük olarak hazırlanan bir anket ile yapılmış, 93 farklı firmadan 294 kişinin katılımı sağlanmıştır. SPSS programı ile temel ve karmaşık tanımlayıcı istatistikler, ve faktör analizi, AMOS programı ile doğrulayıcı faktör analizi ve yapısal eşitlik modelleme analizi yapılarak değişkenler arasındaki ilişkiler incelenmiştir.

Analiz sonuçlarına göre pazar dinamikleri, iş stratejileri, bilgi yönetimi kolaylaştırıcıları, bilgi yaratma süreci, yeni ürün geliştirme yetkinliği ve algılanan şirket performansı arasında anlamlı ilişkiler olduğu görülmüştür. Pazar dinamikleri üç factor ile ölçülmektedir. Bunlardan dinamizm öğrenme ile, rekabet yoğunluğu iş stratejileri ile, ve ürün belirsizliği sosyalleşme ile ilişki içindedir. İş stratejileri, tüm değişkenler grubu içinde en az bir factor ile ilişki içindedir. Bilgi yönetimi kolaylaştırıcılarından öğrenme ve bilgi teknolojileri, bilgi yaratma sürecinin dört kavramını da etkilemektedir. Bu dört süreçten kombinasyon, yeni ürün geliştirme yetkinliği ile, yeni ürün geliştirme yetkinliği de algılanan şirket performansının her iki faktörü, finansal performans ve kalitatif performans ile anlamlı ilişki taşımaktadır. Ulaşılan sonuç akademik çalışmalar ile daha da iyileştirilebilecek bir model olduğu kadar, iş dünyasında yöneticilerin de kullanabileceği bir araç olarak ortaya çıkmaktadır. Bu model ile yöneticilerin, şirketlerin kısıtlı kaynakları da dikkate alınarak, hangi bilgi yönetimi kolaylaştırıcılarına ve bilgi yaratma süreçlerine odaklanacaklarını belirleyecek stratejiler geliştirmeleri daha kolay olacaktır.

Anahtar kelimeler: bilgi yönetimi, bilgi yönetimi kolaylaştırıcıları, bilgi yaratma, yeni ürün geliştirme yetkinlikleri, şirket performansı, yapısal eşitlik modelleme

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TABLE OF CONTENTS

LIST OF SYMBOLS

Symbol	Explanation
β	The regression coefficient
x	The reliability of the predictor variable
R^2	Overall coefficient of determination
χ^2	Chi-square statistic
n	Required sample size
N	Population size
B	Tolerated error of estimation
z	The abscissa of the normal curve that cuts off an area at the tails
m	The margin of error
p	The estimated value for the proportion of a sample that will respond to a survey question

LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness of Fit Index
AMOS	Analysis of Moment Structures
BS	Business Strategies
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CT	Computer Tools
df	Degree of Freedom
EFA	Explanatory Factor Analysis
GFI	Goodness of Fit Index
IT	Information Technology
KM	Knowledge Management
KMS	Knowledge Management system
KMC	Knowledge Management creation
KME	Knowledge Management enablers
KMO	Kaiser-Meyer-Olkin
ML	Maximum Likelihood
NPD	New Product Development
PCP	Perceived Company Performance
R&D	Research and Development
MD	Market Dynamism
NFI	Normed Fit Index
RMSEA	Root Mean Square Error of Approximation
RMSR	Root Mean Square Residual
SEM	Structural Equation Modeling
TLI	Tucker Lewis Index

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICIES

Claim for Originality

This model is an improved and diversified version of the research done by Lee and Choi (2003). The modifications are listed below and summarized in Table 3.1.

1. *Market Dynamism* is included in the model which assumed to influence *Business Strategies*, *New Product Development Capability* and *Perceived Company Performance*.
2. *Business Strategies* is included in the model which assumed to influence *Knowledge Management Enablers*, *Knowledge Creation Process*, *New Product Development Capability* and *Perceived Company Performance*..
3. Two new constructs (*participating in boundary spanning structures, direction and performance information*) are introduced in *Knowledge Management Enablers*, and one construct (*IT quality*) in *IT support*.
4. The mediator between *Knowledge Creation Process* and *Organizational Performance* is accepted to be *NPD Capabilities* instead of Organizational Creativity.
5. *Organizational Performance* is accepted to be *Perceived Company Performance*, as the performance of the company is asked to the participants instead of searching for any financial and qualitative data of companies.
6. The research methods are different, as Structured Equation Modeling is used in this research.
7. Finally, this research is done in Turkey, and in IT sector; while the latter was done in Korea with companies in Manufacturing, Service and Financial business sectors.

Table 1.1 Comparison of Research Model with Model of Lee and Choi (2003)

	This Research	**Lee and Choi (2003)**
Construct Groups	Market Dynamism Business Strategies *KM Enablers* *KC Process* NPD Capability *Perceived Company Performance*	- - *KM Enablers* *KC Process* Organizational Creativity *Organizational Performance*
Country	Turkey	Korea
Sector	IT	Manufacturing, Service, Financial business
Number of firms	93	58 (19, 25, 14 respectively)
Sample size	294	426

1 INTRODUCTION

1.1 Problem Statement

The knowledge-driven economy increasingly requires businesses to function as knowledge-based organizations. The task of managing information is a critical challenge facing modern day organizations and may hold the key to developing a source of advantage (Drucker, 2001). As firms are focusing on their intangible assets, intellectual capital can be viewed as the future basis of sustained competitive advantage. Competitive advantage depends more on “people-embodied know-how” (Prahalad, 1995).

Knowledge management deals with the process of creating value from an organization's intangible assets and is widely appreciated in business world especially since 1980s (Wiig, 1997). Although Drucker (1969) claimed that knowledge can not be managed, and Miller (2000) agreed upon him, many scholars (Nonaka and Takeuchi 1995, Wiig 1997, Davenport and Prusak 1998, Wickramasinghe 2003, Ekbia and Kling 2003, Snyman and Kruger 2004) stated that organizations should spend special effort to handle – or manage – knowledge to be able to survive, to establish sustainable development, and to have competitive advantage. Although most of the organizations are not quite aware of or do not measure the benefits of knowledge management, somehow they believe that it is very crucial.

As many other scholars, the author of this dissertation also believes that knowledge management has a positive effect on the competitiveness of a corporation. This belief is based not only on academic studies that he had chance to cover but also on the experiences accumulated on his professional career path. He had the chance to work in various national and global companies in Service Sector where the main tasks were on New Product Development and Channel Management. The main differentiating success factor among others was observed to be the effective knowledge management.

1.2 Purpose of the study

In this thesis, it is aimed to analyze the impact of knowledge management of on perceived company performance through new product development. A structural equation model

showing the impact of knowledge management on new product development and perceived company performance will be constructed. The contribution to the literature is mainly on providing the relations between market dynamism, business strategies, knowledge management enablers, knowledge creation process, new product development capabilities and perceived company performance with a new model.

1.3 Importance of the study

This study is important for:

• Top management team. Managing information is a critical challenge for all organizations in dynamic environments which can be a key to developing a source of competitive advantage (Drucker, 2001). With a strong evidence of impact of knowledge management on developing a source of advantage, top managers can decide how much to allocate from their scarce resources. This is extremely important also for Turkish Companies, as factors like globalization, being a candidate for European Union Membership, etc., foreign rivalry has not been much harder before.

• Consultants. It is not easy for any company to increase its knowledge management capability within a short time period. When they intend to do so, they will seek outside assistance while making use of their own specialties and qualifications. Having knowledge as their core assets, consultants will be ready to serve.

• IT solution vendors. As technology progress, there will be more solutions in the market to be purchased and applied on for corporations. However, it is again technology that enables rivals to replicate any solution in a shorter time. Vendors will be glad to have their customers to be aware of the importance of knowledge management, which might yield them to spend more on solutions in the market.

• Researchers. Although a lot of researches has been done to identify the relationship between knowledge management and competitiveness, an applicable model would be much more interesting. The contributions to the literature with this thesis will open new gates to be explored.

1.4 Management Questions

Knowledge is the major potential for gaining competitive advantage (Prahalad and Hamel, 1990; Leonard-Barton, 1995; Nonaka and Takeuchi, 1995; Grant, 1996). Organizations can achieve the following through successful knowledge management programs: competitive advantage, customer focus, improve employee relations and development, innovation and lower costs (Skyrme and Amindon, 1997). This brings up the first management question: **Should managers reserve some of their resources for knowledge management?**

There has been strong interest in corporate performance management approaches using performance indicators to provide insights into organizational performance. This improved understanding of value creation can be used as the basis for strategy creation or assessment, to motivate people to do the right things and to communicate with external stakeholders (Marr and Spender, 2004).

Knowledge being an important factor for organizations and critical to strategic advantage caused organizations to reconsider their performance measurement systems. Managers want to understand how to manage and measure their knowledge based assets better, while at the same time, there is increasing pressure on managers to measure benefits and cost effectiveness of their organization's knowledge management initiatives. Corporations should utilize their resources in the most effective and efficient way, otherwise in today's business environment, they might not have a chance to replace the vast ones. The second management question is: **Which factors of knowledge management are affecting the company performance through new product development capabilities?**

This study aims to develop a model that can be applied to any institution for identifying and answering these questions.

1.5 Research Questions to be addressed

In the area of competence, core competence and core capabilities are the major issues. Core competencies represent technological skills, complementary assets, and organizational routines and capacities (Dosi, 1988). Firms can do well mostly in particular technologies, marketing and purchasing, identifying and responding to environmental changes, etc. (Nelson, 1988)

A core capability is defined as the knowledge set that distinguish and provide a competition advantage. This puts emphasis on employee knowledge and skills which are embedded in underlying technical systems, values and norms (Johannessen and Olsen, 2003). Core competence is not static, as only the firms that continuously invest and upgrade their competence will be able to create new strategic growth alternatives (Lei, Hitt and Bettis, 1996). Accepting knowledge management as a core capability, this thesis provides a set of evaluation tools for answering the following questions:

What is the relationship between the knowledge management capabilities of a firm and its competitiveness?

What are the parameters that influence competitiveness of a firm through new product development?

2 LITERATURE REVIEW

2.1 Introduction

It was before the end of 20th century that, the business environment has dramatically changed. With two world wars in a century, and especially after the second one, there were booms that created a sellers' market where it gradually shifted towards a buyers' market in most of the developed countries. The main characteristic of such market is that as they are saturated they do not consume all goods produced. With an increased number of consumers that are better informed and more demanding, differentiation and innovation become more critical than ever. We can also conclude that traditional cost-focus management tools do not provide managers adequate information. Organizations' resources should be aligned in accordance with the external competitive forces to provide better value (Marr and Spender, 2004).

The increasing competition and the high rate of innovation have made knowledge the key asset of knowledge. The most valuable assets of the 21st century enterprise are set to be its knowledge and knowledge workers (Drucker, 2001). The ability of enterprises to exploit their intangible assets has become far more decisive than their ability to invest and manage their physical assets (Snyman and Kruger, 2004).

Globalization, with the help of developments in Information and Communication Technologies, results the economic world to shrink where access to tangible resources does not alone provide a sustainable competitive advantage. Parallel to these, scholars have reacted by putting forward new theories of the firm. Economists like Solow (1956) and Arrow (1962) had done studies on "learning curves" which helped in growing interest in knowledge as a different kind of economic resource. Parallel to the developments in economic and organization theory, Machlup (1966) was the first modern economist to analyze knowledge and related areas. Results of a new research on the transfer of knowledge and its impact on innovation were published by Teece (1977). Drucker (1969) was the first to define knowledge as an important resource, and with several contributions afterwards knowledge is assigned to be one of the major sources of lasting competitive advantage (Nonaka and Takeuchi, 1995).

Knowledge is neither data nor information, and that the difference between them is often a matter of degree (Davenport and Prusak, 1998). Data is structured records of transactions, whereas information has the character of a message with a sender and a receiver. Human agency is at both ends of the communication. Information must inform; it is data that changes the receiver's perceptions.

The key to effectively distinguishing between information and knowledge is not found in the content, structure, accuracy, or utility of the supposed information or knowledge. Rather, knowledge is information possessed in the mind of individuals: it is personalized information (which may or may not be new, unique, useful, or accurate) related to facts, procedures, concepts, interpretations, ideas, observations, and judgments (Alavi and Leidner, 2001).

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 in and is applied in the mind of the knower. In organizations, it often becomes embedded not only in documents or similar inorganic forms and repositories but also in human forms such as organizational routines, processes, practices, and norms (Marr and Spender, 2004).

The theory of organization has been dominated by a paradigm that accepts organization as a system that “processes” information (Nonaka, 1994). Although these processes deal with input-process-output sequence of information processing, the ‘process’ step should include capturing, transferring and creating new knowledge. Innovation is a form of organizational knowledge creation. It is a process where organization creates and defines problems and then, actively develops new knowledge to solve them (Nonaka, 1994).

Organizations have to adapt to changing market conditions in order to remain at the competitive edge (Cagan, Oner, Basoglu, 2003). It was *Quality Management* period starting from 1980’s and *Business Process Reengineering* in 1990’s which yielded *Knowledge Management* by the 21st century. *Quality Management* applications proposed teamwork and empowerment to utilize employee contribution both physically and mentally. *Business Process Reengineering* focused mainly on technology adaptation and

usage to eliminate non-value adding steps in the processes. Thus both the costs were reduces and the satisfaction level of the internal and external customers were increased. In contrast to quality management, *Business Process Reengineering* had critics about focusing only on the process, and technology can disregard the human side of a business, which in the long run could lead to failures of application.

Deriving lessons from experiences in success of Quality Improvement Techniques and Business Process Reengineering, importance of Knowledge Management is increased which was aimed to be used as a step to initiate and manage innovation for gaining competitive advantage.

2.2 Knowledge

2.2.1 Definition of knowledge

Philosophical debates started with Plato's formulation of knowledge as "justified true belief". However there is no single agreed definition of knowledge presently, nor any prospect of one, and there remain numerous competing theories.

Knowledge was defined as information combined with experience, context, interpretation and reflection (Davenport *et al.*, 1998). It is not something new; it has always been used and exchanged within the organizations (Davenport and Prusak, 1999). According to Davenport and Prusak (1999); "*what is new is to recognize knowledge as a corporate asset and to understand the need of managing it and involving it with the same care given when obtaining the value of other more tangible assets*".

Knowledge has been defined as:

“Awareness of efficiency and effectiveness of different actions in producing outcomes based on experience” (Ackoff and Emory, 1972).

“A flow of messages which might add to, restructure or change knowledge” (Machlup, 1983).

“Flow of messages which are derived from either the flow of information or from the ways by which the information organized and structured (perceptional, context specific and purposeful). Knowledge is created and argued by the very flow of information, anchored on the commitment and beliefs of its holder” (Nonaka, 1994).

“(i) expertise, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject, (ii) what is known in a particular field or in total; facts and information or (iii) awareness or familiarity gained by experience of a fact or situation” (Oxford Dictionary, 2005).

The concepts of data, information, and knowledge were separated by Nonaka and Takeuchi (1995).

1. Data is factual, raw material and therefore without information attached.
2. Information is refined into a structural form. The word information is derived from Latin ‘*informare*’ which means ‘*give form to*’ where most people tend to think of information as disjointed little bundles of "*facts*" (Sveiby, 1994). Information can be viewed from “*syntactic*” and “*semantic*” perspectives. It worth to examine the syntactic aspect of knowledge which is the volume of information as it is measured without taking in care of its meaning or value (Shannon and Weaver, 1949; cited in Nonaka, 1994). The best example to this is the telephone bill, where it is not calculated on the content of communication but on the duration of time and distance involved. Semantic aspect of knowledge is more relevant for creating knowledge as it focuses on conveyed meaning.
3. Knowledge was also split into two as explicit and tacit knowledge by Nonaka and Takeuchi (1995).

2.2.2 Tacit knowledge – explicit knowledge

Knowledge that can be expressed in words and numbers only represents the tip of the iceberg of the entire body of possible knowledge (Nonaka, 1994). Polanyi (1966; cited in Nonaka, 1994) was the first to distinguish between tacit and explicit knowledge which later utilized by other authors framing “*we can know more than we can tell*”. He classified human knowledge into two categories. “Explicit” or codified knowledge refers to knowledge that is transmittable in formal, systematic language. On the other hand, “tacit”

knowledge has a personal quality, which makes it hard to formalize and communicate. Tacit knowledge is deeply rooted in action, commitment, and involvement in a specific context (Nonaka, 1994). In Polanyi's words, it "*indwells*" in a comprehensive cognizance of the human mind and body.

While Polanyi (1966) articulates the contents of tacit knowledge in a philosophical context, it is also possible to expand his idea in a more practical direction. Tacit knowledge involves both cognitive and technical elements. The cognitive elements center on what Johnson-Laird (1983) called "mental models" in which human beings form working models of the world by creating and manipulating analogies in their minds. These working models include schemata, paradigms, beliefs, and viewpoints that provide "perspectives" that help individuals to perceive and define their world (Nonaka, 1994). By contrast, the technical element of tacit knowledge covers concrete know-how, crafts, and skills that apply to specific contexts. It is important to note here that the cognitive element of tacit knowledge refers to an individual's images of reality and visions for the future, that is to say, what is and what ought to be. The articulation of tacit perspectives is a key factor in the creation of new knowledge (Nonaka, 1994). Information on the types of knowledge - tacit knowledge and explicit knowledge - are provided in details in Table 2.1 (Nonaka and Takeuchi, 1995). Though both types of knowledge are accepted to be important, tacit knowledge is more difficult to identify and thus manage (Nonaka, 1994).

Explicit – or codified or articulated – knowledge relates to 'knowing about' and can be written and easily transferred. This category of knowledge may include manuals, specialized databases or collections of case law or may even be in the form of standardized techniques of investigation or templates for documents. A key attribute of explicit knowledge is the possibility to store it. Few disagree that it can be stored and shared using manuals and databases.

Tacit knowledge relates to "knowing how" or "understanding" and cannot be directly transferred between individuals; it is transferred through application, practice and social interaction.

Table 2.1 - Two Types of Knowledge (Nonaka and Takeuchi, 1995)

Tacit	(subjective)	**Explicit**	(objective)
Knowledge of experience	(body)	Knowledge of rationality	(mind)
Simultaneous knowledge	(here and now)	Sequential knowledge	(there and then)
Analog knowledge	(practice)	Digital knowledge	(theory)

Tacit knowledge is perceivable, but difficult to pinpoint, model or transfer due to its unstructured nature while being highly experience based, intuitive, simultaneous, and analog. Explicit knowledge differs from tacit knowledge because it embodies structural characteristics that enable people to manipulate, organize, model and transfer its essences (such as logical, sequential, and digital attributes) (Yim *et al.* 2004).

2.2.3 Models of knowledge creation

New knowledge can be created by trying new approaches in the effort to make sense of a particular problem situation, and by learning from what happens (Weick, 1995; Huber, 1991). With assumption of knowledge being created through conversion between tacit and explicit knowledge, four differing models of knowledge conversion are given in Figure 2.1 - Models of The Knowledge Creation (Nonaka, 1994).

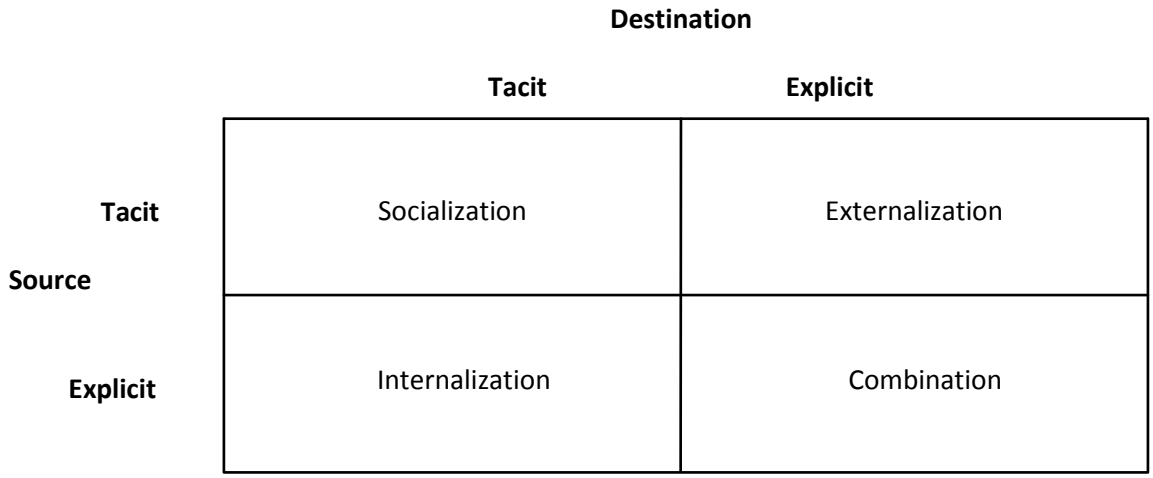


Figure 2.1 - Models of The Knowledge Creation (Nonaka, 1994)

Internalization refers to creation of new tacit knowledge from explicit knowledge; e.g., the learning and understanding that results from reading or discussion (Nonaka, 1994). It is the process in which the existing explicit knowledge from different sources is combined by an individual who then processes this knowledge with the help of his or her own existing knowledge which enables new knowledge emergence (Nonaka and Takeuchi, 2000). The tools for internalization are enhanced search engines enabling various conditions for searches through existing knowledge repositories.

Externalization refers to converting tacit knowledge to new explicit knowledge; e.g., articulation of best practices or lessons learned (Nonaka 1994). It is a process for articulating tacit knowledge into explicit form i.e. with the definitions of this study non-articulated tacit knowledge taking the form of either articulated tacit knowledge or possibly also explicit form (Nonaka and Takeuchi, 2000). Externalization process is described as non-articulated tacit knowledge taking the shapes of metaphors, analogies, hypothesis or models. Since verbally describing images is often inadequate, the differences between images and expressions promote the interaction between individuals which for its part promotes new knowledge creation.

The socialization mode refers to conversion of tacit knowledge to new tacit knowledge through social interactions and shared experience among organizational members; e.g., apprenticeship (Nonaka, 1994). It is a process of sharing tacit knowledge through shared experience between individuals or groups of individuals (Nonaka and Takeuchi, 2000).

Intermediation was used instead of socialization by some scholars like Koulopoulos and Frappaolo (1999). Intermediation is a process for sharing tacit knowledge but additionally it can be understood as a combination of internalization and externalization which do not occur simultaneously; i.e. explicit knowledge is stored in a knowledge base in between. Communities of practice are proposed as a solution for intermediation.

The combination mode refers to the creation of new explicit knowledge by merging, categorizing, reclassifying, and synthesizing existing explicit knowledge; e.g., literature survey reports (Nonaka, 1994).

From the organizational theory point of view:

1. socialization is connected with the theories of organizational culture,
2. combination is rooted in information processing, and
3. internalization is connected with individual and organizational learning.

Theories of organizational learning do not address the critical notion of externalization, and have paid little attention to the importance of socialization even though there has been an accumulation of research on “modeling” behavior in learning psychology (Nonaka, 1994). Another difficulty relates to the concepts of “*double-loop learning*” (Argyris and Schön, 1978) or “*unlearning*” (Hedberg 1981), which arises from a strong orientation toward organization development. Since the first integrated theory of organizational learning presented by Argyris and Schön, it has been widely assumed, implicitly or explicitly, that double-loop learning, i.e., the questioning and reconstruction of existing perspectives, interpretation frameworks, or decision premises, can be very difficult for organizations to implement by themselves (Nonaka, 1994). In order to overcome this difficulty, they argue that some kind of artificial intervention such as the use of organizational development programs is required. The limitation of this argument is that it assumes implicitly that someone inside or outside an organization knows “*objectively*” the right time and method for putting double-loop learning into practice. A mechanistic view of the organization lies behind this assumption. Seen from the vantage point of organizational knowledge creation, on the contrary, double-loop learning is not a special, difficult task but a daily activity for the organization. Organizations continuously create new knowledge by reconstructing existing perspectives, frameworks, or premises on a day-to-day basis. In other words, double-loop learning ability is “*built into*” the knowledge creating model, thereby circumventing the need to make unrealistic assumptions about the existence of a “*right*” answer (Nonaka, 1994).

The essential question of knowledge creation was raised to be establishing an organization's "ba" (Nonaka and Konno, 1998). Ba was defined as a common place or space for creating knowledge. Four types of ba corresponding to the four modes of knowledge creation discussed above are identified: (1) originating ba, (2) interacting ba, (3) cyber ba, and (4) exercising ba.

Organizational knowledge creation involves developing new content or replacing existing content within the organization's tacit and explicit knowledge (Pentland 1995). Through social and collaborative processes as well as an individual's cognitive processes (e.g., reflection), knowledge is created, shared, amplified, enlarged, and justified in organizational settings (Nonaka 1994).

2.2.4 Spiral model of knowledge creation

Tacit knowledge held by individuals has an amplification effect through dynamic interactions between all four models of knowledge conversion. This spiral model of knowledge creation is illustrated in Figure 2.2 (Nonaka, 1994).

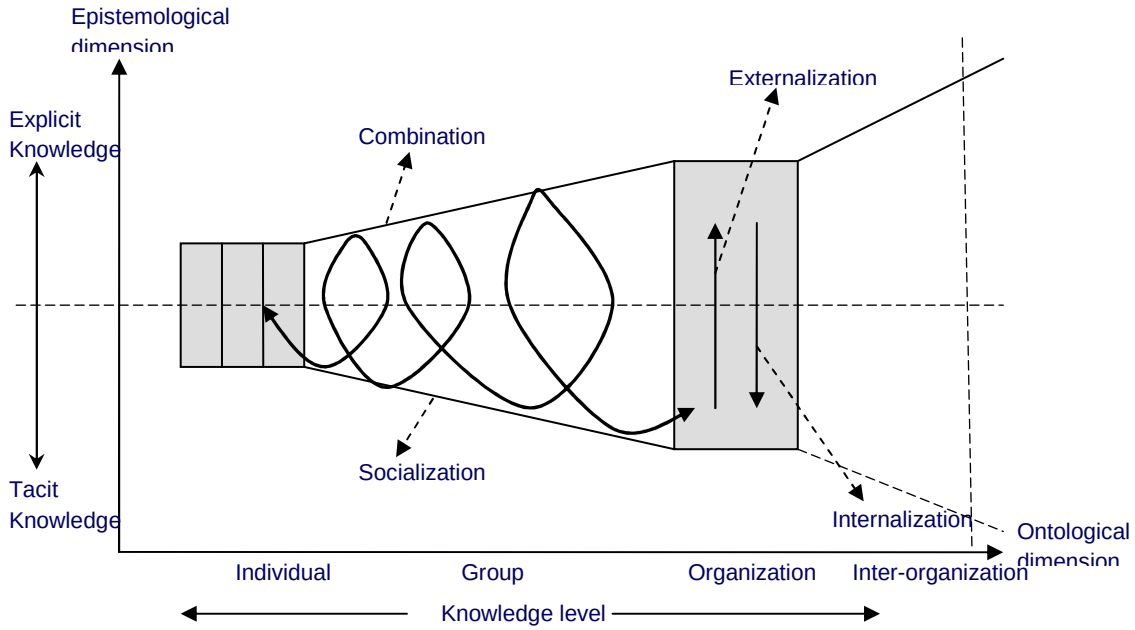


Figure 2.2 - Spiral of Organizational Knowledge Creation (Nonaka, 1994)

According to Nonaka (1994), knowledge creation is a continuous spiral-like process, encompassing four types of knowledge conversion, as follows:

Socialization: tacit knowledge transformed into tacit knowledge, by means of experience sharing.

Externalization: tacit knowledge transformed into explicit knowledge, through concepts, analogies, metaphors, and hypotheses.
Combination: explicit knowledge transformed into other explicit knowledge, forming a knowledge system.
Internalization: explicit knowledge transformed into tacit knowledge, through "*learning by doing*", creating mental models and "*know how*" to be incorporated into individual practice.

The interactions between tacit knowledge and explicit knowledge will tend to become large in scale and faster in speed as more actors in and around the organization become involved.

Organizational knowledge creation, as distinct from individual knowledge creation, takes place when all four modes of knowledge creation are "organizationally" managed to form a continual cycle (Nonaka, 1994). This cycle is shaped by a series of shifts between different modes of knowledge conversion. There are various "*triggers*" that induce these shifts between different modes of knowledge conversion. First, the socialization mode usually starts with the building of a "*team*" or "*field*" of interaction. This field facilitates the sharing of members' experiences and perspectives. Second, the externalization mode is triggered by successive rounds of meaningful "*dialogue*." In this dialogue, the sophisticated use of "metaphors" can be used to enable team members to articulate their own perspectives, and thereby reveal hidden tacit knowledge that is otherwise hard to communicate. Concepts formed by teams can be combined with existing data and external knowledge in a search of more concrete and sharable specifications.

This combination mode is facilitated by such triggers as "*coordination*" between team members and other sections of the organization and the "*documentation*" of existing knowledge. Through an iterative process of trial and error, concepts are articulated and developed until they emerge in a concrete form. This "*experimentation*" can trigger internalization through a process of "*learning by doing*." Participants in a "*field*" of action share explicit knowledge that is gradually translated, through interaction and a process of trial-and-error, into different aspects of tacit knowledge.

While tacit knowledge held by individuals may lie at the heart of the knowledge creating process, realizing the practical benefits of that knowledge centers on its externalization and amplification through dynamic interactions between all four modes of knowledge conversion. Tacit knowledge is thus mobilized through a dynamic "*entangling*" of the different modes of knowledge conversion in a process which will be referred to as a "*spiral*" model of knowledge creation, illustrated in Figure 2.2 (Nonaka, 1994). The interactions between tacit knowledge and explicit knowledge will tend to become larger in scale and faster in speed as more actors in and around the organization become involved. Thus, organizational knowledge creation can be viewed as an upward spiral process, starting at the individual level moving up to the collective (group) level, and then to the organizational level, sometimes reaching out to the inter-organizational level.

The spiral model of knowledge creation has a major affect on the knowledge management literature. However, trying to sketch three different variable categories into two dimensions bears some limitations. Instead, we propose to use three dimensions; tacit knowledge – explicit knowledge; individual – group; intra-organization – inter-organization. Thus, the explanatory power of the model increases which is depicted in Figure 2.3.

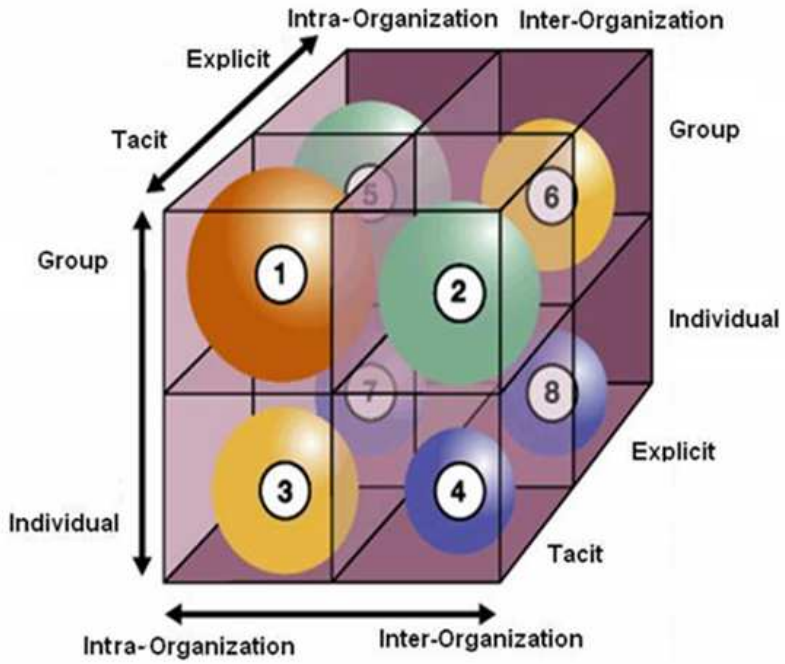


Figure 2.3 Proposed cubical representation of organizational knowledge creation

The three dimensional representation of spiral of organizational knowledge creation is also provided in a table with dimensions, knowledge creation method and examples for each in Table 2.2.

Table 2.2 Three dimensions of organizational knowledge creation

	Know-ledge	**People**	**Structure**	**Knowledge Creation Method**	**Example**
1	Tacit	Individual	Intra-organization	Internalization Socialization	Any learning activity within organization
2	Tacit	Individual	Inter-organization	Internalization Socialization	Meetings in Associations
3	Tacit	Group	Intra-organization	Socialization	Meetings for a project
4	Tacit	Group	Inter-organization	Socialization	Sectoral Conferences
5	Explicit	Individual	Intra-organization	Externalization	Writing project proceedings
6	Explicit	Individual	Inter-organization	Externalization	Writings comments for a proposal
7	Explicit	Group	Intra-organization	Combination	Creating reports for internal use
8	Explicit	Group	Inter-organization	Combination	Creating reports for Associations

2.2.5 Conceptualizing Knowledge

Based on the structure of knowledge, knowledge could be defined as ‘declarative’ and ‘procedural’ knowledge (Anderson, 1983).

Yim et al., (2004) defined declarative knowledge as “know what” while on the other hand, procedural knowledge as “know how”. They proposed a third approach: “know why”. In this taxonomy, compared to the information aspect of know-what and procedural aspect of know-how, know-why is characterized by the capability of reasoning (Yim *et al.*, 2004). Figure 2.4 (Yim *et al.*, 2004) explores the relations between know-why, know-what and know-how. Applying know-what to know-how brings up an experience which causes in reasoning for any better possibilities. This reasoning capability completes to a loop by

modifying existing know-what or know-how.

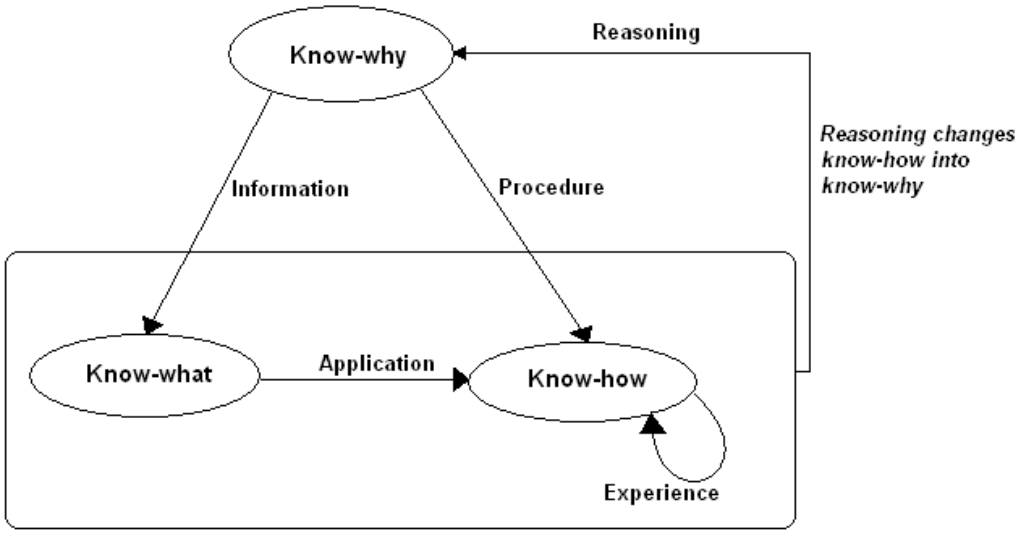


Figure 2.4 Conceptualizing knowledge (Yim *et al.*, 2004)

The same classification in taxonomies was done by Vasconcelos et al., (2000). According to them, declarative knowledge is related to the physical aspect of knowledge. It is the knowledge type required in order to know *what, who, where and when*. It is essential in both interpreting and describing, from a certain viewpoint (conceptualization), the physical features world. It is knowledge of objects (entities or events) and facts about the world, i.e. it is factual information about a given content area.

Procedural knowledge is the knowledge required to accomplish a certain task: it provides a description of the system specific actions required to complete a particular task. It originates from the intellectual skill of knowing *how* to do something. Conventionally, procedural knowledge uses declarative knowledge to describe actions in step by step sequences (Vasconcelos et al., 2000).

Heuristic knowledge describes the knowledge related to the individual experience and implicit reasoning. As meaning that depends on the individual's experience, heuristic knowledge grows with personal work experience. Heuristic knowledge is generated by an internal process and uses both declarative and procedural knowledge to solve problems and

consequently to answer the question *why*.

An understanding of the concept of knowledge and knowledge taxonomies is important because theoretical developments in the knowledge management area are influenced by the distinction among the different types of knowledge (Alavi and Leidner, 2001). There are different types of knowledge and flows among them, where such a classification can help in designing knowledge management systems. Thus KM can provide an opportunity for extending the scope of IT-based knowledge provision to include the different knowledge types summarized in Table 2.1 (Alavi and Leidner, 2001).

Table 2.3 - Knowledge Taxonomies and Examples (Alavi and Leidner, 2001)

Knowledge Types	**Definitions**	**Examples**
Tacit	Knowledge is rooted in actions, experience, and involvement in specific context	Best means of dealing with specific customer
Cognitive tacit:	Mental models	Individual's belief on cause-effect relationships
Technical tacit:	Know-how applicable to specific work	Surgery skills
Explicit	Articulated, generalized knowledge	Knowledge of major customers in a region
individual	Created by and inherent in the individual	Insights gained from completed project
Social	Created by and inherent in collective actions of a group	Norms for inter-group communication
Declarative	Know-about	What drug is appropriate for an illness
Procedural	Know-how	How to administer a particular drug
Causal	Know-why	Understanding why the drug works
Conditional	Know-when	Understanding when to prescribe the drug
Relational	Know-with	Understanding how the drug interacts with other drugs
Pragmatic	Useful knowledge for an organization	Best practices, business frameworks, project experiences, engineering drawings, market reports

Vasconcelos et al. (2000) agrees on the categorization and classification of organizational knowledge as a first step. Organizational knowledge types are explored in three main groups by Vasconcelos et al. (2000):

1. Tacit Knowledge vs. Explicit Knowledge
2. Declarative, Procedural, or Heuristic Knowledge
3. Individual Knowledge vs. Group Knowledge

As in literature extensive work was done on classification of knowledge into tacit or explicit and into declarative, procedural or heuristic; they propose a third category to represent the location of knowledge in the organization: knowledge to be classified into either individual or group (collective) knowledge (Vasconcelos et al., 2000).

In literature tacit knowledge is seen exclusively as a property of individuals. However, research has made it clear that a team of interacting individuals can have knowledge that transcends the knowledge of each of them individually (Walsh, 1995). As organizational knowledge is multidisciplinary, hard to formalize, and generated in discussions with competing viewpoints (Buckingham Shum, 1998), Vasconcelos et al. (2000) attempted to recognize this new understanding of knowledge and incorporate both individual and organizational knowledge. The term Knowledge Structure was used to describe a "mental template" that is used to give a complex information environment form and meaning (Walsh, 1995). As knowledge structures are built on past experience and are used to order data to allow for subsequent interpretation and action; it is possible to state that individual knowledge is concerned with personal knowledge structures, while group knowledge is related to organizational knowledge structures (Vasconcelos et al., 2000).

Different organizational knowledge types and their relation to different types of knowledge assets are displayed in Figure 2.1 (Vasconcelos et al., 2000).

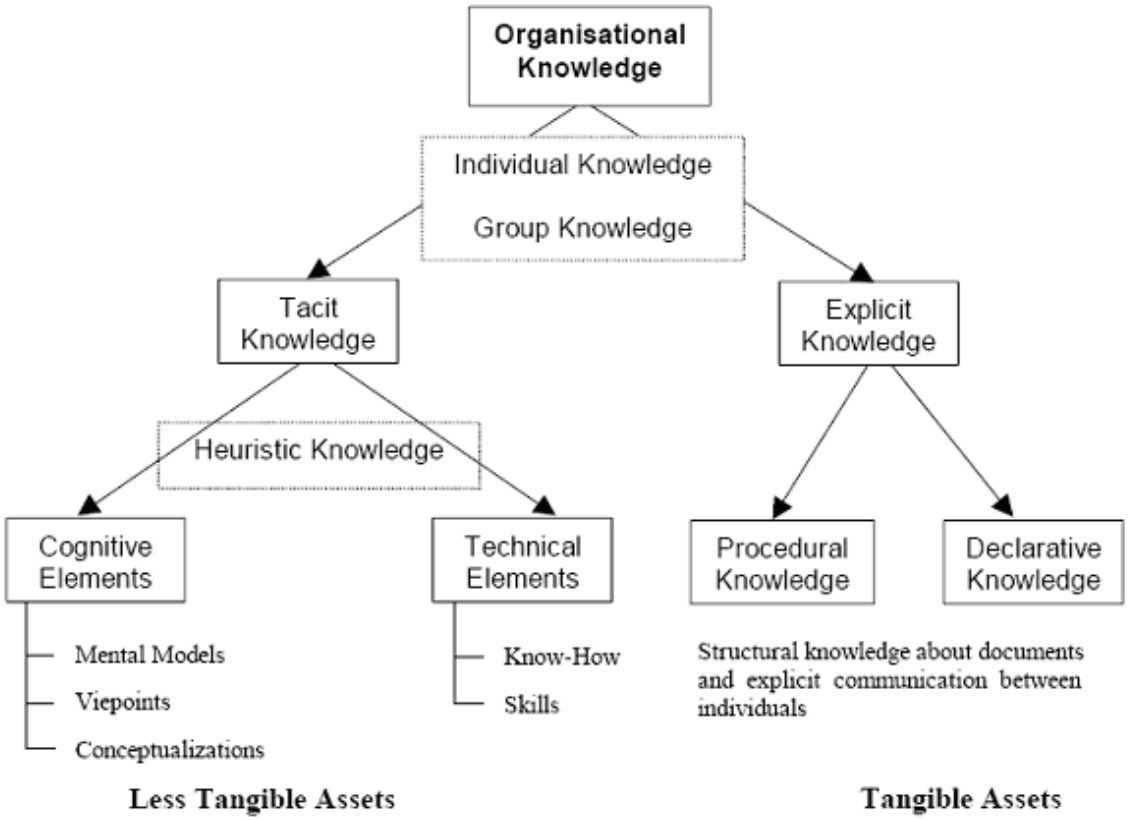


Figure 2.5 Theoretical knowledge taxonomy (Vasconcelos et al., 2000)

2.3 Knowledge Management

We are in a new era where different terms are used to describe it (Wickramasinghe, 2003). Knowledge management is one of the key defining and unifying themes of;

a. the post-industrial era (Huber, 1990),
b. the information age (Shapiro and Verian, 1999),
c. the third wave (Hope and Hope, 1997) and
d. the knowledge society (Drucker, 1999).

It is one of the latest methods advanced by consultants, practitioners, and some academics to meet the demands of what is thought to be an increasingly dynamic and competitive business environment (Ekbia and Kling, 2003).

2.3.1 Definitions of Knowledge Management

Knowledge management is defined on Accenture's web site (www.accenture.com, 2005) as making available the right information to all employees in the organization when they need it and in an easily digestible format, thus the employees can leverage experiences and make more effective business decisions. Knowledge management is mainly the ability to develop, maintain, leverage and renew intangible assets (Itami and Roehl, 1987) which are often called Knowledge Capital or Intellectual Capital (Stewart, 1994). It is accepted as the process of creating value from an organization's intangible assets (Wiig, 1997). Knowledge management not only involves the production of information, but also the capture of data at the source, the transmission and analysis of this data, as well as the communication of information based on, or derived from, the data, to those who can act on it (Davenport and Prusak, 1998).

Knowledge Management is as an integrative and systematic process of coordinating organization-wide activities in acquiring, creating, storing, sharing, diffusing, developing, and deploying knowledge (Rastogi, 2000). This is done by individuals and groups in pursuit of major organizational goals. Here it is the process through which organizations use their institutional and collective knowledge while creating by incorporating organizational learning, knowledge production, and knowledge distribution. Since

knowledge management addresses the generation, representation, storage, transfer and transformation of knowledge (Hedlund, 1994), the knowledge architecture is designed to capture knowledge and thereby enable the knowledge management processes to take place (Wickramansinghe, 2003).

The concept of managing knowledge was stated to be relatively new (Wilson, 2002). Drucker (1969), one of the first people to write about the idea of the 'knowledge society' and the 'knowledge economy', disputes the notion that knowledge can be managed. At the Delphi Group's Collaborative Commerce Summit he scoffed at the notion of knowledge management with the implication that managing knowledge is not that possible and it is only between two ears (Kontzer, 2001). As it is only about what individual workers do with the knowledge they have, when they leave a company, their knowledge also goes with them regardless of how much they have shared. Similar to the ideas of Drucker on knowledge; Miller (2000) discussed the issue as being a unique human capability of making meaning from information, mostly in relationships with other human beings, knowledge is what one knows and what one knows can not be turn into commodity.

The urge for global reach and the speed with which this should be achieved are often considered the main motives behind organizations' interest in Knowledge Management (Alavi and Leidner 1999, Prusak 2001). Snyman (2004) argued the two dimensional perspective of knowledge management defined by MIT Research Center Figure 2.6 (Maybury, 2003).

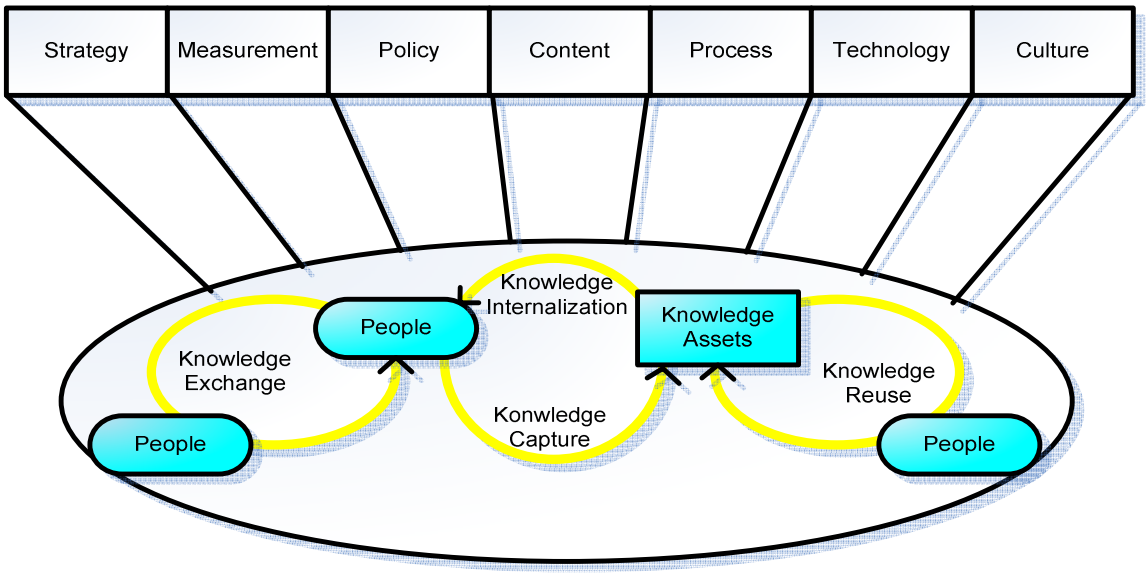


Figure 2.6 Knowledge management enablers (Maybury, 2003)

In the first dimension the activities that are critical to knowledge creation and innovation are defined: knowledge exchange, knowledge capture, knowledge reuse and knowledge internalization. In the second dimension the elements that enable or influence knowledge creation activities are argued which are:

a. Strategy - the alignment of corporate and knowledge management strategies.
b. Measurement - the measures and metrics captured to determine if knowledge management improvement is occurring or if a benefit is being derived.
c. Policy - the written policy or guidance that is provided by the organization.
d. Content - the corporate knowledge base that is captured electronically.
e. Process - the processes that knowledge workers use to achieve the organization's mission and goals.
f. Technology - the information technology that facilitates the identification, creation and diffusion of knowledge among organizational elements within and across enterprises, for instance an enterprise portal.
g. Culture - the environment and context in which knowledge management processes must occur.

All these yield to a learning methodology and a learning organization - one skilled at creating, acquiring and transferring knowledge as well as adapting its actions to reflect new insight and innovation.

2.3.2 Knowledge Management Perspectives

Knowledge management can be differentiated into two as strategic management and operational management of knowledge (Tissen, Andriessen and Deprez, 1998). Operative management uses computer technology to organize and distribute information to and from employees. Strategic management on the other hand is a process that relates the firm's knowledge to:

a. the design of organizational structures that promote knowledge,
b. firm strategy, and
c. the development of knowledge professionals.

Analyzing studies done in knowledge management literature, Nielsen (2005) concluded that two main streams exist: the "content" view and the "process" view.

The content view of knowledge management deals mainly with the categorization and the transferability of the knowledge. Starting from the distinction of tacit and explicit knowledge done by Polanyi (1962), this literature focused on internal analysis of the firm, like knowledge creation (Nonaka, 1994; Nonaka & Takeuchi, 1995) and codification and transfer of knowledge (Kogut & Zander, 1995).

The process view of knowledge management has several perspectives. Starting with Simon (1960), organizational learning has been linked to competitive advantage. The coming out of Multi-National Companies pointed out that knowledge creation can occur in any location of a firm. The 'centers of excellence' points out the geographical distribution of knowledge creation while know-how is generated in all productive activities (Moore & Birkenshaw, 1998). In literature knowledge was also organized as embodied, embedded, embrained, encultured, and encoded (Blackler, 1995). Table 2.1 (Nielsen, 2005) summarizes the main knowledge management perspectives.

Table 2.4 - Comparison of Knowledge Management Perspectives (Nielsen, 2005)

	Content View	**Process View**
Unit of Analysis	Types of Knowledge	Collective Knowledge
Level of Analysis	Intra-organizational: Tacit vs. explicit Knowledge as resource Knowledge as embedded Inter-organizational: knowledge transfer network as repository of knowledge	Intra-organizational: Organizational Learning Absorptive Capacity Intellectual Capital Inter-organizational: Knowledge as strategic tool Network as growth opportunity
Main Focus	Individual vs. group vs. organization Codification, exploitation and protection of knowledge	Ideas, techniques and prescriptions Accumulation and distribution of knowledge
Approach	Descriptive analysis of activities	Practical analysis of practices
Strategic View	Ontological/Structural	Pragmatic/organic
Strategic Objective	Enhancement of efficiency and effectiveness	Enhancement of processes
Main Criticism	Static/Protectionist Limited openness to external knowledge / creation of new knowledge Ignores cognitive / behavioral aspects	Lack of dynamism Internally oriented Knowledge as asset Limited emphasis on synergies Short-term focus
Major Contributors	Hymer (1959) Polanyi (1962) Winter (1987) Prahalad & Hamel (1990) Kogut & Zander (1995) Liebeskind (1996) Conner & Prahalad (1996)	Simon (1960) Cyert & March (1963) Argyris & Schön (1978) Nelson & Winter (1982) Cohen & Levinthal (1990) Nonaka (1994) Hamel & Prahalad (1994) Blacler (1995) Moore & Birkenshaw (1998)

Table 2.5 - Knowledge Perspectives and Their Implications (Alavi and Leidner, 2001)

Perspectives	Knowledge	Implications for Knowledge Management (KM)	Implications for Knowledge Management Systems (KMS)	Authors
Knowledge vis-à-vis data and information	Data is facts, raw numbers- Information is processed/ interpreted data.	KM focuses on exposing individuals to potentially useful information and facilitating assimilation of information	KMS will not appear radically different from existing IS, but will be extended toward helping in user assimilation of information	
State of mind	Knowledge is personalized information.	KM involves enhancing individual's learning and understanding through provision of information	Role of IT is to provide access to sources of knowledge rather than knowledge itself	(Schubert et *al.*, 1998)
Object	Knowledge is the state of knowing and understanding.	Key KM issue is building and managing knowledge stocks	Role of IT involves gathering, storing, and transferring knowledge	Carlsson et al., 1996; McQueen, 1998; Zack, 1998a)
Process	Knowledge is an object to be stored and manipulated.	KM focus is on knowledge flows and the process of creation, sharing, and distributing knowledge	Role of IT is to provide link among sources of knowledge to create wider breadth and depth of knowledge flows	Carlsson et al., 1996; McQueen, 1998; Zack, 1998a)
Access to information	Knowledge is a process of applying expertise.	KM focus is organized access to and retrieval of content	Role of IT is to provide effective search and retrieval mechanisms for locating relevant information	McQueen, 1998
Capability	Knowledge is a condition of access to information.	KM is about building core competencies and understanding strategic know-how	Role of IT is to enhance intellectual capital by supporting development of individual and organizational	Carlsson et al., 1996;

2.3.3 Strategic Management Perspectives and Competitiveness

Management literature was classified into two main streams of theoretical approaches; the content view of strategy and the process view of strategy (Nielsen, 2005). Although it is a very straight simplification that the scholar himself also accepted, it provides a lean basis to discuss and classify the perspectives.

The first one being particularly dominant in industrial economics and marketing literature is the content view of strategy. Alfred Chandler (1962) positioned strategy as a separate business function by declaring "structure follows strategy". More studies done on this where Andrews (1971) added internal strengths and weaknesses and external opportunities and threats. Trying to identify successful strategies in advance leads to studies on sustainable competitive advantage (Porter, 1985). The resource-based perspective focused mostly on the internal analysis of the firm (Prahalad & Hamel, 1990). However, this content view of strategy is criticized mostly on its static approach where competition is accepted as a zero sum game and neglecting context and processes of selecting and implementing the strategies (Young, 1995). Content view of strategy accepts knowledge as a firm specific and cumulative competence (Nielsen, 2005).

The second one is the process theory where managing change and from an external perspective how companies can compete is dealt with. Mintzberg (1996) is one of the leading scholars discussing that the speed of change is too much for companies to adapt their strategies on a content-based analysis and instead have to be more action-oriented (Nielsen, 2005). Resulting from tremendous developments in information technologies, strategy focus evolved on flexibility and new process-oriented tools like Kaplan & Norton's (1992) balanced scorecard, Champy & Hammer's (1993) business process reengineering, Barney's (1995) VRIO framework, even game theory and network theory (e.g., Axelrod, 1984, Powell & DiMaggio, 1991). The process approach is criticized mostly on the lack of attention to the synergistic effects and the granted resources and capabilities supplied by the network partners Dagnino (1999). Table 2.6 (Nielsen, 2005) compares these strategic management perspectives.

Table 2.6 - Comparison of Strategic Management Perspectives (Nielsen, 2005)

	Content View	**Process View**
Unit of Analysis	Competencies Resources Capabilities	Structures Processes Relationships
Level of Analysis	Firm Industry	Firm Networks/Systems
Strategic Behavior	Rent-seeking Resource-protecting	Rent-seeking Efficient Economizing
Knowledge Management View	Knowledge as resource Knowledge as competence	Knowledge as process Knowledge as universal, objective and transferable asset
Main Criticism	Static Process-lacking Context-lacking Zero-sum Protectionist	Somewhat static Content-lacking Lack of attention to endowment of resources and capabilities
Major Contributors	Penrose (1959) Chandler (1962) Andrews (1971) Buckley & Casson (1976) Wernerfelt (1984) Williamson (1985) Porter (1985) Prahalad & Hamel (1990)	Axelrod (1984) Mintzberg (1989) Prahalad & Hamel (1990) Powell & DiMaggio (1991) Kogut *et al.* (1992) Barney (1995) Gulati (1995) Bartlett & Ghoshal (1996)

2.3.4 Knowledge Management for Competitiveness

The true power of knowledge lies in its ability to positively influence and enable the business strategy (Snyman and Kruger, 2004). Synergy between the business strategy and the knowledge management strategy is thus essential. Knowledge should be accepted as one of the most strategic resources of itself, which should result the firm's business strategy to reflect the role of knowledge in helping the firm to compete (Zack, 2002). The true core competence of the organization which provides sustainable competitive advantage lies in its management capability to create relevant organizational knowledge (Nonaka, 1991).

Knowledge management is essentially a strategic tool, because it can be a key resource for decision making, mainly for the formulation and evaluation of alternative strategies (Carneiro, 2000). Any organization should align its knowledge management strategy in

accordance to its mission and objectives. Yim *et al.* (2003) argued this as to have the goals and strategies of knowledge management to be reflective of those of an organization. Knowledge drives strategy and strategy drives knowledge management (Tiwana, 2000). When both business and knowledge management strategy is clearly established; a long-lasting competitive advantage is achieved (Bater, 1999).

Every business organization seeks three goals; to survive, to grow and to be profitable (Porter, 1985). In order to achieve them, they seek at least one competitive advantage and achieve it by competing in one of two ways; being a low-cost producer of goods and services or differentiation of a product or service. By the help of the developments in information and communication technology, companies become more innovative. They have the chance to focus more on the market forces that favor them in competitive environment while having the benefit of both being low cost and differentiation. Accordingly, internal competence including the managing of information was one of the crucial contributors to competitive advantage (Porter, 1985). Organizations should have higher levels of information and intelligence in order to cope with the changing environmental factors such as competition, globalization and technology. Organizational knowledge and competence are forms of strategic assets that enhance the organization's long term adaptation to the environmental changes (Winter, 1987).

In order to have a competitive advantage, resources that are difficult to replicate are required. Davenport and Prusak (1998) mentioned that, in a knowledge-based view of the firm, knowledge is identified as the organizational asset that enables sustainable competitive advantage especially in highly competitive environments. Alavi (1999) accepted this as a fact that barriers exist regarding the transfer and replication of knowledge, thus making knowledge and management of strategic significance.

Knowledge is the only source for innovation and sustainable competitive advantage (Synman and Kruger, 2004). Companies can provide more value to their customers with respect to their competitors when they have a superior knowledge which enables them to be able to coordinate and combine their traditional resources and capabilities in new and distinctive ways (Zack, 1999). The competitive advantage provided by any technology, market share, product, or any other means will be temporary as they can all be copied

(Tiwana, 2000). However, knowledge is the only resource that can not be copied as it is protected by context. This is also supported by Zack (1999) as competitors have to engage in similar experiences in order to acquire similar knowledge while it takes time to acquire knowledge through experience. Competitors are limited too in how much they can accelerate their learning through greater investment.

One of the major distinctions of knowledge from material assets are that, unlike them they do not decreased as they are used, but instead increase. As knowledge is shared, the originator still keeps it while the receiver has the chance to enrich it, which in turn, ideas breed new ideas. A knowledge-based competitive advantage is sustainable because the more a firm already knows, the more it can learn (Cohen and Leventhal, 1990).

In order for organizational resources to become a source of sustainable competitive advantage, certain characteristics must be present (Barney, 1991). On the one hand, these resources must be rare, valuable, without substitutes and difficult to imitate. Moreover, Dierickx and Cool (1989) suggested the following characteristics:

1. They cannot be commercialized as they are developed and accumulated within the company
2. They display a strong intrinsic character as well as social complexity
3. Their origin lie in organizational skill and learning
4. They should be strongly linked to the firm with a high component of immobility
5. Their development is being conditioned on the level of learning, investment, stocks and previous activities.

2.4 New Product Development

The advantage of new products in competition is far more important than marginal changes in prices of existing products (Schumpeter, 1939). Product development is regarded as "*particularly for firms in either fast-paced or competitive markets; among the essential processes for success, existence, and renewal of organizations*" (Brown and Eisenhardt, 1995).

New product development (NPD) is the process by which an organization utilizes its resources and capabilities for the invention of new product or improvement of an existing one (Cooper, 2003). To decrease cycle time and development costs, project teams which perform NPD deal with pressure without sacrificing innovation as characterized by a faster, better and cheaper philosophy (McDonough *et al.*, 1999).

Ansoff's (1957) Product-Market Growth Matrix identifies clearly the variety of growth options available to a business. Figure 2.7 illustrates the key variables that enable a business to grow indicated as an increase either in market opportunities or in product opportunities where NPD is one of the four available options.

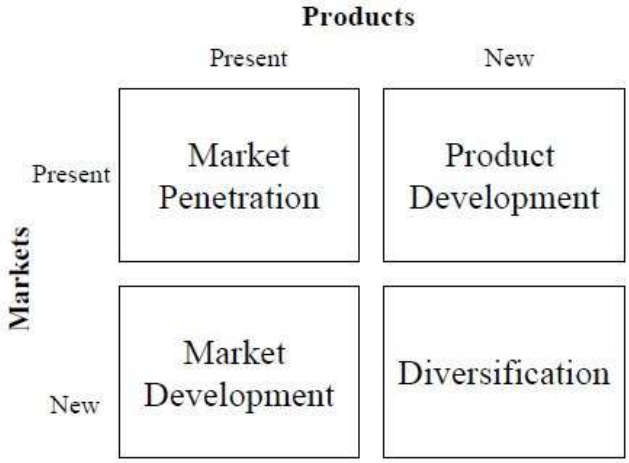


Figure 2.7 - Product-Market Growth Matrix (Ansoff, 1957)

A product has many dimensions Figure 2.8 (Trott, 2002) which can be identified as: quality specifications, price, packaging, features, technology, level of service, brand name (Trott, 2002). It is theoretically possible to name a product "new product" by altering at least one of these dimensions. In fact, it is not easy to define if a product is actually new, so long as it is perceived to be new, it is new (Rogers and Shoemaker, 1971). Table 2.7 (Trot, 2007) shows the classifications of new products.

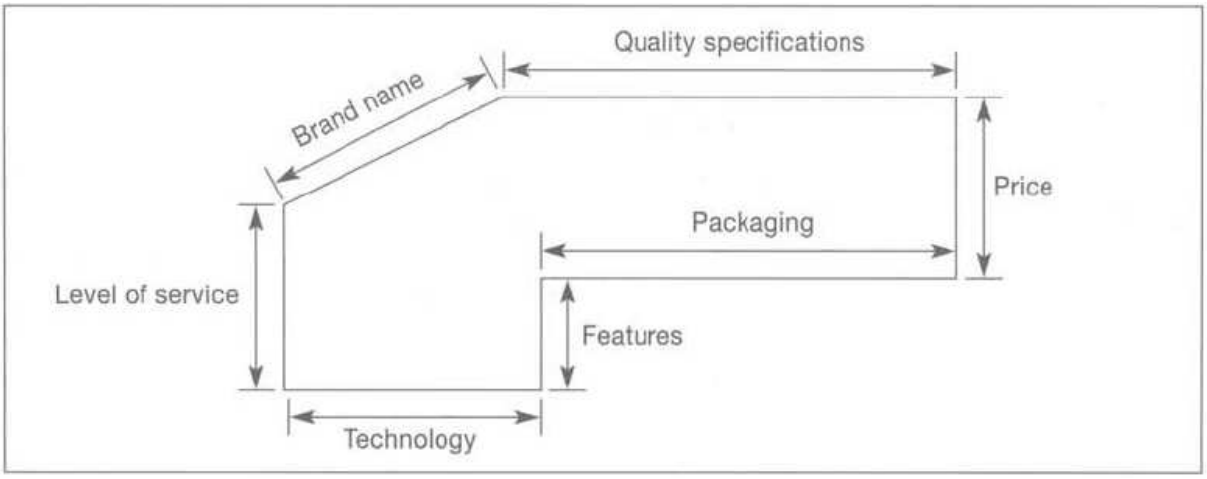


Figure 2.8 - Dimensions of a Product (Trott, 2002)

Table 2.7 - Classifications of New Products (Trot, 2002)

New to the world products	Sony - Walkman, 3M - Post-it Notes
New product lines (new to the firm)	Canon - paper copying machines
Additions to existing lines	HP – Color ink-jet printers
Improvements and revisions to existing products	HP – Color ink-jet printers
Cost reductions	
Repositionings	Aspirin

Many models were formed to identify the processes of NPD which attempted to capture the key activities involved in the process, from idea generation to commercialization of the product (Trott, 2002). Figure 2.9 (Trott, 2002) illustrates one of these models in an eight-stage linear model.

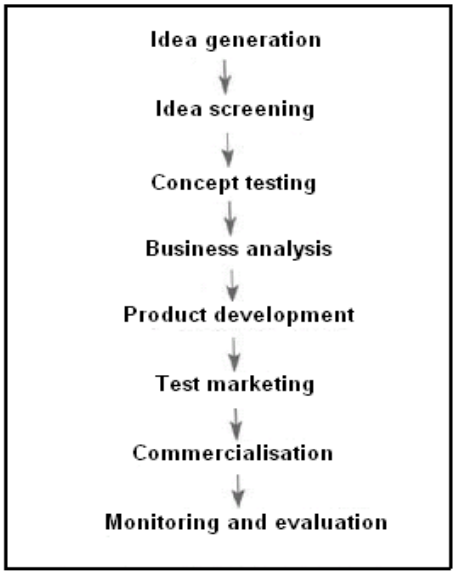


Figure 2.9 - Commonly presented linear NPD model (Trott, 2002)

Liu *et al.* (2005) divided the steps during new product development into four:

1. conception generation, which converts the information needed by the customer into a conception statement;
2. product planning, development performance, cost, form, and other objectives per the product conception;
3. product engineering, converting the product objectives into detailed drawings;
4. manufacturing engineering, designing the work flow, tools/equipment, procedures for part processing, etc., per the engineering drawings.

The Lean Aerospace Initiative (LAI) Product Development Focus Team proposed a product development process model which consists of the phases of product development and their interfaces, boundaries and outputs (McManus et *al.,* 2001). System-level representation for the product development value stream is provided in Figure 2.10 (McManus et *al.*, 2001).

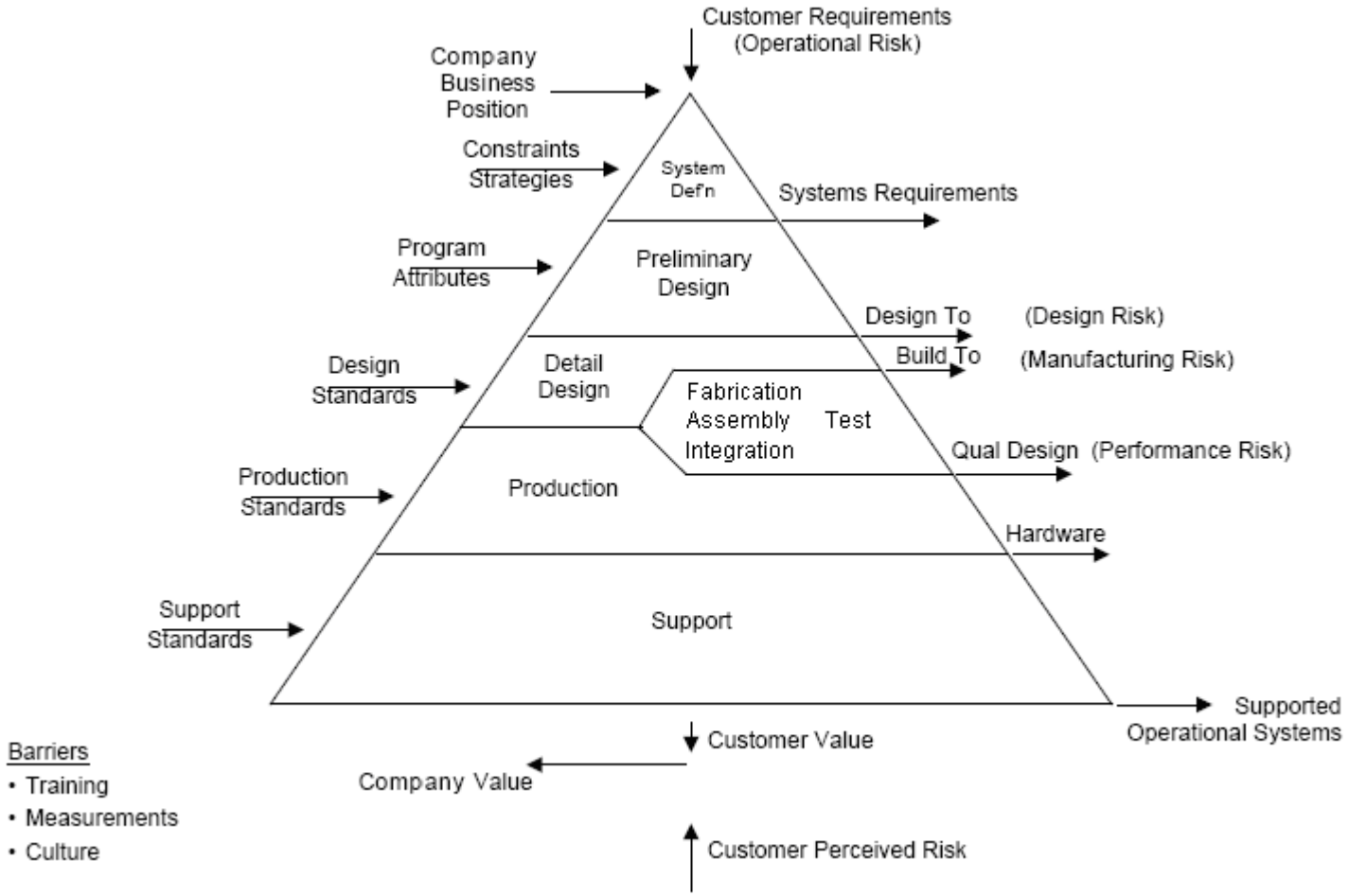


Figure 2.10 - Product Development Process - LAI Value Chain in Product Development (McManus et *al.*, 2001)

Although the product development is divided into sub-program phases, it is actually more advantageous to look at it in terms of product data phases that may or may not overlap with the associated program phase. For the purpose of the model, tasks remain in a common data phase, even though they may be performed during various program phases depending on the business or program. This provides several uses:

1. it provides a common language for communication between the various types of programs.
2. it will provide a means to remained focused on the value stream through the interfaces between the program phases as the process is further decomposed.
3. it will provide a common means for measuring and benchmarking the product development process.

McManus et al., (2001) define some of the methodologies used in mapping the value chain (Figure 2.11). The Value Stream begins with the System Definition phase which has input into it a set of customer requirements (cost, schedule, performance), company business position (desired ROI, portfolio management), and the customer's operational risk position. The indicated constraints are then applied as the customer needs are converted into system requirements.

The Preliminary Design phase takes the systems requirements from the System Definition phase and applies program attributes to develop a design-to package. At this point the operational risk is further defined to include the design risk, or risk that the desired system is not feasible given technological constraints. The activities of this phase must be focused on mitigating this design risk.

The Detailed Design phase takes the design-to package generated in the Preliminary Design phase and applies design standards to develop a build-to package. The design risk defined in the Preliminary Design phase is further mitigated during this process by technology investment and multiple design concepts. With the design risk mitigated, the operational risk is further defined to include manufacturing and performance risk, the risks of being unable to manufacture a product, or that it won't perform as desired. Simulation and analysis are used to mitigate these new risk factors.

The FAIT (Fabrication, Assembly, Integration and Test) phase takes the build-to package generated in the Detailed Design phase and applies prototyping and qualification standards to qualify the design. At this point, the phases begin to become closely coupled. Results of qualification testing are fed back directly into the Detail Design process. This phase also serves as a test bed for the mitigation of the manufacturing and performance risk. A key factor in this risk mitigation is the level and degree to which prototyping is performed, and how these prototypes are used in the actual qualification testing (vs. using production hardware or analytical methods of qualification). The output of this phase is a qualified design.

The Production phase takes the qualified design and applies production standards to generate deliverable hardware. At this point, risk is generally in the form of production yields or rates. The Support phase takes the deliverable hardware and provides the necessary resources to keep the customer's systems operational. The direct outputs of the overall process are customer value (needs satisfied within cost and schedule constraints) and company value (desired profit, portfolio enhancement).

This model is a useful tool as it provides a graphical representation of the key elements of any program that can be used to ensure that activities are focused on maximizing stakeholder value.

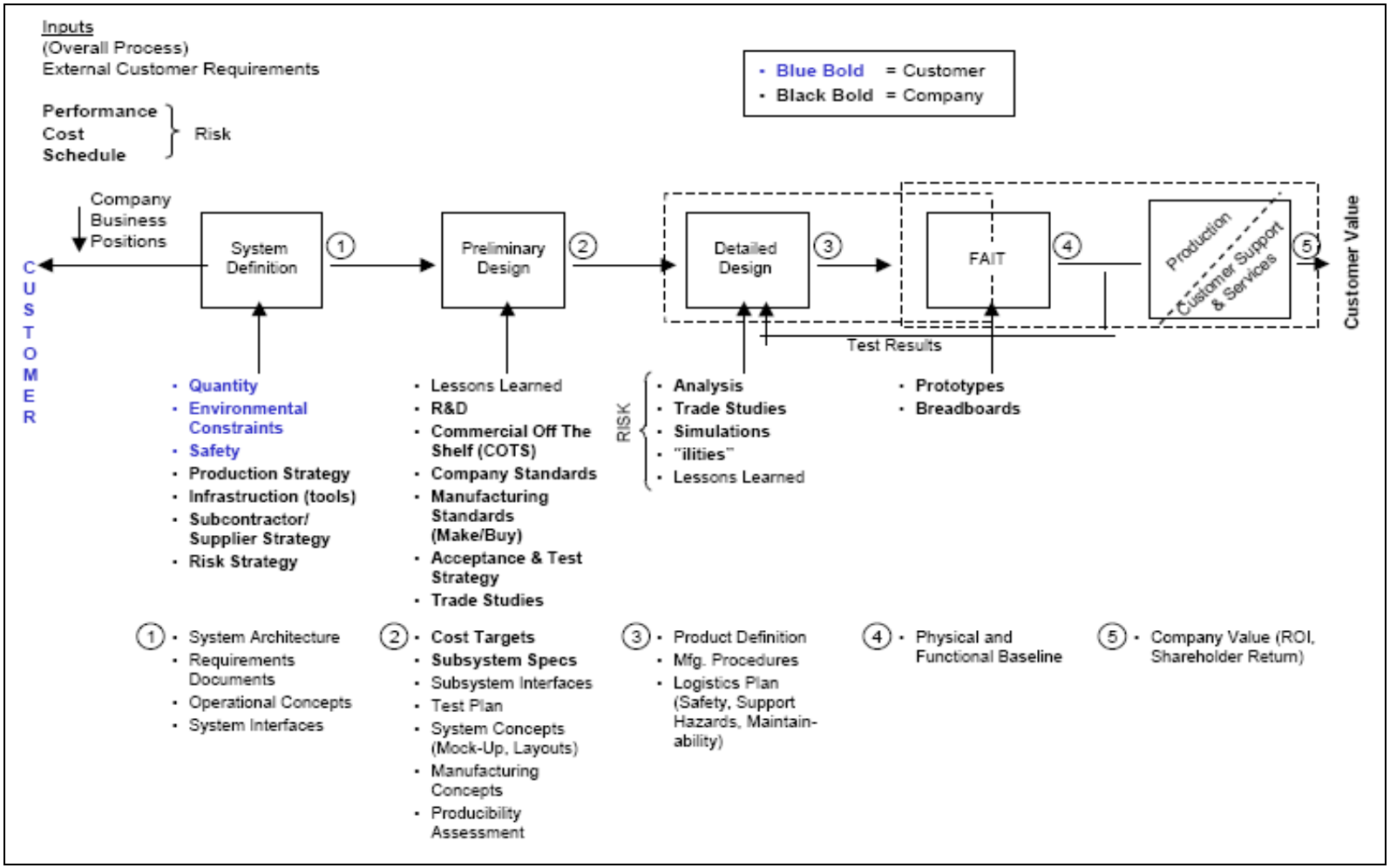


Figure 2.11 - Product Development Process Inputs/Outputs (McManus et *al.*, 2001)

As NPD is viewed mostly from a financial perspective where cash outflows precede cash inflows, Figure 2.12 displays the basic steps and possible cash flow for any NPD process (Trott, 2002).

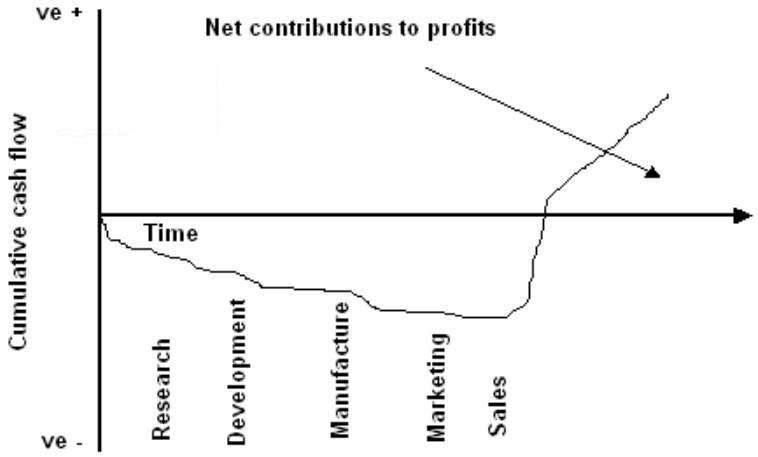


Figure 2.12 - Cash flows and NPD (Trott, 2002)

Cooper (1983) suggested a new product development procedure which covers various activities such as creation, creation dissemination, preliminary product development, economic analysis, product prototype test, pilot run, product mass production and entry to market. According to Clark *et al.* (1987), the new product development process is information processing.

2.4.1 New product development strategy

New product strategy is highly related with marketing strategy, R&D and technology management strategy and in fact as a whole with organization's overall strategy (Trott, 2002). Figure 2.13 illustrates the main inputs into the decision-making process.

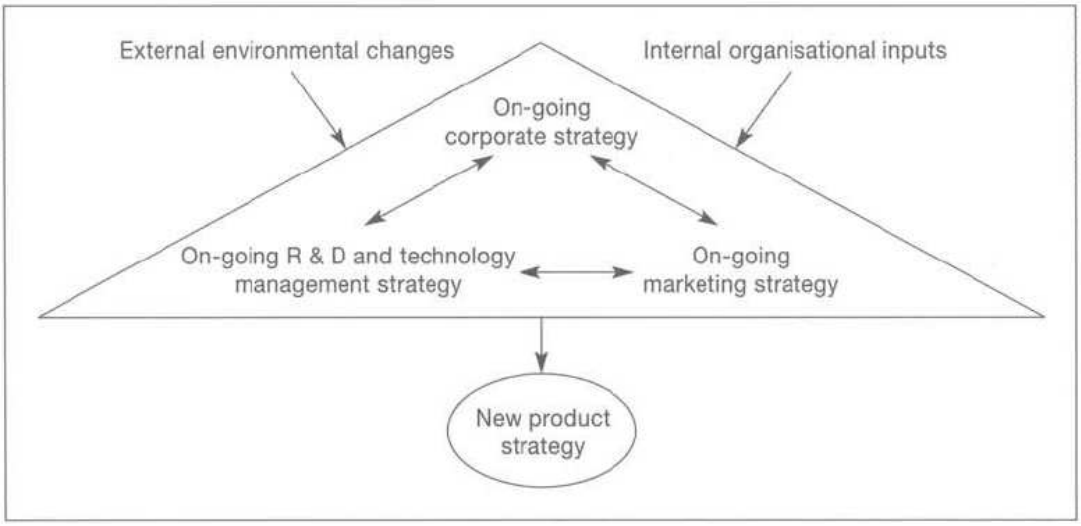


Figure 2.13 - Key inputs into new product strategy (Trott, 2002)

New Product Development (NPD) strategy was divided into three categories based on Ansoff's and Stewart's classification: first to market, fast follower and delayed entrant (Barczak, 1995). Ansoff's product market matrix model was also utilized considering the growing in current market and technology strategy. The results lead to incremental new product development (Song and Montoya-Weiss, 1998). A development strategy that pursues a new market with a new product and technology will create a "real new product". A strategy involving a current market and new product or new market and current product is classified as a moderate innovation. Further developments on Ansoff's directional policy matrix were made where their study for product development strategies replaces Ansoff's product variable with technology (Johnson and Jones, 1957). This study is summarized in Table 2.8Table 2.8 - New Product Development Strategies (Johnson and Jones, 1957). Further classification of the range of options open to a company on product decisions offered which using technology as a variable resulted better illustrates the decisions a company needs to consider.

Table 2.8 - New Product Development Strategies (Johnson and Jones, 1957)

	No Technological Change	**Improved Technology**	**New Technology** to acquire scientific knowledge and production skills, new to the company
No Market Change	Sustain	Reformulation to maintain an optimum balance of cost, quality and availability in the formulae of present products	Replacement to seek new and better ingredients of formulation for present company products in technology not now employed
Strengthened Market to exploit more fully the existing markets for the present company's products	Remerchandising to increase sales to consumers of types now served by the company	Improved product to improve present products for greater utility and merchandisability to consumers	Product line extension to broaden the line of products offered to present consumers through new technology
New Market to increase the number of types of consumer served by the company	New use to find new classes of consumer that can utilize present company products	Market extension to reach new classes of consumer by modifying present products	Diversification to add to the classes of consumer served by developing new technology knowledge

The four new product development strategies defined by Cooper (1984) are as follows:

a. Orientating the enterprise to a new product, which includes; creating a new product, developing a better product than rivals for meeting the customer's demand, and product concentration and differentiation.
b. Market characteristic adopted by the new product; including the characteristics for a new market, customers, competitors and new sales channels.
c. The enterprise's technological orientation and commitment; which is mainly on R&D approach of the company like the percentage of R&D expense to sales amount, company's R&D orientation, etc.
d. Technological characteristic adopted by the new product; mostly on more advanced technologies, highly related with the company's R&D resources, technical maturity and concentration.

A new product development strategy had three aspects (Firth and Narayanan, 1996):

a. new embodied technology;
b. new market applications;
c. innovation in the market.

Based on these aspects, they defined a new product development strategy as

a. innovators;
b. investors in technology;
c. searching for new markets;
d. business as usual;
e. middle-of-the-road.

Three items were defined to form the construction bricks for a new product development strategy (Liu *et al.*, 2005):

a. an enterprise's developing orientation for a new product;
b. market characteristic orientation for a new product;
c. technological characteristics and innovation level for new product development.

2.4.2 New product development performance

Competitive advantage is created through offering products that provide value to customers that is superior to their competitors. Firms compete with one another to capture market segments by offering attractive products and services that enhance customer value. The value of a product or service as perceived by the customer is closely related to customer purchase decisions and this perceived value is the customers' overall assessment of the utility of a product based on perceptions of what is received and what is given (Zeithaml, 1988).

Customer value for a product is the "customers' perception of what they want to have happen in a specific use situation, with the help of a product or service offering, in order to

accomplish a desired purpose or goal." Customer's value depends on the product performance (how well the product meets the customers' expectations) and the product price (what the customer pays for the product offering). Thus for successful performance, the goal of the new product development function of a firm is to enhance customer value by increasing the product performance and decreasing the product price and its value can be assessed along these two dimensions. Zirger and Maidique (1990) examined 330 new products in the electronics industry and showed that product performance and its value to customers significantly affected product profitability.

There is a positive effect on new product development performance for those companies that strongly implement knowledge management method and different new product development strategies taken by companies lead to variations in performance (Liu *et al.*, 2005). Knowledge is at origin of most improvements in customer value (Andersen and Narus, 1998). Its contribution to performance is result of renewing and improving operational competences. Therefore, the organization must use the shared knowledge through product development to provide more valuable products to its customers, and making it harder for them to switch to another supplier. In doing so, organizations need to know about customers' need and foster products that are superior in solving problems for users. It implies using shared knowledge to sense and to act upon trends in the market and generate new strategic opportunities. As result, firms try to do more and better than rivals and to come up with ways to offer customers lower prices or superior quality.

Craven (1998) recognized that the responsibility for creating and delivering superior value does not lie within a firm across different functional departments. Not only customers can be a source of information, but also suppliers linked to the product development process share the responsibility in problem recognition and problem solving. Thus, in order to guarantee better performance and to maximize the fit with customer needs, product development must also take into account the supplier's competences. Successful product developments are those that can find the match between their new developments goals and their suppliers' resources and competences (Schilling and Hill, 1998). The matching of complex customer requirements to suppliers engineering and manufacturing capabilities is fundamental in the generation of customer value. Collaboration and coordination is greatly facilitated when product development integrates common knowledge of both customer

requirements and suppliers capabilities.

In view of this, the outcomes of product development are classified in two categories:

1. process outcomes, which analyze the effectiveness of the product development process in term of teamwork and
2. product *outcomes* concern the characteristics associated with product and its value to customer.

Many researchers argued NPD performance with different parameters. Table 2.9 (Liu et *al.,* 2005).

Table 2.9 - Indexes to Assess New Product Development Performance (Liu et *al.*, 2005)

Authors	**Indexes**
Hopkins (1981)	1) finance evaluation, 2) objectives evaluation, 3) rate for new product accounted for in the gross sales amount, 4) percentage of successful new product development, 5) overall subjective satisfaction scores for new product development
Cooper (1984)	1) overall performance of new product, 2) success rate of new product development, 3) effect of new product on a company
Dwyer and Mellor (1991)	1) assessment of the overall success or failure, 2) profit level, 3) sales goal, 4) opportunities that could be brought by the new product in the future
Calantone *et al.* (1995)	1) ROI - ratio of investment 2) GROI - the investment growth rate 3) ROS - ratio of sales 4) GROS - sales growth rate 5) Market share 6) Growth rate
Song and Parry (1997)	1) overall profit, 2) new product sales compared with competitors, 3) profit rate for new product compared with competitors, 4) new product success compared with the expected profit
Sixotte and Langley (2000)	1) new product life cycle, 2) new product sales and profits, 3) time to market for new product

2.4.3 Relation between KM method and NPD strategy

A new product development strategy is an information processing procedure, i.e. good knowledge management arrangement. The aim in engaging in new product development is to reduce the uncertainty in the course of new product development (Clark and Wheelwright, 1993). Knowledge management integration depends on a wider and trans-functional integration capability. New product development strategy depends on wider knowledge integration to obtain its aims (Clark *et al.*, 1987).

Previous research showed the fact that recording or acquiring the information from past has a significant effect on new product development (Lynn, Simpson, and Souder, 1997). By retrieving and disseminating the information from past projects rapidly and accurately, it can be provided for the performance of product development to be increased (Lynn, Reilly, and Akgun, 2000). New product performance is also affected by the review and utilization of information from past projects (Reilly, and Akgun, 2000). It was found that all these dimensions of knowledge management, which have been researched in combination, influence performance outcomes such as product development cycle time (Sherman, Souder, and Jenssen, 2000).

Companies would achieve better new product development performance if they could react to any fluctuation in the outside environment faster than their rivals (Clark and Wheelwright, 1993). Good strategy flexibility within the enterprise is important for a catalyst to generate a new product R&D concept. For this reason, the efficacy of the knowledge management method is important for new product development strategy.

2.4.4 Relation between KM method and NPD performance

Only companies that pursued the fastest product innovation and possessed the management capability to integrate and allocate internal and external resources would have success in a global competition environment. Therefore, integrating internal and external knowledge in the organization and maintaining good management will lead to a positive effect on new product development performance (Teece and Pisano, 1994).

Knowledge management could be regarded as knowledge integration (Grant, 1996).

Knowledge integration was divided into two: interior and exterior parts. The combination of these two could increase new product performance (Clark and Wheelwright, 1993). Knowledge integration plays an important role as business owners must effectively acquire and integrate external knowledge to develop innovative ideas (Teece *et al.* 1997).

An enterprise with a good capability to absorb market information would reduce market uncertainty (namely external knowledge management), and obtain comparatively high success opportunities. Enterprises with good knowledge management methods will have successful new product development performance (Moorman, 1995).

Some approaches link knowledge management just to technology of information (knowledge management software) and others consider this management like a "philosophy" of the company without practices (Ferrari and Toledo, 2004). They presented a more holistic vision of knowledge management; which structured and balanced many organizational elements that could be analyzed according to the knowledge management vision. Their model is represented in Figure 2.14.

The proposed model of Ferrari and Toledo (2004) was composed of the following elements: principles, contents, processes and infrastructure. They argued these knowledge management elements as essential which should coexist in the organization. They stated the importance of this as: "*It is necessary to develop and to maintain the strengthening principles of knowledge and also to translate them into practical works. The lack of one of them may break the structure of all this management, making it ephemeral, since the organization will only be able to focus on the knowledge "philosophy" or on popular procedures, without any connection to its principles*."

They refer to Nonaka and Takeuchi (1994) on confirming the importance of the leading principles of the knowledge management. The reflection of these principles goes far back to organizational learning theory, with five disciplines proposed by Senge (1990). Senge's (1990) five disciplines are: personal mastery, shared visions, mental models, team learning and systems thinking. Besides these five disciplines, Ferrari and Toledo (2004) emphasized on three more: opening climate, error treatment and sharing culture.

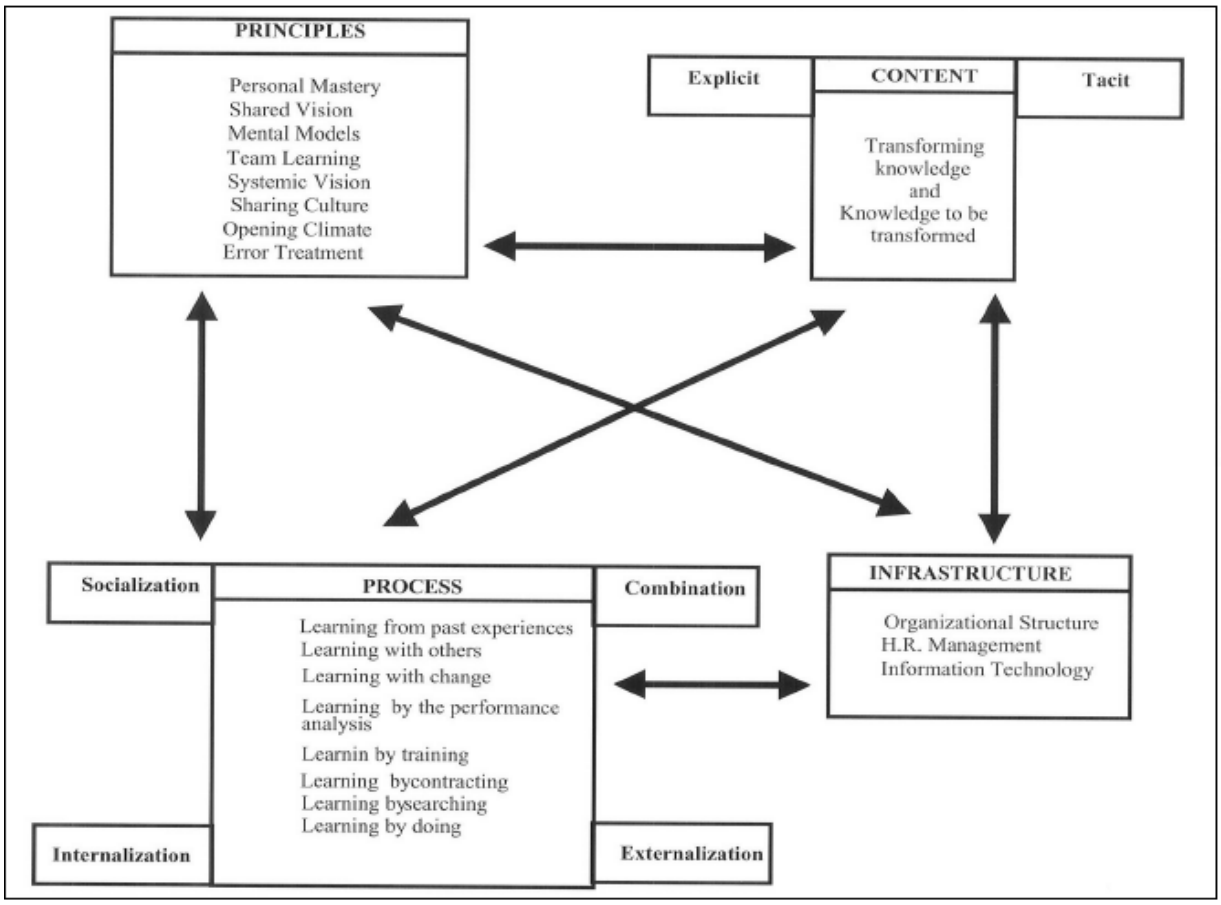


Figure 2.14 - Models of Knowledge Management Analysis (Ferrari and Toledo, 2004)

There are two kinds of knowledge in the processes: the transforming knowledge and the knowledge to be transformed (Ferrari and Toledo, 2004). The process members use the transforming knowledge to transform the inputs into outputs. This can be explained in an example for a sales process; the knowledge of sales techniques can be considered a transforming knowledge.

The knowledge to be transformed is transformed during the process as it goes into the process in an original structure. As an example, in the product development process, the consumers' expectations knowledge, the factory conditions' knowledge, knowledge on contenders, technology, hazards and opportunities, resources, the dissatisfaction with existing products, etc. can be considered the raw material of the product development process, which will be shaped by the transforming knowledge, resulting in the final product of the process. Moreover, these types of knowledge involved in the processes may

be found in tacit or explicit conditions, according to the classification done by Nonaka and Takeuchi (1995).

The processes in the knowledge analysis deals with how knowledge is generated, identified, stored, disseminated, used and discarded in the company (Berchall and Tovstigai 1998). These processes are proposed as:

a. learning from past experiences;
b. learning with others;
c. learning with changes;
d. learning by the performance analysis;
e. learning by training;
f. learning by contracting; and
g. learning by searching (technology transfer).

These processes can be analyzed according to the classification of the knowledge exchange proposed by Nonaka and Takeuchi (1995) where in their study, they had defined in details the differentiation between tacit and explicit knowledge:

a. from tacit to tacit (socialization);
b. from tacit to explicit (externalization);
c. from explicit to explicit (combination); and
d. from explicit to tacit (internalization).

For the infrastructure element, Birchall and Tovstiga (1998) reported that it incorporates all the functional elements of the company that support and facilitate the knowledge management. The scholars focused on the organizational structure, on the human resources management and on the information technology.

A research agenda that was proposed by Cooper (2003) has a framework which consists of an underlying assumption in the application of KMS/CT to NPD where these systems will have a positive effect on the NPD processes, which will in turn lead to improved NPD performance. The scholar argues that there might be frustration traps due to poor

Knowledge Management System (KMS) or Computer Tools (CT) design which in decreases the effectiveness of KMS/CT, and negates the positive relationship between KMS/CT and NPD, and finally has a negative effect on performance. It is also proposed that, systems that have the desired characteristics will over come the "frustration traps" and have a more positive effect on NPD processes and performance (Cooper, 2003). Their model is depicted in Figure 2.15.

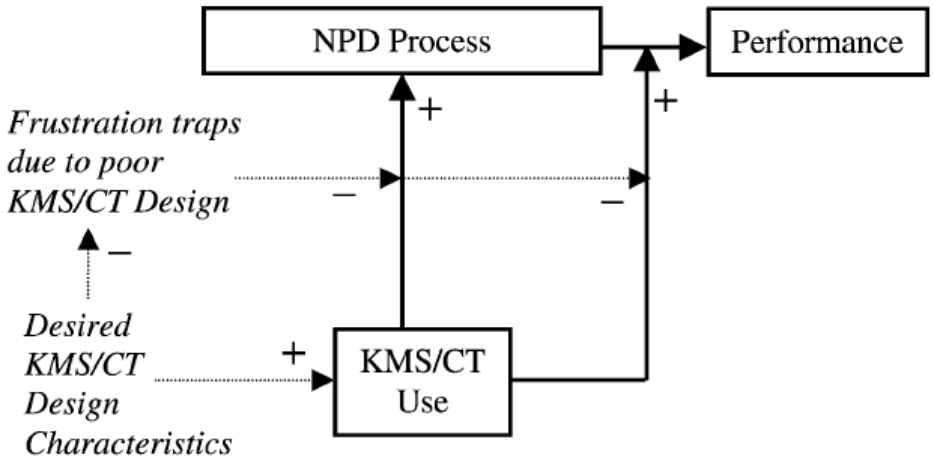


Figure 2.15 - A Model of KMS – NPD Interaction (Cooper, 2003)

In search for evidence to support any of the links in this model, practitioners are welcomed to work under the assumptions embedded in it. His conclusion is that, while the challenges facing practitioners are to build "better" tools, research is needed to identify what "better" means, how to accomplish it, and how to evaluate it. Finally he posed a series of research questions in an attempt to focus research efforts on areas that would be of direct benefit to practitioners creating knowledge management systems and collaborative tools to support risk reduction in new product development.

Although researchers have investigated knowledge management factors such as enablers (influencing factors), processes (KM activities), and performance; still, most current empirical research has explored the relationships between these factors in isolation (Lee and Choi, 2003). These scholars argued on the lack of a direct relationship between knowledge management processes and organizational performance. As many factors

influence the determination of the organizational performance, attempts to trace causality to any single factor such as knowledge process may be risky. In order to understand the effect of the knowledge processes on organizational performance, it is offered to have intermediate outcomes (for example, knowledge satisfaction or organizational creativity). The research framework for studying knowledge management by Lee and Choi (2003) is shown in Figure 2.16.

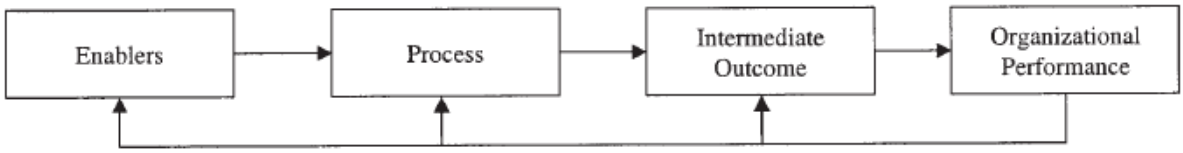


Figure 2.16 - An Integrative Research Framework for Studying Knowledge Management (Lee and Choi, 2003)

The relationships among knowledge management factors were divided into four, depending on how they identify the relationships. These relationships are between:

1. knowledge enablers;
2. knowledge enablers and process;
3. knowledge process and organizational performance; and
4. knowledge enablers, processes, and organizational performance.

The comparison of previous studies is summarized in Table 2.10 and they are also depicted in Figure 2.17.

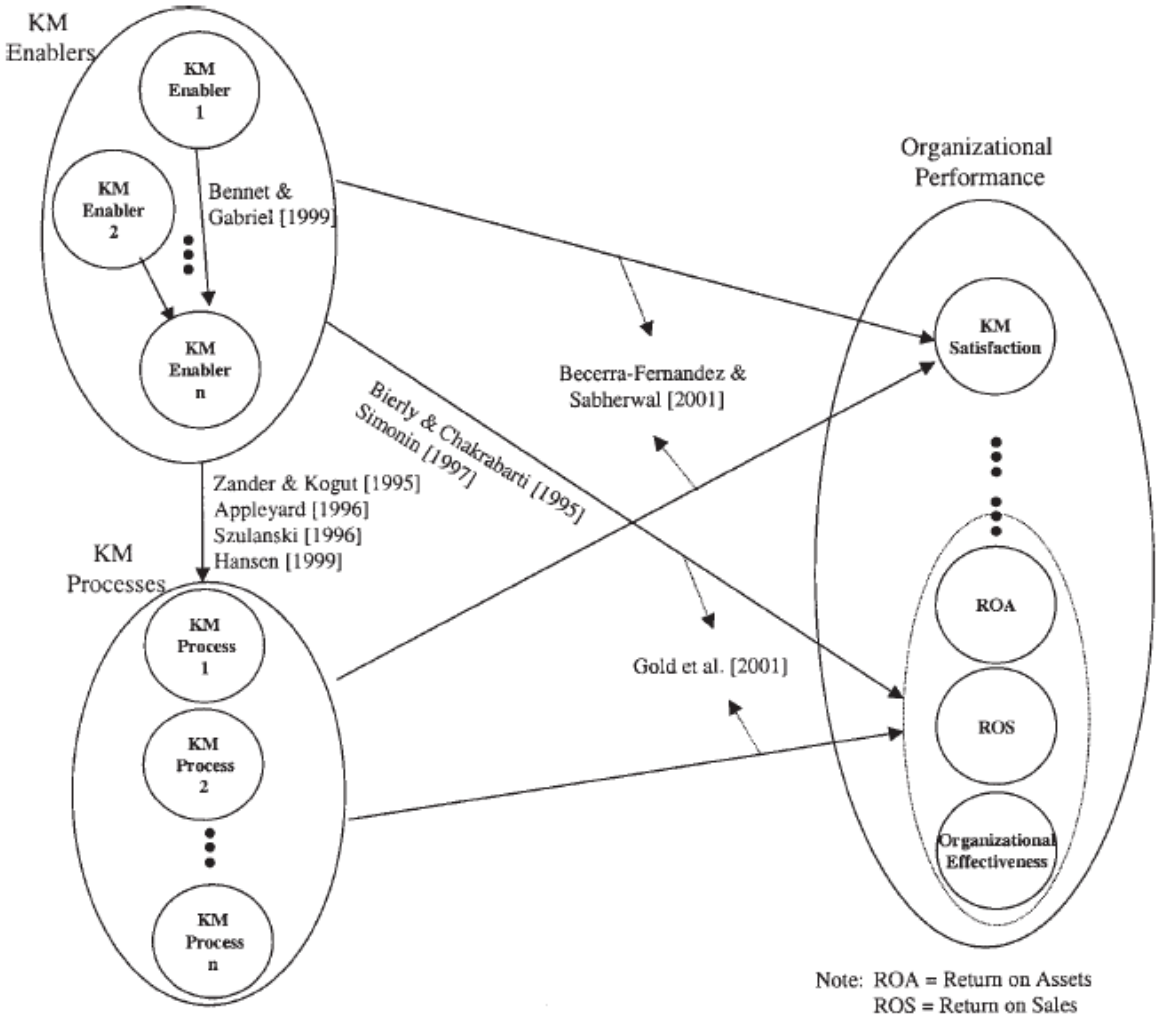


Figure 2.17 - Research Models for Studying Knowledge Management (Lee and Choi, 2003)

Table 2.10 - A Comparison of Previous Studies (Lee and Choi, 2003)

Study	KM enablers	KM processes	Organizational Performance	Findings
Relationship among enablers				
Bennet and Gabriel (1999)	Structure, Culture, Size, Environment, KM method	N/A	N/A	Effect of change-friendly culture on the number of KM methods employed.
Relationship between enablers and processes				
Zander and Kogut (1995)	Characteristics of societal knowledge	Transfer (time to transfer)	N/A	Codifiability, teachability, and parallel development have significant effects on the time to transfer.
Appleyard (1996)	Industry and national characteristics	Transfer (number of times the respondents provide and receive knowledge in a given period)	N/A	Public sources of knowledge are much more prevalent in knowledge transfer in semiconductors than in the steel industry; Public sources of technical knowledge play a larger role in knowledge transfer in Japan than in the United States.
Szulanski (1996)	Characteristics of the knowledge transferred source recipient context.	Transfer (four-stage transfer processes).	N/A	Recipient's lack of absorptive capacity, causal ambiguity and an arduousness of the relationship are the major impediments to knowledge transfer.
Hansen (1999)	Weak ties (distant and infrequent relationships); Knowledge characteristics.	Transfer (percentage of a project's total knowledge that comes from other divisions).	N/A	Weak ties impede the transfer of complex knowledge.

Table 2.11 - A Comparison of Previous Studies (continued)

Study	KM enablers	KM processes	Organizational Performance	Findings
Relationship between enablers and performance				
Bierly and Chakrabarti (1996)	KM strategy	N/A	ROS ROA	Innovators and explorers are more profitable than exploiters and loners.
Simonin (1997)	Collaborative experience Collaborative know-how	N/A	Tangible benefits (ROI, ROA); Intangible benefits.	Collaborative know-how allows firms to achieve greater organizational benefits; collaborative experience alone does not ensure that a firm will benefit from collaboration.
Relationship among knowledge enablers, processes, and performance				
Becerra-Fernandez and Sabherwal (2001)	Task (process or content orientation; focused or broad domain).	Creation (socialization, externalization, combination, internalization).	KM satisfaction	Socialization is suitable for broad and process-oriented tasks, externalization for focused and content-oriented tasks, combination for broad and content-oriented tasks, and internalization for focuses and process-oriented tasks; combination and externalization affect knowledge satisfaction.
Gold *et al.* (2001)	Infrastructure capability (technology, structure, culture).	Process capability (acquisition, conversion, application, protection).	Organizational effectiveness	Infrastructure and process capabilities contribute to the achievement of organizational effectiveness.

To fill the gap between KM factors and performance and interconnect them, a model is developed by Lee and Choi (2003) from a process oriented perspective and then tested empirically (Figure 2.18). The model has seven enablers: collaboration, trust, learning, centralization, formalization, T-shaped skills, and information technology support and emphasizes knowledge creation processes; socialization, externalization, combination, and internalization. Organizational creativity is incorporated into the model to establish credibility between knowledge creation and performance.

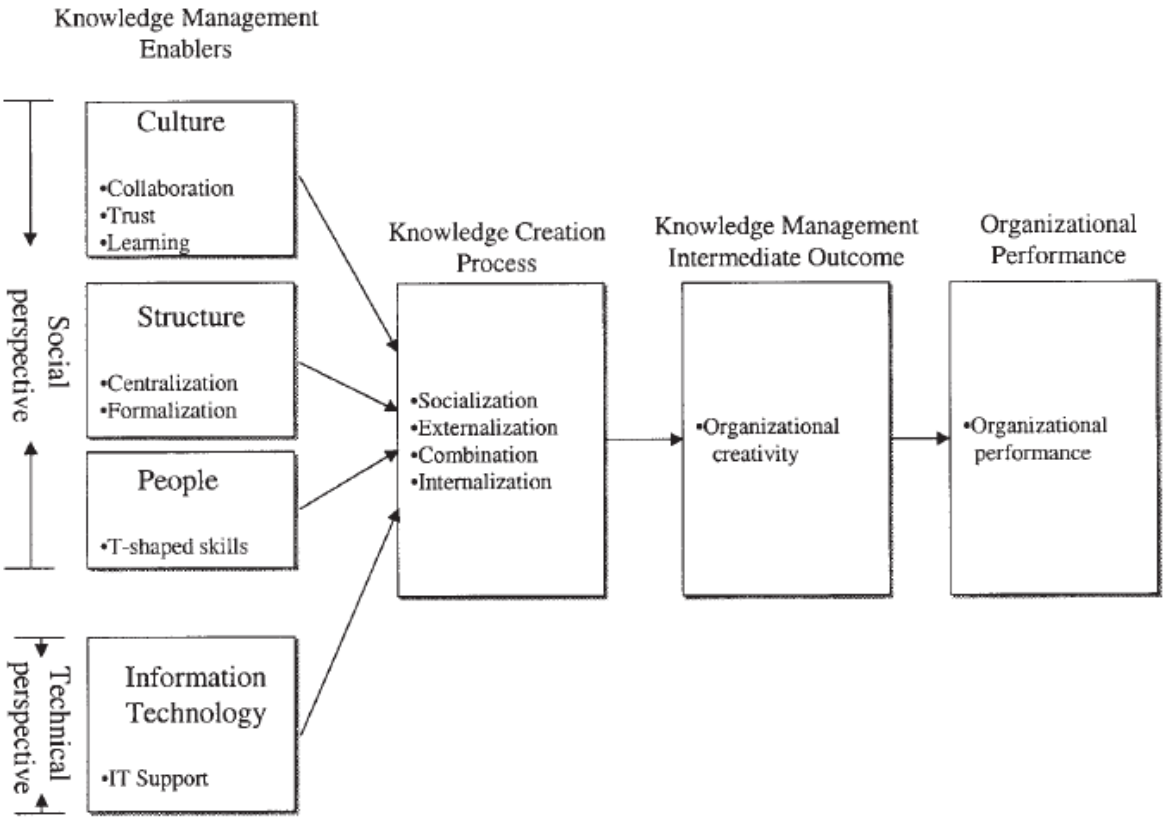


Figure 2.18 - A Model for KM Enablers and Organizational Performance (Lee and Choi, 2003)

Mohrman et al. (2003) derived a structural equation model of the knowledge system for new product development (NPD) from a sample of 1200 engineers in 10 technology firms, and validated on a hold-out sample. Their model has a core of knowledge work behaviors that: (1) expand knowledge relevant to NPD by focusing on the performance of the

organization as a system; (2) increase knowledge available by linking knowledge sources with needs; (3) access procedural knowledge by using systematic processes; and (4) generate knowledge by trying new approaches and experimenting. They examined the organizational antecedents of these behaviors, and their impacts on knowledge outcomes and organizational effectiveness. Their model is depicted in Figure 2.19 Conceptual model **of NPD organization knowledge system (Mohrman et al., 2003)**.

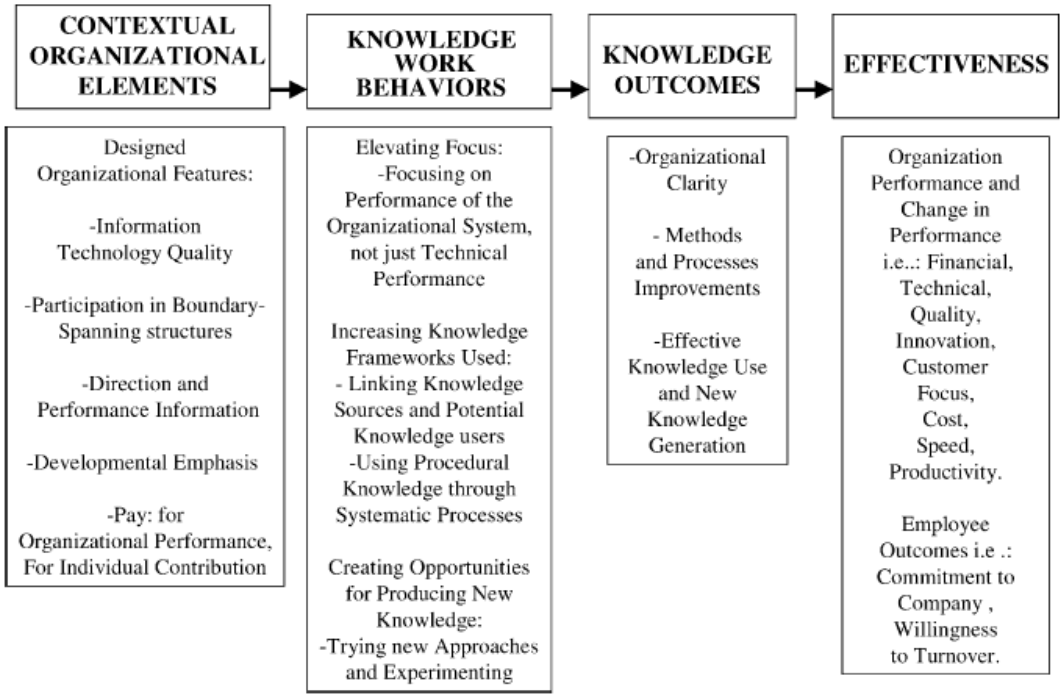


Figure 2.19 Conceptual model of NPD organization knowledge system (Mohrman et al., 2003)

2.4.5 The relation between NPD strategy and NPD performance

The product innovation level is related to performance directly (Kotabe, 1990). As product innovation level gets higher, performance becomes better.

Booz, Allen and Hamilton proposed three new product development cases with seven activities (Davis, 1988). Among them two are failed and one succeeded. Both the two failed revealed that to omit the important developing activities and product test will give rise to failure.

Case studies were done by using 23 variables and eight models to compare each success or failure characteristic among 148 electronic products (Zirger and Maidique, 1990). Its results revealed that a company with excellent R&D organization would have higher success probability in new product development since it completed the development activities.

Any company who wants to succeed integration of all upstream (i.e. design) and downstream (i.e. manufacturing) problems, all design activities must involve the following three capabilities (Wheelwright and Clark, 1992):

1. possessing a keen perception in solving downstream problems;
2. zero-error design;
3. rapid problem solving.

These design capabilities depend deeply on the complete product development activities.

Interviews with higher-level managers from five large companies (i.e. IBM, 3M, Northern Telecom, Emerson Electric) were done where all these companies had performed new product development procedures. All of these managers accepted the positive effect of implementation of new product development procedures (Cooper and Kleinschmidt, 1991).

2.4.6 Knowledge-related challenges in NPD

Obtaining the knowledge which is necessary to address concerns, problems, uncertainties, assumptions, and the relationships between them is difficult in the dynamic world of NPD projects (Cooper, 2003). To acquire some specific piece of knowledge is not essentially a one-time activity, where once acquired, that knowledge is continually available. Instead, it can be forgotten, mis-remembered, or otherwise "de-acquired".

NPD can be defined as a fast-paced, creative process where participants are often switching between high-level conceptual issues and a low-level focus on details. It is an unfortunate reality that in design teams, essential activities routinely "fall through the cracks", documentation lags development, and decisions are made then remade because of an inability to bring all the players together, the introduction of new players, and an inability to remember all the details. Issues are raised and forgotten since attention was diverted elsewhere. Based on sketchy information that is not revisited, decisions are made. Since no one is assigned to follow up on opportunities, they are lost. Research into NPD had showed a number of factors that affect the process in Table 2.11.

Table 2.11 - Factors That Affect NPD Process (Cooper, 2003)

Factors	**Authors**
Technology	Dvir *et al.* (1998), Shenhar (1998), Karlsson and Åhlström (1999), Tatikonda and Rosenthal (2000), Song and Montoya-Weiss (2001)
Product Characteristics	Brown and Eisenhardt (1995), Cohen and Bailey (1997), Cardinal and Lei (2000)
Project Structure	Olson *et al.*(1995), Song *et al.* (1998), Larson and Gobeli (1989)
Team Member Characteristics and Patterns	Katz (1982), Keller (1986), McDonough and Barczak (1992), Ancona and Caldwell (1992)
Team Processes	Katz and Tushman (1979), Dyer and Song (1998), Gobeli *et al.* (1998), Susman and Ray (1999)
Organizational Context	Allen (1977), Keller (1986), Pinto *et al.* (1993), Gerwin and Moffat (1997), McComb *et al.* (1999)
External Environment	Balachandra and Friar (1997), Fox *et al.* (1998), Lynn and Akgün (1998), Souder *et al.* (1998)

Uncertainty exists relative to both possible outcomes and their likelihood of occurring (Cooper, 2003). Projects face the challenge of identifying the factors influencing them relative to uncertainties in: the market (e.g. Fox *et al.*, 1998), the availability and performance of new technology (e.g. Song and Montoya-Weiss, 2001), the cost and availability of components and materials, the validity of assumptions, the interaction effects in tightly coupled systems (e.g. Perrow, 1981), the predictability of system responses under varying input and environmental conditions, the ability of the project team to perform, and the ability of the project to detect problems. Under ideal conditions, it is possible for the project to define all unknowns and perform a risk management program to systematically address them. In fact, projects have limited resources, and therefore must decide which uncertainties to explore and decrease. Both the acquisition of outside knowledge and the development of internal knowledge are crucial to resolving uncertainty efficiently.

2.4.7 Task Uncertainty in the Initiation of NPD

Task uncertainty can be defined as the difference between the amount of information which is necessary to complete a project and the amount of information which is possessed by the project team at the time of the initiation of the project. The process of reduction in uncertainty as the project continues through the development cycle needs the acquisition of information in progress (Tushman, 1979). Information can be obtained by external sources such as customers (Griffin and Hauser, 1993), suppliers (Sherman, Souder, and Jenssen, 2000), competitors (Garvin, 1993; Moenaert and Souder, 1990), professional publications (Rothwell and Robertson, 1973), professional meetings, and professional contacts (Lynn, Reilly, and Akgun, 2000). Also, the relevant members of the product development team from both R&D and marketing can generate information internally. Furthermore, it can be attained to decrease uncertainty by the information acquired from past related product development projects (Meyers and Wilemon, 1989). Through communication with personnel contributing to past related projects from both R&D and marketing, such information may be acquired.

Based on the contingency theory of organizational design, higher levels of integration across functions and the use of modes of integration which have higher potential for the

process of information will facilitate uncertainty reduction. Yet, to achieve the optimal levels and modes of integration will only produce the appropriate structural conditions. What is important is the content of the information that is coordinated, including not only current project information but also information which is acquired from past related product development projects.

Research on individual learning has showed that personally recording information facilitates learning (Hartley, 1983; Kiewra, 1985). Likewise, research on organizational learning and knowledge management in new product development has demonstrated the influence of recording past product development projects on performance (Lynn, Reilly, and Akgun, 2000). Recording does not only include more than technical specifications and engineering change orders; but, it also encompasses information on customer reactions to early product concepts, prototypes, and launched products. Effective recording is very important since it provides a record of information for others to subsequently access and review.

2.5 Business Strategies

Strategy is defined as a set of decision-making rules to guide organizational behavior where "objectives" are represented as the end that the firm seeks to attain and "strategy" as the means to this end (Ansoff, 1957). One of the classical definitions of strategy is: "*determination of the basic long-term goals and objectives of an enterprise and the adoption of courses of action and the allocation of resources necessary for carrying out these goals"* (Chandler, 1962)

Although strategy is defined in various ways there is always a common thread (Mintzberg, 1972). One of the best examples for this is in game theory strategy is a set of rules that governs all moves. According to management theoricians, strategy is often defined as a conscious plan to achieve specific ends. According to Mintzberg (1979) all such definitions treat strategy as an explicit set of guidelines developed in advance of the taking of specific decisions. He defined strategy as "*a pattern in a stream of significant decisions*".

Two main tasks were stressed for managers by Miles and Snow (1984). First one is to develop and utilize a strategy that aligns the organization's capabilities with the opportunities and constraints present in its environment. Second one is to arrange resources internally to support the alignment where both require clear understanding of organizational status in terms of strategy.

Developments in technology and the application areas resulted in redefinition of strategy as the creation of a unique and valuable position, involving a different set of activities (Porter, 1996). From the organizational point of view; strategy is defined as organizational processes which have significant political ramifications within organizations and the broader society (Levy *et al.*, 2001). They introduce strategy as a set of practices and discourses which promotes instrumental rationality, reproduces hierarchical relations of power and systematically privileges the interests and viewpoints of particular groups (Livvarcin, 2007).

In the 1950s a new idea was introduced which shaped the foundations of what we now call SWOT analysis (Selznick, 1957). In SWOT analysis the idea was based on matching the organization's internal factors with external environmental circumstances. As the importance of long term perspective in organizations were emphasized; strategy was stressed to be necessary to give a company structure, direction, and focus (Chandler, 1962).

Chandler's work was built up by adding a range of strategic concepts and inventing a whole new vocabulary by Ansoff (1962). The strategy grid that was developed by this scholar, compared market penetration strategies, market development strategies and horizontal and vertical integration and diversification strategies. The identification of the gap between where we currently are and where we would like to be is called "gap analysis" (Ansoff, 1962). He viewed strategy as the necessary extension of managerial control from the internal to the external environment (Levy, Alvesson and Willmott, 2001)

Management by objectives (MBO) stresses the importance of objectives in organizations. In his classic work, *The Age of Discontinuity,* Drucker (1968) coined the phrases "knowledge society" and "knowledge worker" to explain the concept of intellectual

capital.

By the end of 1970s, Fred Gluck (the head of McKinsey's strategic management practice) and his colleagues sought to loosen some of the constraints imposed by mechanistic approaches by proposing that successful companies' strategies progress through four basic stages that involve grappling with increasing levels of dynamism, multidimensionality and uncertainty and that therefore become less amenable to routine quantitative analysis which can be seen in Figure 2.20 (cited in Ghemavat, 2000).

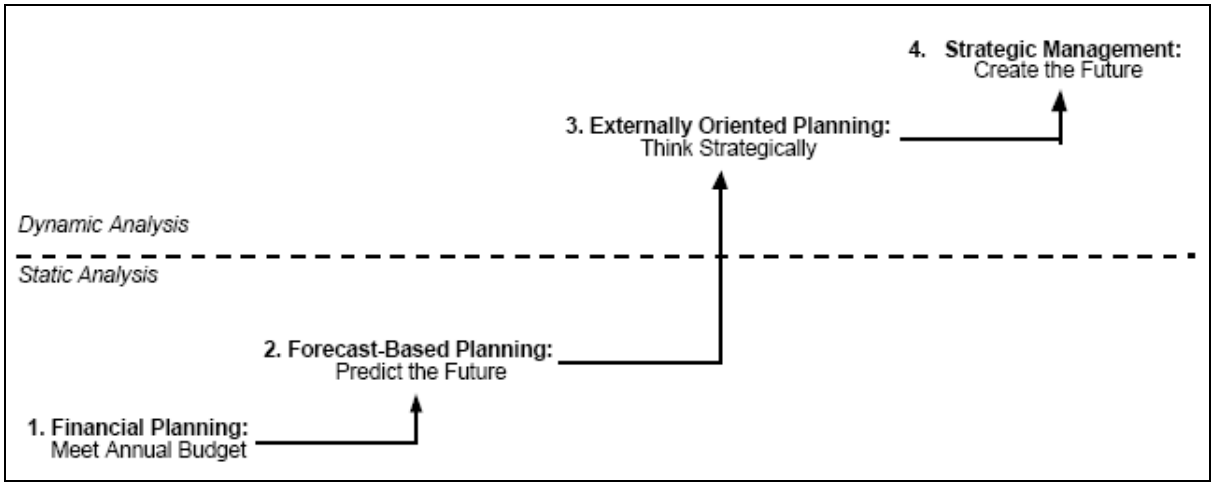


Figure 2.20 - Four Phases of Strategy by Gluck (1979, cited in Ghemavat, 2000)

In search for explaining the success of Japanese management techniques, seven aspects were by Pascale and Athos (1981): Strategy, Structure, Systems, Skills, Staff, Style, and Subordinate goals. The first three factors are called hard factors and existing literature and American companies were excelled. Remaining four factors were called soft factors and were not well understood (Wickens, 1995). Soft factors of Japanese management resemble the Strategy Vector Model approach which takes into consideration the contribution of individuals on organizational strategy and performance (Livvarcin, 2007).

Mintzberg (1987) has defined strategy with five "p"s as a:

1. plan (rules towards goal),
2. pattern (mode of behaviour),
3. position (safe place),
4. perspective (visions and targeting), and
5. ploy (beating the competitors).

Long term planning for competitive position of a firm is named as strategic direction (Hamel and Prahalad, 1989) where they declared that strategy needs to be more active and interactive. According to them small groups are isolated, and lose touch with reality (Hamel and Prahalad, 1994).

One of the most influential strategists of the twentieth century was Michael Porter who introduced many new concepts including; 5 forces analysis (Porter, 1979), generic strategies (Porter, 1980b, 1987, 1996), the value chain (Porter, 1985), strategic groups (Porter, 1998), and clusters (Porter, 1998).

In the late 1990s, the *practice* of strategy lost its simple narrative and complicated by an apparent profusion of tools and ideas about strategy in particular and management in general, many of which are quite historical. Illustration in **Error! Reference source not found.** (Pascale, 1990; cited in Ghemavat, 2000) displays the influence indexes for business ideas, i.e., importance-weighted citation counts.

According to Kaplan & Norton (2000), the capability to enforce business strategy is a more important aspect than the strategy itself.

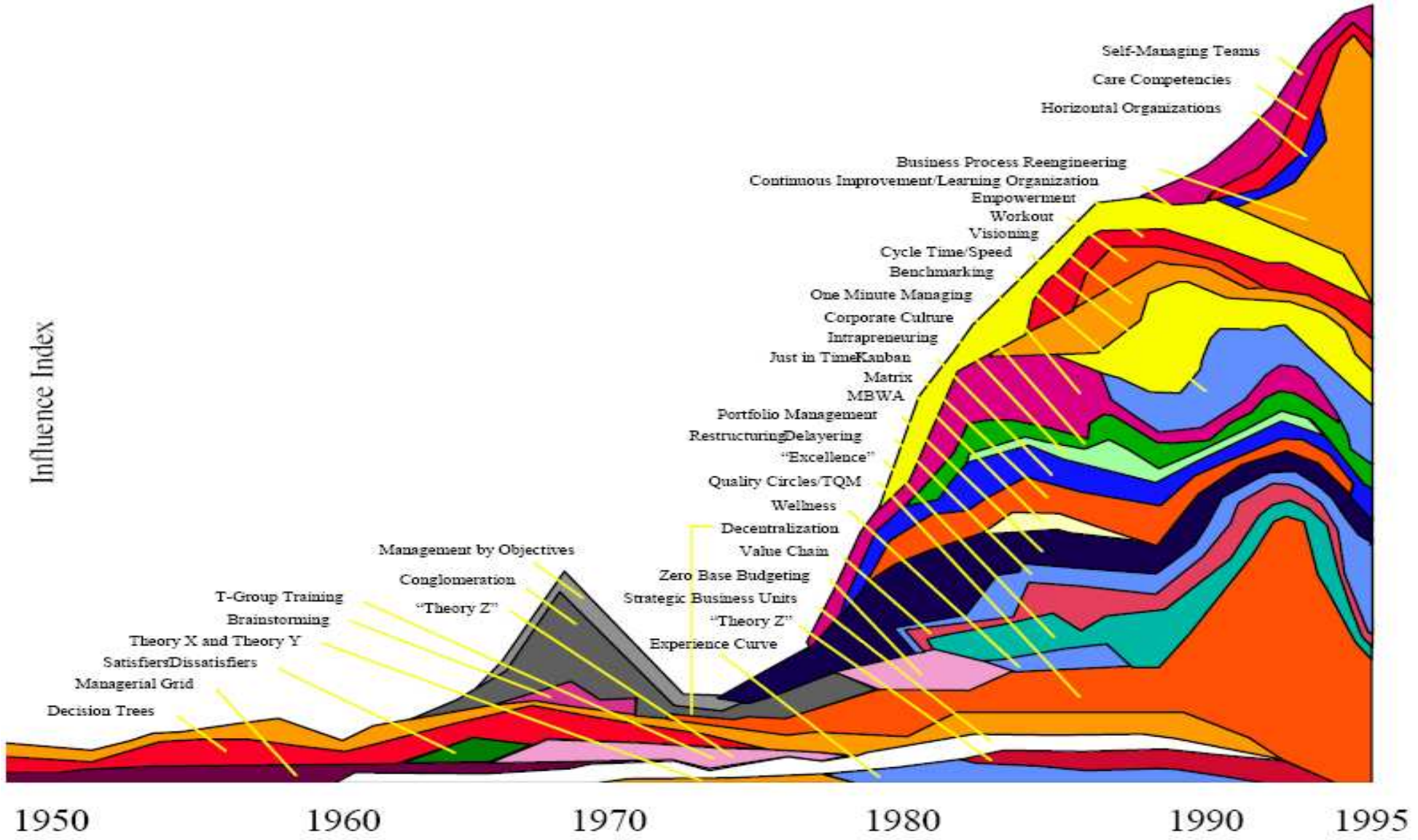


Figure 2.21 - Ebbs, Flows and Residual Impact of Business Fads 1950-1995 (Pascale, 1990; cited in Ghemavat, 2000)

2.6 Market Dynamism

Strategy research has emphasized the influence of environmental variables for a long time (Rosenbloom, 1978; Freeman, 1986). In high technology changing industries, the organizations have to adapt faster to the changing customer demands. In a dynamic global market, the companies will need to develop stronger global market knowledge competencies, especially focusing on the global customer knowledge process and on the global responsiveness in order to succeed. Hence, the environmental turbulence, both technological and market, are expected to have a significant impact on the market knowledge competence development and utilization of the global company (Yeniyurt *et al.*, 2005)

In uncertain environments, small and medium sized enterprises are influenced more from industry characteristics, like technology change or market growth, while, large firms, in contrast, are less driven by such contextual influences due to their market power, resources and external stability (Miller and Friesen, 1977; Miller, 1987).

A longstanding question in strategy and organizational theory is how the amount of organizational structure shapes performance in dynamic environments (Davis et al, 2007). In literature we have many researches on this issue that highlight a fundamental tension between possessing too little and too much structure (Burns and Stalker, 1961; Henderson and Clark, 1990; Uzzi, 1997; cited in Davis *et al.*, 2007). Organizations that have little structure can not manage to guide efficiently in generating appropriate behaviors (Weick, 1993). On the other hand, organizations that has too much structure too much constrained without enough flexibility (Siggelkow, 2001). This fundamental tension results in a dilemma for organizations competing in dynamic environments as success in these settings demands both efficiency and flexibility (Davis et al, 2007). Still, regarding to studies done, high performing organizations resolve this tension by using a moderate amount of structure to improvise a variety of innovative solutions (Brown and Eisenhardt, 1997).

Dynamism refers to the rate of change, absence of pattern and unpredictability of the environment (Dess and Beard, 1984). Dynamism is explained as a combination of instability and uncertainty (Tagerden *et al.*, 2003).

Many studies have been done on the influence of environment on organizational strategies, structures, processes and outcomes (Gilley *et al.,* 2004). A study done by these scholars on 86 small manufacturing firms highlighted that higher level of perceived environmental dynamism reduce the flexibility of businesses as they are discouraged from making managerial and financial commitments. The environmental dynamism is thus characterized as threatening, complex and risky.

Information transfer and telecommunications have high technological advances which constitutes one of the main sources of uncertainty in existing environments (Prastacos *et al.*, 2002). By the help of new technological developments, information and communication flows can take place in an immediate pace. This results in shorter product life cycles, quickly invalidated patents to protect new technology, faster new product development and adapting to each customer more quickly (Hitt *et al.*, 1998).

Globalization is another important source of dynamism in existing environments. It affects multinational firms as well as local companies. On the other hand, global market conditions generate more opportunities, threats and challenges for organizations. The pressure of global competition is expected to increase in the twenty-first century (D'Souza and Williams, 2000). The evaluation of organizational performance gets more complicated as organizations have to learn to coordinate activities across national borders, must assume that customers' preferences and demands differ between countries, which results it more difficult to identify and analyze competitors (Hitt *et al.*, 1998).

Multiple events cause dynamism (Milliken, 1990; Sutcliffe and Zaheer, 1998). It is a consequence of a set of primary uncertainties that refer to exogenous variables, such as changing customer preferences or the appearance of new technologies. In addition to this, the level of dynamism is determined by the existence of competitive uncertainties (Dudaroglu, 2008). Organizations have to pay attention to both strategies implemented by existing competitors that can rapidly provide substitutes or technologically advanced products, and to the actions of new participants in the market, relationships with subcontractors, suppliers and distributors.

Actions carried out by certain existing firms in competitive environments can cause to dynamism. Degree of uncertainty and degree of munificence/hostility reflect the environmental characteristics (Elbanna and Child, 2007). Frequent discontinuities in the market conditions affect firms' competitiveness negatively (Hitt *et al.*, 1998).

Market dynamism is related to the rate of change of the customer preferences, market segments, and demand patterns (Javorski & Kohli, 1993; Narver & Slater, 1990). It can be described as the rate of changes in competitive conditions associated mostly to customers' demand (Simon *et al.*, 2002). Market dynamism is the result of factors such as rapid shift in technology, price, and variance in product availability and support services (Cannon *et al.* 2000).

The degree of market dynamism ranges from moderately dynamic to high-velocity markets (Eisenhardt and Martin, 2003). Moderately dynamic markets have relatively stable industry structures in which competitors, customers, etc., are well known but roughly predictable and change occurs frequently. High-velocity markets have ambiguous industry structure, blurred boundaries, ambiguous and shifting players, nonlinear and unpredictable change.

Characteristics of the market dynamism result in high product variety and high demand uncertainty (Sharma *et al.*, 2004). The study investigates the inter-relationships between market dynamism, manufacturing flexibility and type of automation components in 24 manufacturing firms in the automobile industry and 15 manufacturing firms in the machine tools industry in India. The characterized market dynamism by these scholars is as follows:

1. High rate and variety of NPD,
2. Shifts in demand of different models,
3. Shifts in total demands,
4. Shifts in customers' loyalty,
5. Fast changing technology, etc.

Market dynamism is a heterogeneous flow of opportunities and has four dimensions which affect performance (Davis et al, 2007):

1. Velocity: the pace of opportunities flow into a given environment
2. Complexity: the degree to which environmental opportunities have many features that must be successfully dealt with by the organization
3. Ambiguity: the degree to which the key features of opportunities are difficult to interpret
4. Unpredictability: the degree to which past opportunities are dissimilar from present ones and so are unforeseeable.

In such complex and dynamic environments, managers have to make paradigm shift to guide their organizations. They are also aware that imputing linear and rational attributes to non-linear problems will lead to erroneous strategic actions as long as the new challenges are complex and non-linear (Hitt *et al.*, 1998). This results in emerging new principles for managing firms where time frames for strategic decisions are narrower. Market dynamism does not only affect organizational decisions and activities, but also the nature of work in organizational and environmental contexts (Morris, 2004).

2.7 **Firm Performance**

Performance is central to the study of business strategies or policies (Dudaroglu, 2008). Success of a firm is contingent to multiple determinants. Type of an industry, competitive intensity, technological shift, degree of flexibility, changing customer demands in domestic and in international markets make the evaluation of firm performance more complicated (Hitt *et al.*, 1998). There are three major approaches that were used to measure organizational performance in the literature. These are:

1. goal approach (Etzioni, 1964; cited in Hitt *et al.*, 1998)
2. system resource approach (Yuchtman & Seashore, 1967; ; cited in Hitt *et al.*, 1998)
3. constituency approach (Thompson, 1967; cited in Hitt *et al.*, 1998)

The goal approach measures the performance by the explicit goals such as profit, sales growth, etc. The system resource approach measures the performance in terms of the key

internal and external factors upon which the firm depends for survival. The constituency approach measures the performance as the degree of fulfillment of constituent needs (Dess & Robinson, 1984).

Firm performance is considered as an important parameter when investigating organizational structure, strategy, and planning (Dess and Robinson, 1984). It is a multidimensional construct which can be measured by many different tools. Firm performance may be defined as the degree to which companies achieved its business objectives (Elenkov, 2002). It may be measured in terms of organizational learning, profitability, or other financial benefits in knowledge management (Simonin, 1997; Davenport, 1999).

Performance is conceptualized in three dimensions as effectiveness, efficiency and adaptiveness (Ruekert *et al.*, 1985). Effectiveness considers the degree to which the goals are reached. Efficiency focuses on the relationship between outputs and the inputs required to reach those outputs. Adaptiveness reflects the ability of the organization to adapt to environmental changes. Efficiency is associated with profitability; effectiveness is associated with achieving non-financial goals, and adaptiveness is associated with adaptation to changes (Homburg *et al.*, 1999).

Dimensions of firm performance are classified as financial, operational, and organizational (Hart, 1992. Financial performance includes return on investment, return on sales, return on equity, earnings per share, and sales growth. Operational performance includes new product development and marketing effectiveness. Organizational performance reflects broad organizational outcomes and capabilities such as employee satisfaction and organizational focus on quality or adaptability (Tagerden *et al.*, 2003).

Many researchers agreed that “hard” measures, such as economic measures, were more reasonable for use in measuring a firm’s performance than subjective measures. Some scholars suggested that the use of hard measures increased the level of confidence in the reported relationships and was more meaningful to managers than soft measures. Several financial performance measures are return on sales (ROS) (McDougall *et al.*, 1994); return on assets (ROA) (Roth & Rick, 1994); the percentage of annual change in sales

(McDougall *et al.*, 1994); and the percentage of annual change in profits. ROA is a presumed aim of most businesses and is a measure often used in researches (Hambrick, 1983).

Yılmaz *et al.* (2004) distinguished between the performance components that relate to external organizational outcomes, i.e., financial, production/service and market performance (profitability, cost, quality, flexibility, sales growth, and market share), and internal organizational processes, i.e., qualitative firm performance (quality improvements, innovativeness, employee satisfaction, and employee commitment).

Knowledge Management directly influences human behavior and through that company performance (Corso *et al.*, 2005). To be useful, knowledge must be distributed; only that way can it increase company performance in the market place (Demarest, 1997). Next, all the project team's experience and company knowledge are used to define exactly what is required from the new business system. Broadly speaking, the information system has to provide information at both the strategic and operational levels. Strategic information is used to measure company performance and determine business objectives and plans (Fisher and Kenny, 2000).

Based on Ulusoy *et al.*'s (2008) study, the performance indicators are divided into three sub-groups in this study; namely market performance, new product development performance, and financial performance.

Market performance of a company is described by profitability, sales growth, and market share by some scholars (Yilmaz, Alpkan and Ergun, 2005), while it is described by sales growth, market share, market development and a new product development constructs by some others (Sarkar, Echambadi, Harrison, 2001).

Only companies that pursued the fastest product innovation and possessed the management capability to integrate and allocate internal and external resources would have success in a global competition environment (Teece and Pisano, 1994). Therefore, integrating internal and external knowledge in the organization and maintaining good management will lead to a positive effect on new product development performance. Knowledge management could

be regarded as knowledge integration (Grant, 1996). Knowledge integration is divided into interior and exterior parts (Clark and Wheelwright, 1993). The combination of these two could increase new product performance. An enterprise with a good capability to absorb market information would reduce market uncertainty (namely external knowledge management), and obtain comparatively high success opportunities (Moorman, 1995).

While the effective coordination between R&D and marketing is necessary in order to develop the optimal product design, this may be a necessary but not sufficient condition. In order to achieve higher levels of performance in new product development (NPD), what also is needed is the integration of knowledge (or information) from past product development projects (Adams, Day, and Dougherty, 1998).

Indexes with respect to scholars on NPD performance are presented in Table 2.9 (Liu et *al.*, 2005).

3 PROPOSED RESEARCH MODEL

3.1 Conceptual Model of the Research

Many approaches about knowledge management are presented in the theory and in the organizations (Ferrari and Toledo, 2004). Many researchers have emphasized three major factors for managing knowledge: enablers, processes and organizational performance (Demarest, 1997; Beckman, 1999; O'Dell and Grayson, 1999). Some approaches link knowledge management just to technology of information (knowledge management software) and others consider this management like a "philosophy" of the company without practices. Many factors influence the determination of organizational performance while attempts to trace causality to any single factor such as knowledge process may be risky (Lee and Choi, 2003). In order to understand the effect of the knowledge processes on organizational performance, it is offered to have intermediate outcomes (for example, knowledge satisfaction or organizational creativity). This study focuses on NPD Capability as an intermediate outcome.

3.1.1 Perceived Company Performance

Organizational performance may be defined as the degree to which companies achieved its business objectives (Elenkov, 2002). It may be measured in terms of organizational learning, profitability, or other financial benefits in knowledge management (Simonin, 1997; Davenport, 1999).

Knowledge Management directly influences human behavior and through that company performance (Corso *et al.*, 2005). To be useful, knowledge must be distributed; only that way can it increase company performance in the market place (Demarest, 1997). All the project team's experience and company knowledge are used to define exactly what is required from the business system. Broadly speaking, the information system has to provide information at both the strategic and operational levels. Strategic information is used to measure company performance and determine business objectives and plans (Fisher and Kenny, 2000)

There are several measures of customer acceptance in the new product development literature such as customer acceptance, customer satisfaction, attainment of revenue goals, revenue growth, attainment of market share goals and unit sales goals (Griffin and Page 1993). In this research, customer satisfaction, total sales, market share, profit with respect to Total Sales, profit with respect to total assets, and general profitability of the firm are used to measure the level of perceived company performance.

Market share is one of the widely used measures of new product performance in the literature (Griffin and Page 1993 & 1996) and the search for new markets (Gupta and Wilemon 1996) along with strengthening existing markets is one of the primary motivations for new product development. The competitive position of a firm is determined by its market power as defined by the share of the market it commands. Higher market share enables firms to charge higher prices, achieve economies of scale, erect entry barriers through advertising, distribution and shelf space, and reduce competitive activity, resulting in higher profitability (Porter, 1980). The success of a product or service in the market depends on the customer value for the product, which is contingent upon the extent to which it meets the customer expectations within their purchasing power.

Spreng et al. (1996) suggest that the customer evaluation of product and company performance contributes to their evaluations of satisfaction. Cooper and Kleinschmidt (1987) showed product superiority in terms of product performance, features and innovativeness to be key factors in differentiating new product winners from losers. However, high performance alone cannot guarantee that customers will purchase a product especially when it is priced high (Zeithaml, 1988). Increased product performance and decreased price contributes to higher customer value and satisfaction, keeping in mind that the firm’s ability to offer a lower price is limited by the unit cost.

Business organizations must not only create value for their customers through new product design but must also be able to capture a part of that value for their shareholders. As mentioned before, a higher market share enables firms to charge higher prices, achieve economies of scale, erect entry barriers through advertising, distribution and shelf space, and reduce competitive activity, resulting in higher profitability (Porter 1980) and thus the market share. However, the relationship between market share and profitability is often in

question (Jacobson and Acker 1985) and it is possible that a product that captures high market share could still be unprofitable. Thus, there is a need for a measure of commercial performance, which not only includes the market-based measure of performance but also the financial performance. A survey of the Product Development Management Association members found that *"a vast majority (86%) of firms who already measure success and failure focus on obtaining a picture of the balanced end results of individual products. They measure whether the customer's needs have been met while simultaneously producing financial results for the firm*" (Gupta and Wilemon 1996).

3.1.2 New Product Development Capability

Products are designed to help customers meet their needs. Product performance measures the effectiveness of a product's ability to perform its primary function (Mallick and Schroeder, 2003). It tells us how well a specific product is able to deliver what it is supposed to do. Product development is a deliberate business process involving scores of generic decisions including – concept development, supply-chain design, product design and production ramp-up and launch (Krishnan and Ulrich 2001). These decisions are vital for successful product performance and require a thorough analysis and research of the pros and cons of the possible ramifications. A considerable amount of resources in the form of R&D expenditure are required in each of these decision categories to meticulously design and develop a product and to identify and eliminate potential technical problems that might arise in the future stages. Thus more R&D resource employed increases the possibility of solving a technical problem earlier. It also increases the possibility of arriving at a better design solution. But, increased R&D resource consumption also causes an increase in the overall costs, which causes the product cost to increase. Since the price that a firm charge in the market is bounded below by the cost, increased product cost often results in an increased product price. Firms had to utilize their R&D capability at an optimum point to ensure that they neither do fall back in the market nor spend too much cost.

Time has become a critical element in competing in today's environment (Sarin, and McDermott, 2003). Time as a metric for measuring product development performance has gained significant popularity in the academic and practitioner literature (Clark and

Fujimoto 1989, Adler et al., 1995, Griffin 1997, Swink 1999). The use of time as a metric for measuring new product development has appeared as speed-to-market (Tatikonda and Rosenthal 2000), launched on time, and concept-to-market in the new product development literature (Griffin & Page 1993 and 1996). Speed to market is a measure of the time taken by the team to develop the product (Olson, Walker, and Ruekert, 1995). Importance of time as a source of competitive advantage is recognized in the business strategy literature as time-based competition (Stalk 1988).

Time can also be viewed as a resource. It is a critical input to the new product development process. For a given level of product development resource, the longer the time available to study the user needs, develop and test alternative concepts for technical feasibility, the greater is the likelihood that a better solution will be found. This will also lead to consumption of product development resources over a longer period of time leading to an increase in the cost allocated to the final product. However, any attempt to reduce product development cost through increased pressure on speed may have many costly side effects such as increased focus on incremental innovation and mistakes during the product development process all of which lead to products with poor technical performance (Crawford 1992).

Instead of a linear representation for our model, we choose a pie model. This indicates that, the pie might have more pieces effecting on the focus issue. Figure 3.1 represents our basic model on perceived company performance and that NPD capability is one of the issues that affect it. This representation enables model to keep in mind that the defined variable is not the only one for the focus one and the study is open for enhancements for further studies.

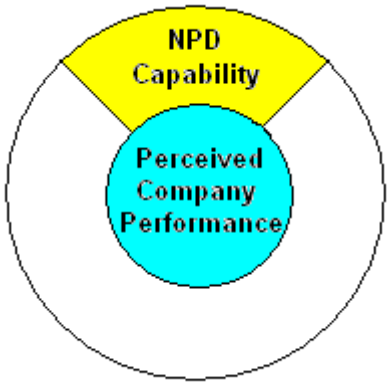


Figure 3.1 - Perceived Company Performance with focus on NPD Capability

NPD performance is assessed by some means which new product sales compared with competitors is one of them (Song and Parry, 1997).

3.1.3 Knowledge Creation Process

An enterprise with a good external knowledge management would obtain comparatively high success opportunities and enterprises with good knowledge management methods will have successful new product development performance (Moorman, 1995).

Only companies that pursued the fastest product innovation and possessed the management capability to integrate and allocate internal and external resources would have success in a global competition environment (Teece and Pisano, 1994). Therefore, integrating internal and external knowledge in the organization and maintaining good management will lead to a positive effect on new product development performance.

The knowledge creation process occurs through conversion of tacit and explicit knowledge, where four differing models of knowledge creation were identified by Nonaka (1994). These are socialization, internalization, externalization and combination.

Socialization refers to the transfer of individual tacit knowledge to organizational tacit knowledge. Tacit knowledge is difficult to articulate but need not be verbal (Nonaka, 1994) and is transferred by team interaction, and sharing of mental models, technical skills,

experiences and perspectives.

Internalization is a mode exemplified by an iterative process of trial and error and experimentation with explicit knowledge, resulting in organizational learning and tacit knowledge creation (Nonaka, and Takeuchi, 1995).

Externalization is the conversion of subjective tacit knowledge based on experience to objective explicit knowledge (Nonaka, 1994; Nonaka, and Takeuchi, 1995). It is challenging because tacit knowledge is difficult to articulate, communicate, formalize and encode (Winter, 1987; Nonaka, 1994; Nonaka, and Takeuchi, 1995). Tacit knowledge is 'sticky' because the rules of expertise are unknown (von Hippel, 1994), and to progress through to higher knowledge stages requires an increase in understanding of causal influences (Bohn, 1994). Nonaka (1994) proposes repeated, time-consuming dialogue, sharing one's original experience and a metaphor–analogy-model sequence for effective externalization. Metaphor, experiencing one thing in terms of another, is an intuitive cognitive process to relate concepts, which are then resolved through analogy to things that are already understood, and finally made explicit through prototypes. Prototypes and models are explicit representations of new products (Scott, 1998). For example, in product development, dialogue includes ideas exchanged in discussion threads that focus on specific expertise, forums for brainstorming new ideas and critiquing proposed approaches; and discussion on customer feedback on new products from sales, marketing, and customer service. This dialogue increases understanding of customer requirements and technical capabilities.

Combination is the organizational knowledge creation mode whereby individual explicit knowledge is converted to group and organizational explicit knowledge (Nonaka, and Takeuchi, 1995). This mode is facilitated by categorization and traditional information processing (Nonaka, Umemoto, Senoo, 1995).

When we apply them to our model the representation of the model becomes as follows:

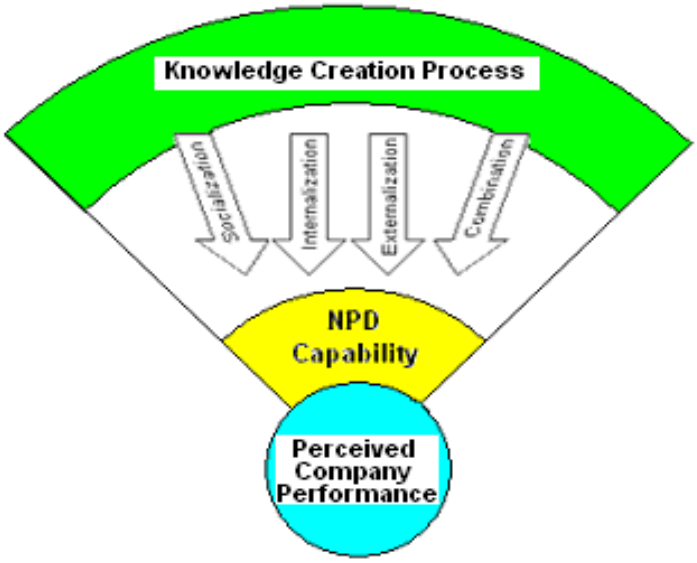


Figure 3.2 - NPD Capability effected by Knowledge Creation Process

In MIT Research Center, the activities that are critical to knowledge creation and innovation are defined as knowledge management enablers (Maybury, 2003). These are:

1. Strategy - the alignment of corporate and knowledge management strategies.
2. Measurement - the measures and metrics captured to determine if knowledge management improvement is occurring or if a benefit is being derived.
3. Policy - the written policy or guidance that is provided by the organization.
4. Content - the corporate knowledge base that is captured electronically.
5. Process - the processes that knowledge workers use to achieve the organization's mission and goals.
6. Technology - the information technology that facilitates the identification, creation and diffusion of knowledge among organizational elements within and across enterprises, for instance an enterprise portal.
7. Culture - the environment and context in which knowledge management processes must occur.

Similarly, Ferrari and Toledo (2004) presented a more holistic vision of knowledge management; which structured and balanced many organizational elements, which could be analyzed according to the knowledge management vision. What they argued is the infrastructure consisted of three elements: 1- organizational structure, 2- HR management and 3- Information technology.

3.1.4 Knowledge Management Enablers

Knowledge management enablers which can also be called as influencing factors are organizational mechanisms for fostering knowledge consistently (Ichijo *et al.*, 1998). They can stimulate knowledge creation, protect knowledge, and facilitate the sharing of knowledge in an organization (Stonehouse, and Pemberton 1999).

The lack of a direct relationship between knowledge management processes and organizational performance was also introduced by Lee and Choi (2003). According to them; as many factors influence the determination of the organizational performance, attempts to trace causality to any single factor such as knowledge process may be risky. In order to understand the effect of the knowledge processes on organizational performance, it is offered to have intermediate outcomes (for example, knowledge satisfaction or organizational creativity). Thus they divide the previous studies done on relationships among knowledge management factors into four; depending on how they identify the relationships. These relationships are between:

a. knowledge management enablers;
b. knowledge management enablers and processes;
c. knowledge management processes and organizational performance; and
d. knowledge management enablers, processes, and organizational performance.

First they studied on knowledge management enablers and interactions among them. Studies identified that, KM enablers had an effect on knowledge creation processes (Zander and Kogut, 1995).

Impacts of KM enablers and knowledge creation processes on KM satisfaction were

studied by Becerra-Fernandez & Sabberwal (2001; cited in Lee and Choi, 2003) where they found a strong relation between them.

Still, instead of seeking a direct relation between organizational performance and KM enablers and knowledge creation processes, having intermediate outcomes would ease to form a more reasonable model (Lee and Choi, 2003). The scholars put knowledge management intermediate outcome as organizational creativity (Figure 3.3, Lee and Choi, 2003). In our study we preferred NPD Capability instead of organizational creativity as knowledge management intermediate outcome.

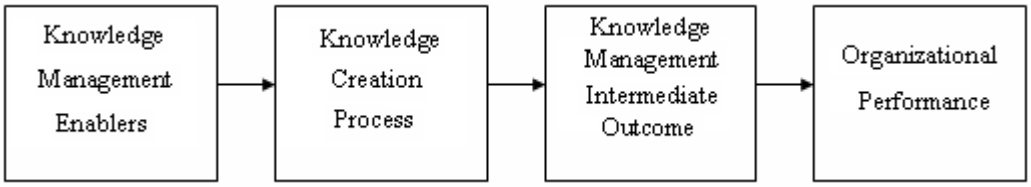


Figure 3.3 - A Model for the Impact of KM Enablers on Organizational Performance (Lee and Choi, 2003)

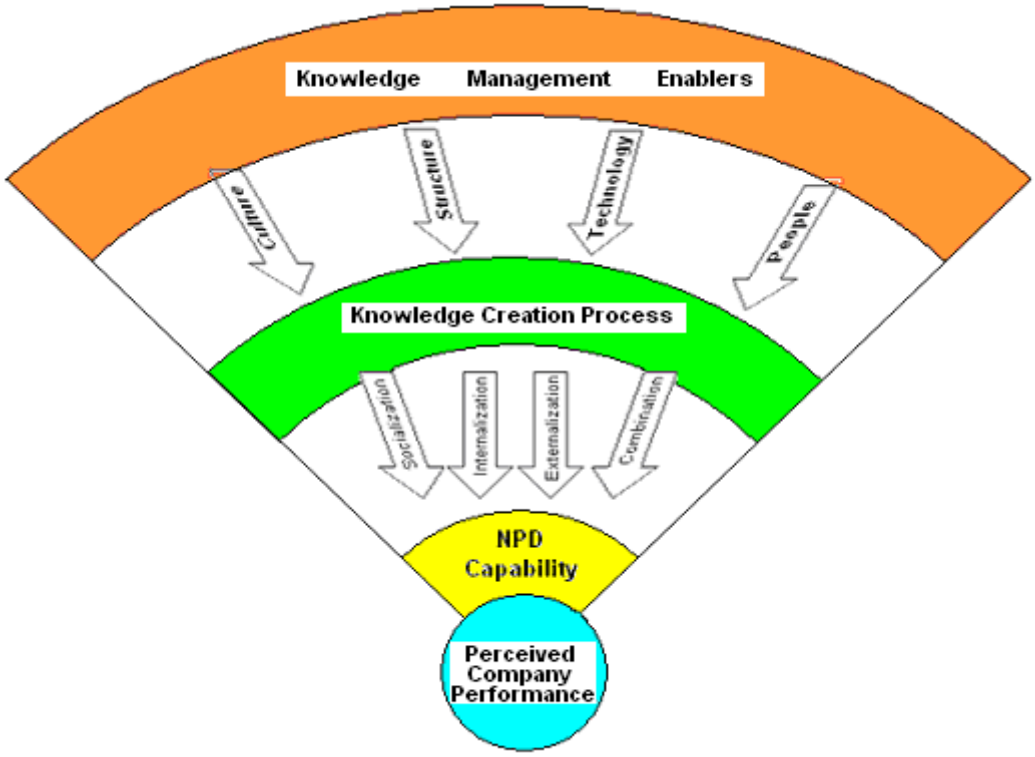


Figure 3.4 - The Research Model with Knowledge Management Enablers

3.1.4.1 Culture

One of the major factors for a successful knowledge management is organizational culture (Chase, 1997; Davenport, Long and Beers, 1998, Davenport and Prusak 1998, Gold and Malhotra, 2001; Lee and Choi, 2003). Culture defines not only what knowledge is valued, but also what knowledge must be kept inside the organization for sustained innovative advantage (Long, 1997). People are not necessarily willing to share all types of knowledge (Constant *et al.*, 1994), and organizational culture, not technology, has a greater impact on whether people exchange knowledge (Orlikowski, 1996).

Organizational culture was described as a complicated set of assumptions, values, behaviors, and artifacts, and it changes over time as organizations adapt to environmental contingencies (Miller, 1995). Organizational culture drives an organization's formal and informal expectations of individuals, defines the types of people who will fit into the organization, and affects how people interact with others both inside and outside the

organization (De Long and Fahey, 2000). Building an effective culture within which people operate in an organization is a crucial requirement for effective knowledge management (Gupta and Govindarajan, 2000; Gummer, 1998). Organizations should establish an appropriate culture that encourages people to create and share knowledge within an organization (Leonard-Barton, 1995; Holsapple and Joshi, 2001). While most managers may recognize the importance of culture, they find it difficult or impossible to articulate the culture-knowledge relationship in ways that lead to action (De Long and Fahey, 2000).

Collaboration may be defined as the degree people in a group actively help one another in their work (Hurley, and Hult, 1998; Krogh, 1998). Collaborative cultures affect customer knowledge creation through increasing knowledge exchange (Belbaly, Benbya, Meissonier, 2007). Teece and Pisano (1994) thought that only companies that pursued the fastest product innovation and possessed the management capability to integrate and allocate internal and external resources would have success in a global competition environment. Therefore, integrating internal and external knowledge in the organization and maintaining good management will lead to a positive effect on new product development performance.

Trust can be defined as maintaining reciprocal faith in each other in terms of intention and behaviors (Kreitner, and Kinicki, 1992). Trust may facilitate open, substantive, and influential knowledge exchange (Nelson, and Cooprider, 1996). When people trust each others, they are more willing to participate in knowledge exchange (Nahapiet, and Ghoshal, 1998). Szulanski (1996) empirically found that the lack of trust among employees is one of the key barriers against knowledge exchange. The increase in knowledge exchange in NPD projects brought on by mutual trust results in customer knowledge creation. Trust also encourages a climate conducive to better customer knowledge creation by alleviating the fear of risk (Belbaly, Benbya, and Meissonier, 2007). The presence of a high level of trust can reduce this risk (Nelson, and Cooprider, 1996). Trust is also critical in a cross-functional or inter-organizational team because withholding information because of a lack of trust can be especially harmful to customer knowledge creation (Hedlund, 1994; Jarvenpaa, and Staples, 2000).

Learning is the process by which knowledge comes into being and is enhanced over time, and is therefore intimately associated with KM. Organizational performance requires not only exploiting what is known, but also exploring new domains of knowledge to create opportunities for future exploitation (March, 1991). It is identified as a quantifiable improvement in activities, increased available knowledge for decision-making or sustainable competitive advantage (Cavaleri, 1994; Dodgson, 1993). Learning can be analyzed in two major parts: individual learning and organizational learning (where group learning is covered in organizational learning).

Research on individual cognition indicates that many general factors are associated with increased individual learning. Some of these factors include general mental ability (Anastasi, 1982; cited in Lynn, Reily, and Akgün, 2000), motivation (Locke and Lathan, 1984), self efficacy (Mitchell *et al.*, 1994), feedback (Kluger and DeNisi, 1996), and personality factors, such as conscientiousness (Digman and Takemoto-Chock, 1981). Other research has suggested that certain behavioral practices can also enhance learning. One simple set of practices that can be used to improve learning is note taking or recording, reviewing those notes, filing systems, and goals/project vision1 (e.g., Kievra, 1984; Kievra *et al.*, 1988).

Organizational learning is defined as the acquisition of knowledge by individuals and groups who are willing to apply it in their jobs in making decisions and influencing others to accomplish tasks important for the organization (DeNisi, Hitt, Jackson, 2003). Whereas a single instance of organizational learning (that is, a single change event) may be relatively easy for other organizations to imitate, continuous organizational learning has cumulative effects that are much more difficult to imitate. Thus, continuous learning is an important capability that can serve as a source of sustainable competitive advantage. As a result, many highly competitive organizations now invest in developing the capability for continuous organizational learning.

Training and development programs are commonly used to promote organizational learning. Such programs seek to increase the knowledge capital, and to a lesser extent, the social capital of employees. Most training and development programs focus on ensuring that employees have the most up-to-date, explicit knowledge in their respective areas of

specialization. Because explicit knowledge is well known, programs for its dissemination can be easily imitated. Although it is necessary to maintain competitive parity, explicit knowledge usually cannot serve as the basis for a sustainable competitive advantage. But tacit knowledge is not easily disseminated. Tacit knowledge must be learned by using it, and this often requires extended periods of social interaction. Because tacit knowledge is learned by experience, the transfer of such knowledge is generally a slow and complex process (Teece *et al.*, 1997). Thus, management practices aimed at leveraging tacit knowledge are more difficult for outsiders to understand and imitate successfully. A strategic alliance such as a joint venture can be useful for transferring tacit knowledge because it allows partners' employees to get close enough to transfer tacit knowledge (Lane & Lubatkin, 1998). Another approach to transferring tacit knowledge is to assign more experienced professionals to lead a team of less experienced professionals (Baron & Kreps, 1999; Sherer, 1995). Over time, the less experienced professionals learn the more experienced professionals' tacit skills (Hitt, Bierman *et al.*, 2001). Organizations with significant learning capabilities understand the importance of both tacit and explicit knowledge and are able to ensure that both types of knowledge are used to promote learning.

Participating in boundary spanning structures: The NPD literature has emphasized the importance of structures that span boundaries and bring together contributors with a range of knowledge and perspectives (Mohrman *et al.*, 1995; 2003; DeSouza, and Evaristo, 2003). Creation of today's complex systems and products requires merging of knowledge from diverse disciplinary and personal skills-based perspectives where creative cooperation is crucial for innovation (Leonard-Barton and Sensiper, 1998). Collaboration and multidisciplinary problem-solving are increasingly required in today's NPD world as many of the most important problems and consequently much knowledge creation occurs at the intersection of disciplines and functions (Leonard-Barton, 1995). Formal boundary spanning structures such as cross-functional teams are forums where inter-subjective sense-making (Weick, 1995) may occur to address novel problems that require combining knowledge to generate solutions. Indeed, participation in boundary spanning structures such as cross-functional teams and product councils has been found to lead to expanded innovative sense-making (Dougherty *et al.*, 2000), because it exposes employees to

knowledge from different disciplines and functions in the course of addressing complex technical, market, and business NPD challenges (Mohrman *et al.*, 2003). When people are embedded in a network of cross-boundary work relationships it can expand their focus of attention and link them to the organizational memory (Anand *et al.*, 1998).

Direction and performance information: It is strategies that yield to business plans, goals and activities for the company and its various units and projects and thus to the new products developed (Dougherty, 2001). Goals, metrics, plans, and milestones are among the generically subjective sense-making frameworks of the organization and are intended to create shared understanding about standards and targets (Weick, 1995). They focus employees' attention, and motivate higher levels of performance (Locke and Latham, 1990). Performance information and feedback is a necessary companion to goals so that knowledge workers know the degree to which goals are being attained (Mohrman *et al.*, 2003). Direction and performance information asks how well informed the respondent feels about various types of company, project and business unit goals, plans and performance progress. Information about goals and performance may also make evident areas requiring technical breakthroughs because current understanding is inadequate, and thus trigger sense-making activities including the trying of new approaches (Louis and Sutton, 1991)

3.1.4.2 Structure

Centralization: In firms, individuals interact and communicate with other individuals, and they perform different roles and functions. The firm's organizational structure regarding the standardization and centralization of tasks affects the way individuals interact with each other (Siriram, and Snaddon, 2004). Centralization refers to the locus of decision authority and control within an organizational entity (Caruana, Morris, and Vella, 1998). It can be defines as "*degree of authority and control over decisions*" (Lee and Choi, 2003). When decision making authority is concentrated, the creative solutions reduce; instead, if the power is dispersed, spontaneity, freedom of expression and experimentation arise (Graham, and Pizzo, 1996). The latter ones are lifeblood of knowledge creation (Lee and Choi, 2003).

Moreover, centralized structure hinders interdepartmental communication and frequent sharing of ideas (Woodman, Sawyer, and Griffin, 1993) due to time-consuming communication channels (Bennet, and Gabriel, 1999). Other results can be identified as distortion and discontinuousness of ideas (Stonehouse, and Pemberton, 1999). Without a constant flow of communication and ideas, knowledge creation does not occur (Lee and Choi, 2003). A decentralized organizational structure has been found to facilitate an environment where employees participate in knowledge building process more spontaneously (Hopper, 1990). Participatory work environments foster knowledge creation by motivating organizational members' involvements.

Organizational integration across functional and disciplinary specialties drives superior capabilities (Hoopes and Postrel, 1999). This may be achieved through flatter hierarchies, cross-functional teams, electronic groupware, and similar current management preoccupations all aimed at improving communication among different individuals and departments. Therefore the firm's organizational structure may affect knowledge transfer (Siriram, and Snaddon, 2004). We can conclude that decreased centralization in the form of locus of authority can lead to increased creation of customer knowledge in NPD projects (Stonehouse, and Pemberton, 1999).

Formalization: Formalization refers to the degree to which decisions and working relationships are governed by formal rules, standard policies, and procedures (Holsapple and Joshi, 2001; Rapert and Wren, 1998). Knowledge creation requires flexibility and less emphasis on work rules (Ichijo, *et al.*, 1998; Lusch *et al.*, 1998). The range of new ideas seems to be restricted when strict formal rules dominate an organization (Lee and Choi, 2003). Flexibility can accommodate better ways of doing things (Graham and Pizzo, 1996). Therefore, the increased flexibility in an organizational structure can result in increased creation of knowledge. Knowledge creation also requires variation (Wilkstrom, and Norman, 1994). In order to be more adaptable when unforeseen problems arise, an organization may accommodate variation in process and structure. Low formalization permits openness and variation, which encourage new ideas and behaviors (Damanpour, 1991). Knowledge creation is also likely to be encouraged through unhindered communications and interactions (Bennet and Gabriel, 1999). Formality stifles the communication and interaction necessary to create knowledge. Lack of formal structure

tends to enable organizational members to communicate and interact with one another to create knowledge (Jarvenpaa and Staples, 2000).

Several studies have come to the conclusion that formalization weakens knowledge management (Ichijo, *et al.* 1998, Starbuck, 1992) In contrast; Lee and Choi (2003) showed no relationship between formalization and knowledge creation. The scholars concluded that, this intriguing result reflects the two different aspects of formalization. According to the ambidextrous model, which is based on the distinction between the initiation and implementation stages of innovation (Duncan, 1976, Lusch, Harvey, Speier, 1998; cited in Lee and Choi, 2003), formalization may inhibit tacit-related activities such as socialization and externalization, but may encourage explicit-related activities such as combination and internalization. In particular, a more careful investigation of externalization is of interest. Externalization involves the expression and conversion of tacit into explicit knowledge (Nonaka, 1994). From this perspective, a formal organizational structure may inhibit spontaneity and freedom of expression necessary for externalization (Bennet and Gabriel, 1999). Lee and Choi (2003) found that, the emphasis of externalization is on tacit knowledge, and thus externalization is negatively associated with formalization. On the other hand, the formal structure can facilitate the rapid and continuous conversion of tacit into explicit knowledge (Graham, Pizzo, 1996). If the conversion process or its technology perspective of externalization is emphasized like Becerra-Fernandez and Sabherwal (2001), it can be speculated that formalization can affect externalization positively (Lee and Choi, 2003).

3.1.4.3 People

People are at the heart of organizational knowledge creation (Choi and Lee. 2002; Holsapple and Joshi, 2001). It is people who create and share knowledge. Therefore, managing people who are willing to create and share knowledge is important (O'Dell *et al.*, 1999).

T-Shaped skills: The proposition that creativity and new ideas spring from the interaction of different knowledge sets has found acceptance in knowledge literature (Simon 1985, Madhavan and Grover, 1998). In the context of NPD teams, an implication has been that

the deliberate conflict of ideas-what Leonard-Barton (1995) has termed "creative abrasion-has a positive influence on performance (Madhavan and Grover, 1998). However, whether the abrasion is creative or destructive may depend on the capability of individual specialists to sustain a meaningful and synergistic conversation with one another. Such a capability goes beyond the mere social skills of "getting along with team members" (e.g., tolerance of different perspectives) to specific cognitive skills. Such skills have been termed "T-shaped skills" by Iansiti (1993). Persons with T-shaped skills are those who are "*not only experts in specific technical areas but also intimately acquainted with the potential systemic impact of their particular tasks. On the one hand, they have a deep knowledge of a discipline like ceramic materials engineering, represented by the vertical stroke of the T. On the other hand, these ceramic specialists also know how their discipline interacts with others, such as polymer processing- the T's horizontal top stroke* (Iansiti 1993, p. 139)."

T-shaped skills are both deep vertical knowledge (the vertical part of the "T") and broad lateral associative skills (the horizontal part of the "T"); this means that their possessors can explore particular knowledge domains and their various applications in particular products (Leonard-Barton, 1995). People with T-shaped skills are extremely valuable for creating knowledge because they can integrate diverse knowledge assets. They have the ability both to combine theoretical and practical knowledge and to see how their branch of knowledge interacts with other branches. Therefore, they can expand their competence across several functional branch areas, and thus create new knowledge (Johannessen, Olsen and Olaisen, 1999; Madhavan and Grover, 1998). Knowledge and competence can be acquired by admitting new people with desirable skills (Stonehouse and Pemberton, 1999). In particular, T-shaped skills embodied in employees are most often associated with core capability (Iansiti, 1993, Johannessen, *et al.*, 1999; Leonard-Barton, 1995). T-shaped skills may enable individual specialists to have synergistic conversations with one another (Madhavan and Grover, 1998). Some indications of a T-shaped skill set may be (1) a broad, rather than narrow, set of professional and personal interests; (2) a variety of professional and personal experiences; and (3) a richly diverse network of professional and personal contacts.

3.1.4.4 Information Technology

Technology contributes to knowledge management (Gold *et al.,* 2001). Technology infrastructure includes Information Technology (IT) and its capabilities (Raven *et al.*, 1996; Scott, 1998). IT is widely employed to connect people with reusable codified knowledge, and it facilitates conversations to create new knowledge. Among technology-related variables, this study focuses on IT support (Stonehouse *et al.*, 1999) and IT quality (Mohrman *et al.,* 2003). IT allows an organization to create, share, store, and use knowledge (Leonard-Barton, 1995). Therefore, the support of IT is essential for initiating and carrying out knowledge management.

IT quality: The knowledge management literature has focused on IT tools and their potential to support collaboration among people with different knowledge bases (e.g. Boland and Tenkasi, 1995); to enable knowledge access and sharing including connections to company experts (Anand *et al.*, 1998); and to disseminate generic and codified knowledge, including algorithms and systematic work processes that embody the knowledge of the firm (Cross and Baird, 2000; Fulk and DeSanctis, 1999; Leonard-Barton, 1995). Defined in terms of these potentialities, high quality IT is expected to foster working in a way that takes an expanded focus and draws in more knowledge (Mohrman *et al.,* 2003).

Although many knowledge management programs started out as IT solutions, the management literature increasingly views IT as but one element of knowledge management: useful for storage and distribution of explicit knowledge, but less helpful for sharing tacit knowledge and stimulating the use or creation of knowledge (Anand *et al.*, 1998; Davenport and Prusak, 1998).

Mohrman *et al.* (2003) found out in their study that IT quality contributes to three knowledge work behaviors, using systematic processes, knowledge linking, and (weakly) trying new approaches. It also relates directly, although weakly, to one knowledge outcome, effective knowledge generation and use, and, also weakly, to one effectiveness variable, commitment to company.

IT support: IT support means the degree to which knowledge management is supported by the use of Its (Gold, Malhotra, and Segars, 2001). This technology infrastructure includes IT and its capabilities (Raven, and Prasser, 1996; Scott, 1998). IT is widely employed to connect people with reusable codified knowledge, and it facilitates conversations to create new knowledge (Lee and Choi, 2003; Raub and Wittich, 2004). IT allows an organization to create, share, store, and use knowledge (Leonard-Barton, 1995). Therefore, the support of IT is essential for initiating and carrying out knowledge management.

IT affects knowledge in a variety of ways. First, IT facilitates rapid collection, storage, and exchange of knowledge on a scale not practicable in the past, thereby assisting the **knowledge creation process** (Roberts, 2000). Second, a well developed technology integrates fragmented flows of knowledge (Gold, Malhotra, and Segars, (2001). This integration can eliminate barriers to communication among departments in organization. Third, IT fosters all modes of knowledge creation and is not limited to the transfer of explicit knowledge (Raven and Prasser, 1996; Scott, 1998; Riggins, and Rhee, 1999)

Lee and Choi (2003) confirmed that IT support affects combination. There are several resources for a sound understanding of the impact of IT on knowledge combination (Nonaka and Takeuchi, 1995). IT is critical for codifying explicit knowledge; it provides fast feedback for explicit knowledge (Krogh, Nonaka, and Aben, 2001). In order to support knowledge combination, the question is not whether to deploy IT, but how to deploy it as simply improving the IT infrastructure does not provide a competitive advantage for knowledge combination (Lee and Choi, 2003).

3.1.5 Market Dynamism

Dynamism is explained as a combination of instability and uncertainty (Tagerden *et al.*, 2003). Market dynamism is related to the rate of change of the customer preferences, market segments, and demand patterns (Javorski & Kohli, 1993; Narver & Slater, 1990).

There are different approaches in literature to measure market dynamism. There is a propensity to use objective indicators of market dynamism, like, two-step procedure to

calculate the level of dynamism (Keats and Hitt, 1988). These scholars' study has two steps where in the first one, the natural logarithm of sales for each industry is regressed against time; in the second step, the algorithms of the standard errors from these models are calculated and taken as an index of environmental dynamism.

In another study, **market dynamism** was measured by including four items assessing the rate of changes in customer preferences, competitors' strategies, product characteristics, and technology (Yilmaz, *et al.*, 2005).

Managers' perceptions of the environment determined strategic decisions and actions in the organization (Sutcliffe, and Huber, 1998). In addition to this; the same research identified that, there were no discrepancy between the perceptions of similar environmental characteristics among managers belonging to different organizations or industries. That is, managers' perception of the environment can be taken as an approximation of the actual environmental features that the organization faces.

Market dynamism was conceptualized as the frequency of major market related changes by different scholars (Child, 1972; Duncan, 1972; cited in Homburg et al., 1999). According to Homburg et al., (1999) major changes in sales strategies, pricing behavior, sales promotion/ advertising strategies, customer preferences in product features, and customer preferences in the price/ performance relationship reflect the degree of market dynamism.

3.1.6 Business Strategies

Strategy is defined as a set of decision-making rules to guide organizational behavior (Ansoff, 1957). Mintzberg (1979) defines strategy as a pattern in a stream of significant decisions.

By the integration of **Market Dynamism** and **Business Strategies** to the model, the new becomes as Figure 3.5 - The Research Model in Pie Diagram.

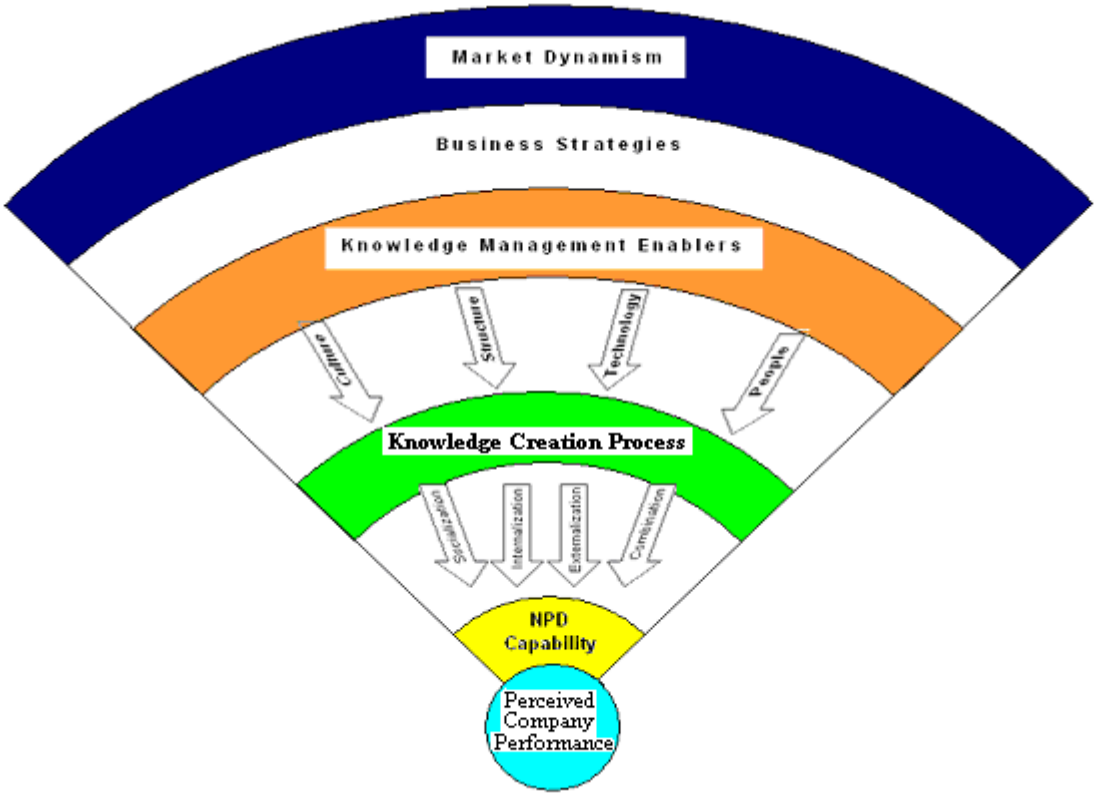


Figure 3.5 - The Research Model in Pie Diagram

The pie model enables us to keep enough room for additional variables that might affect the dependent variable. Here, the model has layers where each layer is also represented as a pie also. The model can be enhanced by adding more variables in additional pies till the circle are complete, and these are subject to further studies.

In addition to Pie Model, the model can be presented as in classical terms which are represented in Figure 3.6.

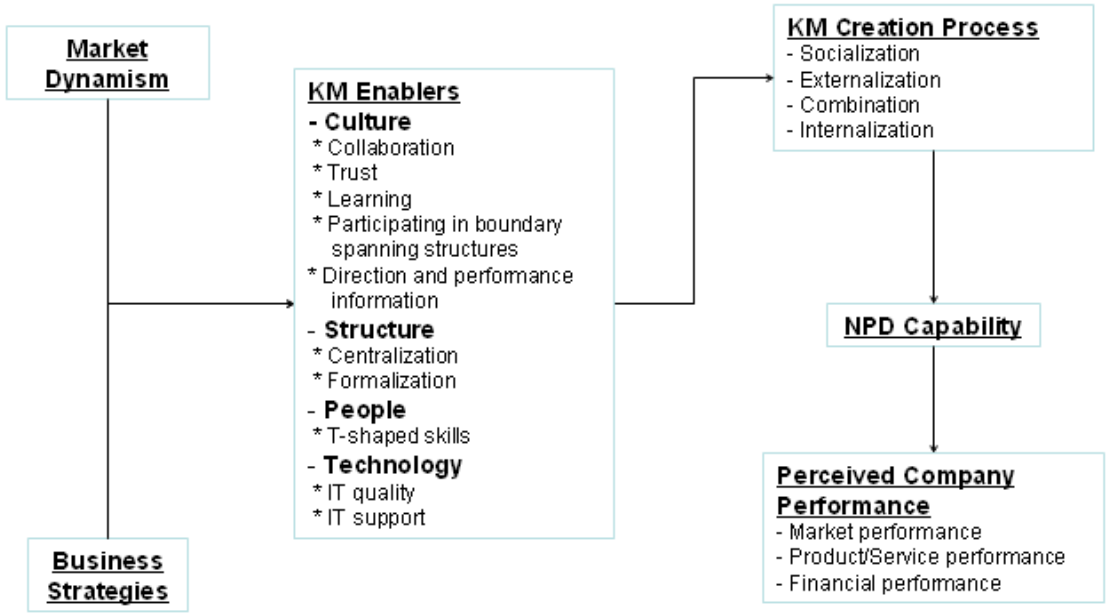


Figure 3.6 - The Research Model in Linear Diagram

According to the conceptual definitions and aforementioned studies of research variables, the conceptual model of the research is proposed as in Figure 3.7.

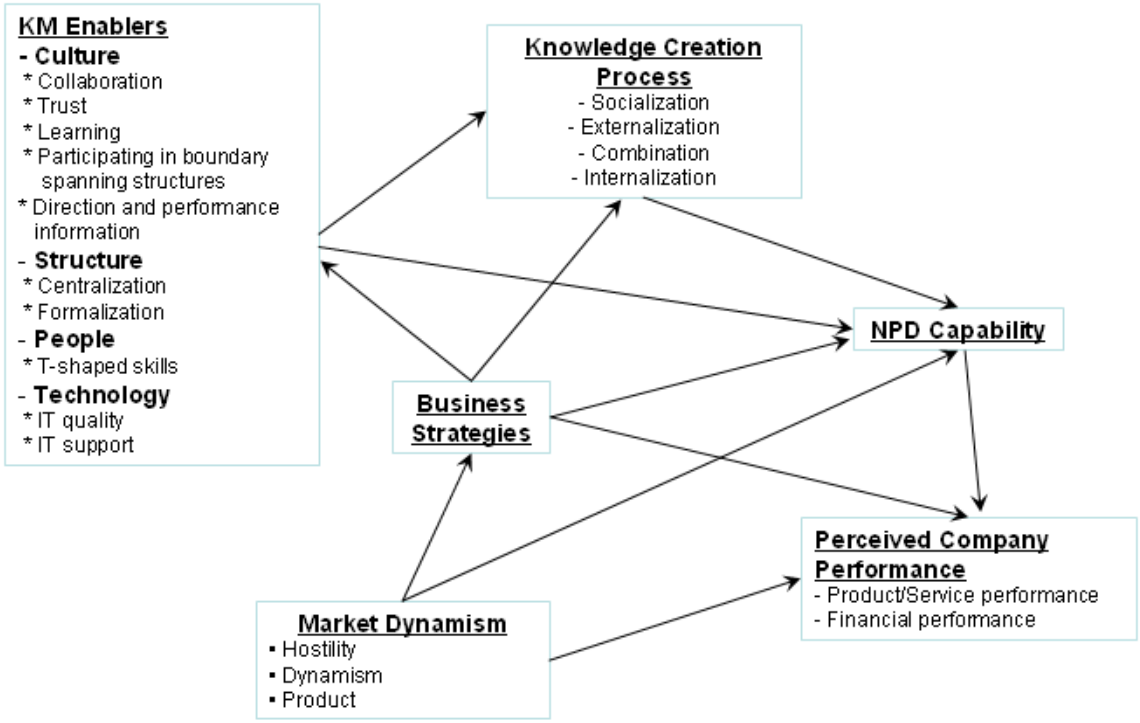


Figure 3.7 - The Research Model

3.2 Hypotheses Development

The hypotheses relationships among research variables are shown Figure 3.7 - The Research Model. The relationships were derived from previous research, while they were organized around the main conceptual areas discussed in the previous chapters of this research. The draft hypotheses were discussed by three academicians and then finalized accordingly.

3.2.1 Market Dynamism

Market dynamism is related to the rate of change of the customer preferences, market segments, and demand patterns (Javorski & Kohl, 1993; Narver & Slater, 1990). It can be described as the rate of changes in competitive conditions associated mostly to customers' demand (Simon *et al.*, 2002). Market dynamism can be measured by including four items assessing the rate of changes in customer preferences, competitors' strategies, product characteristics, and technology (Yilmaz, *et al.*, 2005). Managers' perceptions of the environment determine strategic decisions and actions in the organization (Sutcliffe, and Huber, 1998). Still, there were no discrepancies between the perceptions of similar environmental characteristics among managers belonging to different organizations or industries. That is, managers' perception of the environment can be taken as an approximation of the actual environmental features that the organization faces. Characteristics of the **market dynamism** result in high product variety and high demand uncertainty (Sharma *et al.*, 2004).

Hypotheses 1: Market Dynamism has a significant positive impact on **Business Strategies**.

Hypotheses 2: Market Dynamism has a positive impact on NPD Capability.

Hypotheses 3: Market Dynamism has a positive impact on **Perceived Company Performance**.

3.2.2 Business Strategies

Miles and Snow (1984, 1994) stressed on two main tasks of managers: First one is to develop and utilize a strategy that aligns the organization's capabilities with the opportunities and constraints present in its environment. Second one is to arrange resources internally to support the alignment where both require clear understanding of organizational status in terms of strategy. Levy *et al.* (2001) introduced strategy as a set of practices and discourses which promotes instrumental rationality, reproduces hierarchical relations of power and systematically privileges the interests and viewpoints of particular groups (Livvarcin, 2007). As the importance of long term perspective in organizations were emphasized; strategy was stressed to be necessary to give a company structure, direction, and focus (Chandler, 1962). Craven (1998) recognize that the responsibility for creating and delivering superior value does not lie within a firm across different functional departments. Not only customers can be a source of information, but also suppliers linked to the product development process share the responsibility in problem recognition and problem solving. Thus, in order to guarantee better performance and to maximize the fit with customer needs, product development must also take into account the supplier's competences.

Hypotheses 4: Business Strategies have a significant positive impact on (KM Enablers):

a. collaboration
b. trust
c. learning
d. participating in boundary spanning structures
e. Centralization
f. Formalization
g. Direction and performance information
h. T-shaped skills
i. IT quality
j. IT support

Hypotheses 5: Business Strategies have a significant positive impact on **Knowledge Creation Process**:

a. Socialization
b. Internalization
c. Externalization
d. Combination

Hypotheses 6: Business Strategies have a significant positive impact on NPD Capability.

Hypotheses 7: Business Strategies have a significant positive impact on **Perceived Company Performance**.

3.2.3 Knowledge Management Enablers

Knowledge management enablers which can also be called as influencing factors are organizational mechanisms for fostering knowledge consistently (Ichijo *et al.*, 1998). They can stimulate knowledge creation, protect knowledge, and facilitate the sharing of knowledge in an organization (Stonehouse, and Pemberton 1999).

Studies identified that, KM enablers had an effect on knowledge creation processes (Zander and Kogut, 1995). Impacts of KM enablers and knowledge creation processes on KM satisfaction were studied by Becerra-Fernandez & Sabberwal (2001) where they found a strong relation between them.

An enterprise with a good external knowledge management would obtain comparatively high success opportunities and enterprises with good knowledge management methods will have successful new product development performance (Moorman, 1995). There is a positive effect on new product development performance for those companies that strongly implement knowledge management method (Liu *et al.*, 2005).

Hypotheses 8: Knowledge Management Enablers have a significant positive impact on **Knowledge Creation Process** for all of its factors.

a. Collaboration	a. Socialization b. Internalization c. Externalization d. Combination
b. trust	
c. learning	
d. participating in boundary spanning structures	
e. Centralization	
f. Formalization	
g. Direction and performance information	
h. T-shaped skills	
i. IT quality	
j. IT support	

Hypotheses 9: Knowledge Management Enablers have a significant positive impact on NPD Capability for all of its factors.

3.2.4 Knowledge Creation Process

Companies that pursue the fastest product innovation and possessed the management capability to integrate and allocate internal and external resources will have success in a global competition environment (Teece and Pisano, 1994). Therefore, integrating internal and external knowledge in the organization and maintaining good management will lead to a positive effect on new product development performance. Knowledge management could be regarded as knowledge integration (Grant, 1996). Knowledge integration was divided into two: interior and exterior parts. The combination of these two could increase new product performance (Clark and Wheelwright, 1993).

Hypotheses 10: Knowledge Creation Process has a significant positive impact on NPD Capability, for each of its factor.

a. Socialization
b. Internalization
c. Externalization
d. Combination

3.2.5 New Product Development Capability

Product development is a deliberate business process involving scores of generic decisions including – concept development, supply-chain design, product design and production ramp-up and launch (Krishnan and Ulrich 2001). Different new product development strategies taken by companies lead to variations in performance (Liu *et al.*, 2005).

Hypotheses 11: NPD Capability has a significant positive impact on **Perceived Company Performance**.

4 RESEARCH DESIGN AND METHODOLOGY

The purpose of this study is to test the hypotheses based on the framework presented in the previous chapters. The hypotheses were developed to test the relationships between **Knowledge Management Enablers**, **Knowledge Creation Process**, **New Product Development Capability**, **Market Dynamism**, **Business Strategies** and **Perceived Company Performance**.

This chapter presents the research design, strategy and methodology that were used to answer the research questions of the study. The constructs are described and their operational definitions are given, and the research method and analysis method are explained. The pre-pilot and pilot studies are explained in detail as it plays a one of the key roles to build up the instrument in coordination with research sample, data sources and data collection methods.

4.1 Instrument Development

During the initial steps of the instrument development, a workshop was done with two Academicians (Assistant Director of University Research Center, and Research Assistant - PhD Student), and two company executives (CEO, and Marketing Director) contributed on the model. A presentation was held to audience reflecting the studies done in literature as well as models on the same content. During dissertation writing phase, some emails were sent to scholars and one satisfying answer was received from one of them. Dr. Chih-Hung Tsai was kind to share their instrument they had used on their article “an empirical study on the correlation between the knowledge management method and new product development strategy on product performance in Taiwan’s industries (Liu, Chen, Tsai, 2005)”. Although the original instrument received was in Chinese, online web based translators were used to translate the instrument.

Market Dynamism and Business Strategies items in the instrument are originated from study by Ulusoy et al. (2008).

Items for Knowledge Management Enablers are taken from the study done by Lee and Choi (2003). They were used and validated by the scholars. Their study implied that

Knowledge Creation Process mediates between enablers and organizational creativity. Being aware of some recent studies that regard both knowledge enablers and knowledge creation process as antecedents of organizational performance (Becerra-Fernandez and Sabherwal, 2001, Gold et al, 2001) that is, both of them are independent variables of organizational performance, they had done additional test to find out that knowledge creation process mediates between the four enablers (collaboration, trust, learning, and centralization) and organizational creativity.

Items for the Knowledge Creation Process are taken from the study done by Lee and Choi (2003). These items had been used and validated by Nonaka et al. (1994). They conducted a confirmatory factor analysis to test Nonaka's (Nonaka and Takeuchi, 1995) organizational knowledge creation model with data collected from 105 Japanese middle managers. Results of the study suggest that the construct of knowledge creation consists of four knowledge conversion processes: socialization, externalization, combination, and internalization. All four knowledge conversion processes explain a high amount of variance in the knowledge creation construct. Four factors constitute the process of converting tacit to tacit knowledge; accumulation of tacit knowledge, extra-firm social information gathering activities, intra-firm social information gathering activities, and transfer of tacit knowledge from the master to the different team members. Externalization process is made up of one factor. This result differs from Nonaka's theory that hypothesized that metaphor and dialogue would be retained. Combination process consists of three factors that represent a three-step sequence of data processing: acquisition and integration of information, synthesis and processing of information, and dissemination of information.

Explicit knowledge in the organization may be converted into tacit knowledge (internalization) in two different ways: personal experience in which knowledge is acquired from real world and simulation and experimentation in which knowledge is acquired from the virtual world.

4.1.1 Measurement of Constructs

The key constructs in this study are **Knowledge Management Enablers**, **Knowledge Creation Process**, **New Product Development Capability**, **Market Dynamism**, **Business Strategies**, and **Perceived Company Performance**. For all these variables, a multiple-item method was used to construct the questionnaires. Each item was based on a six point Likert scale. The six point Likert scale was used in this study to avoid a mid-point, which prevents respondents from using a neutral default options. The instrument was developed by enhancing previous studies done and for the constructs that had been used in instruments where the questionnaire was provided; same items were used in this research's instrument. The instrument was written and applied in Turkish. Research constructs were operationalized on the basis of related studies and pilot tests. Operational definitions of research variables are explained in the following sections.

4.1.1.1 Knowledge Management Enablers

Many researchers have emphasized three major factors for managing knowledge: enablers, processes and organizational performance (Demarest, 1997; Beckman, 1999; O'Dell and Grayson, 1999). Knowledge management enablers which can also be called as influencing factors are organizational mechanisms for fostering knowledge consistently (Chino *et al.*, 1998). They can stimulate knowledge creation, protect knowledge, and facilitate the sharing of knowledge in an organization (Stonehouse, and Pemberton 1999). In this research model, **knowledge management enablers** are accepted as **organizational culture, structure, people** and **technology**.

4.1.1.1.1 Culture

Organizational culture is one of the major factors for a successful knowledge management (Davenport and Prusak 1998, Gold, Malhotra, and Segars, 2001; Lee and Choi, 2003). Organizational culture is a complicated set of assumptions, values, behaviors, and artifacts, and it changes over time as organizations adapt to environmental contingencies (Miller, 1995). Building an effective culture within which people operate in an organization is a crucial requirement for effective knowledge management (Gupta and Govindarajan, 2000). Organizations should establish an appropriate culture that encourages people to create and share knowledge within an organization (Leonard-Barton, 1995).

In this research culture is measured with five subscales: collaboration, trust, learning and participating in boundary spanning structures, and direction and performance information. They are measured by a 6-point Likert-type scale ranging from 1=Strongly Disagree to 6= Strongly Agree.

Collaboration subscale measures the degree where people in a group actively help one another in their work (Krogh, 1998). Collaborative cultures affect customer knowledge creation through increasing knowledge exchange (Belbaly, Benbya, Meissonier, 2007).

Trust subscale measures the degree of maintaining reciprocal faith in each other in terms of intention and behaviors (Kreitner, and Kinicki, 1992). Trust may facilitate open, substantive, and influential knowledge exchange (Nelson, and Cooprider, 1996).

Learning subscale measures the process by which knowledge comes into being and is enhanced over time. Organizational learning is defined as the acquisition of knowledge by individuals and groups who are willing to apply it in their jobs in making decisions and influencing others to accomplish tasks important for the organization (DeNisi, Hitt, Jackson, 2003). Organizational performance requires not only exploiting what is known, but also exploring new domains of knowledge to create opportunities for future exploitation (March, 1991).

Participating in boundary spanning structures subscale measures the degree of exposing employees to knowledge from different disciplines and functions in the course of addressing complex technical, market, and business NPD challenges (Mohrman *et al.*, 2003). Structures that span boundaries and bring together contributors with a range of knowledge and perspectives have important place in knowledge management literature (Mohrman *et al.*, 1995; 2003; DeSouza, and Evaristo, 2003). Merging of knowledge from diverse disciplinary, personal skills-based perspectives and creative cooperation is crucial for innovation (Leonard-Barton and Sensiper, 1998). Participation in boundary spanning structures such as cross-functional teams and product councils has been found to lead to expanded innovative sense-making (Dougherty *et al.*, 2000).

Direction and performance information subscale measures at what degree the knowledge workers know which goals are being attained (Mohrman *et al.*, 2003). Goals, metrics, plans, and milestones are among the generically subjective sense-making frameworks of the organization and are intended to create shared understanding about standards and targets (Weick, 1995). They focus employees' attention, and motivate higher levels of performance (Locke and Latham, 1990). The components of culture are shown in Table 4.1.

Table 4.1 – Constructs - Culture

Construct	Sub-construct	Source	Cited in
Culture	Collaboration	Teece and Pisano, 1994; Hurley, and Hult, 1998 Krogh, 1998; Belbaly, Benbya, Meissonier, 2007	Lee and Choi (2003)
	Trust	Kreitner, and Kinicki, 1992; Hedlund,1994 Nelson, and Cooprider, 1996; Szulanski 1996 Nahapiet, and Ghoshal, 1998 Jarvenpaa, and Staples, 2000 Belbaly, Benbya, Meissonier, 2007	
	Learning	Digman and Takemoto-Chock, 1981 Locke and Lathan, 1984; Kievra, 1984 Kievra *et al.*, 1988; March, 1991 Dodgson, 1993; Cavaleri, 1994 Mitchell *et al.*, 1994; Sherer, 1995 Kluger and DeNisi, 1996; Teece *et al.*, 1997 Lane & Lubatkin, 1998; Baron & Kreps, 1999 Anastasi, 1982 cited in Lynn, Reily, and Akgün, 2000 ; Hitt, Bierman *et al.*, 2001; DeNisi, Hitt, Jackson, 2003	
	Participating in boundary spanning structures	Hopper, 1990; Mohrman *et al.*, 1995 Leonard-Barton, 1995; Weick, 1995 Leonard-Barton and Sensiper, 1998 Anand *et al.*, 1998; Hoopes and Postrel, 1999 Dougherty *et al.*, 2000; Mohrman *et al.*, 2003 DeSouza, and Evaristo 2003; Siriram, and Snaddon 2004	Mohrman *et al.*, 2003
	Direction and performance information	Locke and Latham, 1990; Louis and Sutton, 1991 Weick, 1995; Dougherty, 2001, Mohrman *et al.*, 2003	

4.1.1.1.2 Structure

Structure is measured by two subscales: centralization, formalization. They are summarized in Table 4.2 and measured by a 6-point Likert-type scale ranging from 1=Strongly Disagree to 6= Strongly Agree.

Table 4.2 – Constructs - Structure

Construct	Sub-construct	Source	Cited in
Structure	Centralization	Woodman, Sawyer, and Griffin, 1993 Graham, and Pizzo, 1996 Caruana, Morris, and Vella, 1998 Bennet, and Gabriel, 1999 Stonehouse, and Pemberton, 1999 Lee and Choi, 2003; Siriram, and Snaddon, 2004	Lee and Choi (2003)
	Formalization	Duncan, 1976; Damanpour, 1991; Wilkstrom, and Norman, 1994; Graham and Pizzo, 1996; Rapert and Wren, 1998; Ichijo, *et al.*, 1998; Lusch *et al.*, 1998; Bennet and Gabriel, 1999; Jarvenpaa and Staples, 2000; Holsapple and Joshi, 2001; Becerra-Fernandez and Sabherwal 2001; Lee and Choi, 2003; Lusch, Harvey, Speier, 1998	

Centralization subscale measures the locus of decision authority and control within an organizational entity (Caruana, Morris, and Vella, 1998). It can be defines as "*degree of authority and control over decisions*" (Lee and Choi, 2003). Centralized structure hinders interdepartmental communication and frequent sharing of ideas (Woodman, Sawyer, and Griffin, 1993) due to time-consuming communication channels (Bennet, and Gabriel, 1999). Without a constant flow of communication and ideas, knowledge creation does not occur (Lee and Choi, 2003).

Formalization subscale measures the degree to which decisions and working relationships are governed by formal rules, standard policies, and procedures (Holsapple and Joshi, 2001; Rapert and Wren, 1998). Low formalization permits openness and variation, which encourage new ideas and behaviors (Damanpour, 1991). Knowledge creation is also likely

to be encouraged through unhindered communications and interactions (Bennet and Gabriel, 1999). Formality stifles the communication and interaction necessary to create knowledge. Studies have come to the conclusion that formalization weakens knowledge management (Ichijo, *et al.* 1998, Starbuck, 1992).

4.1.1.1.3 People

People are at the heart of organizational knowledge creation (Choi and Lee. 2002; Holsapple and Joshi, 2001). It is people who create and share knowledge. Therefore, managing people who are willing to create and share knowledge is important (O'Dell *et al.*, 1999). People are measured by one subscale which is t-shaped skills. It is summarized in Table 4.3 - Constructs - People and measured by a 6-point Likert-type scale ranging from 1=Strongly Disagree to 6= Strongly Agree.

T-shaped skills subscale measures at what degree their possessors can explore particular knowledge domains and their various applications in particular products (Leonard-Barton, 1995). People with T-shaped skills are extremely valuable for creating knowledge because they can integrate diverse knowledge assets.

Table 4.3 - Constructs - People

Construct	Sub-construct	Source	Cited in
People	T-shaped skills	Simon 1985; Iansiti, 1993 Leonard-Barton 1995; Madhavan and Grover 1998 Stonehouse and Pemberton, 1999 Johannessen *et al.*, 1999	Lee and Choi (2003)

4.1.1.1.4 Information Technology

IT allows an organization to create, share, store, and use knowledge (Leonard-Barton, 1995). Therefore, the support of IT is essential for initiating and carrying out knowledge management. They are measured by a 6-point Likert-type scale ranging from 1=Strongly Disagree to 6= Strongly Agree

IT quality: IT quality contributes to three knowledge work behaviors, using systematic

processes, knowledge linking and (weakly) to trying new approaches (Mohrman *et al.*, 2003). It also relates directly, although weakly, to one knowledge outcome, effective knowledge generation and use, and, also weakly, to one effectiveness variable, commitment to company.

IT support: IT support means the degree to which knowledge management is supported by the use of IT (Gold, Malhotra, and Segars, 2001). This technology infrastructure includes IT and its capabilities (Raven, and Prasser, 1996; Scott, 1998). IT allows an organization to create, share, store, and use knowledge (Leonard-Barton, 1995). Therefore, the support of IT is essential for initiating and carrying out knowledge management.

Table 4.4 - Constructs - Technology

Construct	Sub-construct	Source	Cited in
Technology	IT quality	Boland and Tenkasi, 1995 Leonard-Barton, 1995 Anand *et al.*, 1998 Davenport and Prusak, 1998 Fulk and DeSanctis, 1999 Cross and Baird, 2000 Mohrman *et al.*, 2003	Mohrman et al., (2003)
	IT support	Nonaka and Takeuchi, 1995 Leonard-Barton, 1995 Raven, and Prasser, 1996 Scott, 1998 Riggins, and Rhee, 1999 Roberts, 2000 Gold, Malhotra, and Segars, 2001 Krogh, Nonaka, and Aben, 2001 Lee and Choi, 2003 Raub and Wittich, 2004	Lee and Choi (2003)

4.1.1.2 Knowledge Creation

At a fundamental level, knowledge is created by individuals and an organization cannot create knowledge without individuals (Nonaka, 1994). The organization supports creative individuals or provides a context for such individuals to create knowledge. Organizational knowledge creation, therefore, should be understood in terms of a process that "*organizationally*" amplifies the knowledge created by individuals, and crystallizes it as a part of the knowledge network of organization (Nonaka, 1994).

Knowledge processes (knowledge management activities) can be thought of as a structured coordination for managing knowledge effectively (Gold *et al.*, 2001). Typically, knowledge processes include activities such as creation, sharing, storage, and usage (Beckman, 1999; Alavi and Leidner, 2001). Whereas knowledge processes represent the basic operations of knowledge (Spek and Spijkervet, 1997), enablers provide the infrastructure necessary for the organization to increase the efficiency of knowledge processes (Sarvary, 1999). Organizational Knowledge Creation has four modes—socialization, internalization, externalization and combination. These Knowledge Creation Processes are provided in Table 4.5 where detailed literature review is provided below. They are measured by a 6-point Likert-type scale ranging from 1=Absolutely not Cares to 6= Absolutely Care.

Table 4.5 - Constructs - Knowledge Creation

Construct	Source
Socialization	Winter, 1987; Nonaka, 1994 von Hippel, 1994; Bohn, 1994 Nonaka, Umemoto, Senoo, 1995 Nonaka, and Takeuchi, 1995; Scott, 1998
Internalization	
Externalization	
Combination	

Socialization: Socialization refers to the transfer of tacit knowledge. As tacit knowledge is difficult to articulate it can be transferred by interaction, and sharing of mental models, technical skills, experiences and perspectives (Nonaka, 1994).

Internalization: Internalization is experimentation with explicit knowledge, resulting in learning and tacit knowledge creation (Nonaka, and Takeuchi, 1995).

Externalization: Externalization is the conversion of subjective tacit knowledge to objective explicit knowledge (Nonaka, 1994; Nonaka, and Takeuchi, 1995). Prototypes and models are explicit representations of new products (Scott, 1998). For example, in product development, exchanging ideas, brainstorming and critiquing on forums, and discussion on customer feedback on new products from sales, marketing, and customer service increases

understanding of customer requirements and technical capabilities.

Combination: Combination is the organizational knowledge creation mode whereby explicit knowledge is converted to new explicit knowledge (Nonaka, and Takeuchi, 1995). This mode is facilitated by categorization and traditional information processing (Nonaka, Umemoto, Senoo, 1995).

4.1.1.3 Market Dynamism

Market dynamism was measured by including four items assessing the rate of changes in customer preferences, competitors' strategies, product characteristics, and technology (Yilmaz, *et al.*, 2005). The scale proposed by Ulusoy *et al.* (2008) used in the research to measure market dynamism. It is comprised of 20 items, which are assessed on a Likert-type scale, ranging from 1 (strongly disagree) to 6 (strongly agree). The scale for Market Dynamism used in this survey research is shown below in Table 4.6 - Market Dynamism Items in Instrument

Table 4.6 - Market Dynamism Items in Instrument

Construct	**Source**
This sector grows very fast	Ulusoy et al. (2008)
Competition in this sector is very intensive	
This sector is recognized with intensive price competition	
There are many rivals in this sector	
There is a dominant competitor with big market share in this sector	
Competitors strategies and actions changes continuously in the market	
There are a lot of potential customers in this sector	
New product supply in this market is very high	
Competitors can easily copy new products	
Competing products are very similar to each other	
Products diminish in a fast pace in the market	
There are a lot of imported competing products in this sector	
Many different and complicated products were developed by competitors	
Customer demands change very fast in this sector	
Customer needs are very complicated and different than each other	
Customers are very conscious about the demands and expectations	
Price determines the loyalty to current products in this sector	
Technological change rate is very high in the market	
Applied technologies are complicated and different than each other	
It is hard to find qualified work power and to retain them in this sector	

4.1.1.4 Business Strategies

Business Strategies was measured by 16 items, all with six point Likert-type scale. Among them items price and quality are assessed on scales, ranging from 1 (very low …) to 6 (very high …). Focusing (target market share) and Variation (product range) are assessed on scales, ranging from 1 (too narrow) to 6 (too wide). Big investments and small investments assessed on scales ranging from 1 (fully operational) to 6 (fully strategic). Items from 9 to 12 are assessed on scales ranging from 1 (absolutely not important) to 6 (absolutely very important). Items ranging from 13 to 16 are assessed on scales ranging from 1 (strongly disagree) to 6 (strongly agree). The scale for Business Strategies used in this survey research is shown below in Table 4.6 - Market Dynamism Items in Instrument

Table 4.7 – Business Strategies Items in Instrument

Price	Yilmaz et al. (2005); Ulusoy et al. (2008)
Quality	
Focusing (target market share)	
Variation (product range)	
Big investments	
Small investments	
To make small changes in present products for the present market	
To develop new products for existing markets	
To enter new markets with present solutions	
To enter new markets with new products	
New technology development	
Improve its own technology	
Improve technology developed by others	
Use technology developed by others	

4.1.1.5 New Product Development Capability

New product development is the process by which an organization utilizes its resources and capabilities for the invention of new product or improvement of an existing one (Cooper, 2003). To decrease cycle time and development costs, project teams which perform NPD deal with pressure without sacrificing innovation as characterized by a faster, better and cheaper philosophy (McDonough *et al.*, 1999). NPD Capability is comprised of 9 items, which are assessed on a Likert-type scale, ranging from 1 (much more unsuccessful) to 6 (much more successful).

Table 4.8 - NPD Capability Items in Instrument

Construct	**Source**
The quality of new developed products and services	McDonough et al. (1999); Cooper (2003)
Introducing new products before competitors	
New product development speed	
New product development cost	
New product development sales	
Profits from new developed products	
New product development flexibility	
New product development quality	
Lessons learned during new product development	

4.1.1.6 Perceived Company Performance

Organizational performance may be defined as the degree to which companies achieved its business objectives (Elenkov, 2002). It may be measured in terms of organizational learning, profitability, or other financial benefits in knowledge management (Simonin, 1997; Davenport, 1999).

Knowledge Management directly influences human behavior and through that company performance (Corso *et al.*, 2005). To be useful, knowledge must be distributed; only that way can it increase company performance in the market place (Demarest, 1997). All the project team's experience and company knowledge are used to define exactly what is required from the business system. Broadly speaking, the information system has to provide information at both the strategic and operational levels. Strategic information is used to measure company performance and determine business objectives and plans (Fisher and Kenny, 2000)

Table 4.9 - Perceived Company Performance Items in Instrument

		Cited in
Market Performance		Yilmaz et al. (2005)
Customer satisfaction	Narver and Slater (1990); Barringer and Bluedorn (1999); Hornsby et al. (2002); Yilmaz et al. (2005); Ulusoy et al. (2008)	
Total sales		
Market share		
Product/Service Performance		
Product/Service Quality	Narver and Slater (1990); Barringer and Bluedorn (1999); Hornsby et al. (2002); Yilmaz et al. (2005); Ulusoy et al. (2008)	
Product/Service Cost		
Product/Service Flexibility		
Product/Service Speed		
Financial Performance		
Profit with respect to Total Sales (Profit/Total Sales)	Narver and Slater (1990); Barringer and Bluedorn (1999); Hornsby et al. (2002); Yilmaz et al. (2005); Ulusoy et al. (2008)	
Profit with respect to Total Assets (Profit/Total Assets)		
General profitability of the firm		

4.1.2 Pre-Pilot Study

The pre-pilot instrument was formed and sent to ten managers from different Information Technologies (IT) companies and asked them to evaluate the items and design while answering. Among ten, four of them returned which makes 40% of response rate. The instrument is provided as pilot study as Appendix 1 and Appendix 2 in Turkish and in English respectively.

The most interesting observation during this phase is that, the instrument was prepared in Microsoft Word format and the samples were asked to print out the document and fill it. Afterwards, they were expected to fax it to the provided number or scan and sent it back via email. However, none of the responses was like this, instead, all filled the word document and sent back via email. This strengthened the idea that, the instrument should be applied to samples from IT companies on a software based environment; and a web based solution suits even better than a word format.

During the pre-pilot study, some comments on the content of the instrument were also received. One of the respondents mentioned that, he did not want to give in details the sales volumes exactly. For the same item, it was observed that the other three respondents did not answer also. Thus, for the pilot study, the item was changed from an open question to selection from six choices, values with intervals.

Similar to sales volume, none of the responses had any values for market size and market share of the company for the last three years. This might cause, the respondents did not know the values or did not want to share the figures. These items were they were taken out of the instrument for future studies.

The legal status of most companies in Turkey is either Corporate or Limited Company. As the final instrument will be asked for those professionals who are working in a company in IT sector, the choices were decreased to three only instead of six, eliminating limited partnership, unlimited company, and private company (sole proprietorship). The choices become corporate, limited company and other.

In business strategies part, the arrangement of the items was changed. Items about investments were moved up, in order to have similar types of questions in a consecutive manner. Another comment was for the items about information technology (IT) quality and IT support. The comment was that; the items were not easy to understand and meaning of the items was more or less the same. To eliminate confusion on these items, they were rephrased using the same wording of Mohrman *et al. (2003).*

The comments about the length of the instrument were in common: it takes too much time to complete it all. This "too much time" is a subjective criteria. Still, additional support was provided mentioning that concentration disappears after a while which might yield to lower the quality of the research. In order to avoid this, the items regarding the constructs in Knowledge Enablers were decreased to three instead of four.

4.1.3 Likert Scale Used

Rating scales are among the most widely used measuring instruments in academic studies, and it is therefore not surprising that a great deal of research has been devoted to the effects of variations in rating scale format, including differences in the number of response categories (Preston and Colman, 2000). Currently, most rating scales, including Likert-type scales and other attitude and opinion measures, contain either five or seven response categories (Bearden, Netmeyer, & Mobley, 1993).

In spite of numerous researches, the issue of the optimal number of response categories in rating scales is still unresolved. Some investigators have studied response patterns and information retrieval. Schutz and Rucker (1975) found in their study of response patterns that "the number of available response categories does not materially affect the cognitive *structure derived from the results*" (p. 323), which seems to suggest that the number of response categories has little effect on the results obtained. On contrary to this research, several other studies provided support for the use of scales with more than two or three response categories. Garner (1960), as an example, suggested that maximum information is obtained by using more than 20 response categories. On the other hand, Green and Rao (1970) found that information retrieval is maximized by using six or seven response categories, with little extra information being gained by increasing the number of

categories beyond seven.

By using computerized solution seeking, some researchers in this area have arrived at different conclusions regarding reliability. In a study based on Monte-Carlo simulation methods, Cicchetti, Showalter, and Tyrer (1985) found evidence for an increase in inter-rater reliability from two-point to seven-point scales; beyond this–even up to 100 response categories–no substantial increase in reliability was found. These researchers concluded that "*the differences in scale reliability between a 7-, 8-, 9-, or 10-category ordinal scale on one hand, and a 100-point or continuous scale on the other is trivial . . . 7 ordinal categories of response appear at least functionally interchangeable with as many as 100 such ordered categories*".

Matell and Jacoby (1972) demonstrated that as the number of scale steps increases, respondents' use of the mid-point category decreases. They advice on minimum usage of the mid-point category by either not including it at all or using scales with many points. Their conclusion is "*the decision would seem to depend on the level of 'uncertain' responses one is willing to tolerate*" (Matell & Jacoby 1972). It is agreed by many authors that the optimal number of scale categories is content specific and a function of the conditions of measurement (Cox 1980; Friedman, Wilamowsky, & Friedman 1981). In this study, six point Likert scale is used. The scale names used for various items are displayed in Table 4.10.

Table 4.10 - Likert Scales Names used in Questionnaire

Strongly Disagree	Disagree	Partially Disagree	Partially Agree	Agree	Strongly Agree
Absolutely not important	Not important	Partially not important	Partially important	Important	Absolutely very important
Absolutely Not Cares	Mostly Not Cares	Partially not Cares	Partially cares	Mostly Cares	Absolutely Cares
Much more unsuccessful	Mostly unsuccessful	Partially unsuccessful	Partially successful	Mostly Successful	Much more successful

4.1.4 A Discussion on Scales of Measurement

According to Stevens (1951; cited in Morgan and Griego, 1998), "*In its broadest sense measurement is the assignment of numerals to objects or events according to rules*". The process of research begins with a problem that is made up of a question about the relationship between two, or usually more, variables (Morgan and Griego, 1998). Measurement is introduced when these variables are operationally defined by certain rules which determine how the participants' responses will be translated into numerals. Four scales or levels of measurement have been described by Stevens (1951; cited in Morgan and Griego, 1998) which are, nominal, ordinal, interval and ratio.

Interval scales have mutually exclusive categories that are ordered from low to high and in addition to this, the categories are equally spaced (Morgan and Griego, 1998). Most physical measurements (length, weight, money, etc.) are ratio scale because they not only have equal intervals between the values/categories, but also have a true zero. The measurement of psychological characteristics such as attitudes, often cannot be certain about whether the intervals between the ordered categories are equal, as required for an interval level scale. As used in this research, 1 for Strongly Disagree, 2 for Mostly Disagree, 3 for Partially Disagree, 4 for Partially Agree, 5 for Mostly Agree, and 6 for Strongly Agree; it is possible to argue on the difference between Strongly Disagree-Mostly Disagree, as different than Mostly Disagree-Partially Disagree. This holds true for any other choices with Partially Disagree-Partially Agree also. Still, some scholars consider them to be at least *approximately interval* (Morgan and Griego, 1998). The researcher accepted them to be ordinal scales and this was represented in SPSS 16.0 as *ordinal*.

4.1.5 Pilot Study

This pilot study is accepted as a kind of feasibility study which is "*small scale version, or trial run, done in preparation for the major study*" (Polit, Back and Hungler, 2001). Van Teijlingen and Hundley (2001) discussed the reasons for a pilot study and concluded the following items:

1. Developing and testing adequacy of research instruments,
2. Assessing the feasibility of a (full-scale) study/survey,
3. Designing a research protocol,
4. Assessing whether the research protocol is realistic and workable,
5. Establishing whether the sampling frame and technique are effective,
6. Assessing the likely success of proposed recruitment approaches,
7. Identifying logistical problems which might occur using proposed methods,
8. Estimating variability in outcomes to help determining sample size,
9. Collecting preliminary data,
10. Determining what resources (finance, staff) are needed for a planned study,
11. Assessing the proposed data analysis techniques to uncover potential problems,
12. Developing a research question and research plan,
13. Training a researcher in as many elements of the research process as possible,
14. Convincing funding bodies that the research team is competent and knowledgeable,
15. Convincing funding bodies that the main study is feasible and worth funding,
16. Convincing other stakeholders that the main study is worth supporting.

Most of these issues are also fitting for this study. Pilot study was done using a web based tool from an online service provider: www.questionpro.com. Before applying to full scale study, the researcher had the chance to clarify the points with respect to comments and statistical analysis. The first point observed and received as a feedback is that, though the request had been sent to a variety of samples, those who were not in deal of product development were not able to complete the instrument. Many emails were received asking for excuse of not completing the questionnaire as items did not to their profession, some because of their tasks, others because of their company/sector. The instrument was applied to IT sector in this research.

4.1.5.1 Pilot Study Results

In Pilot Study, a group of colleagues both in work environment and in academic environment were asked to answer the instrument. They were sent an email, explaining the importance of the study both to the researcher and to the academic environment; and a link was provided for them to access to the questionnaire.

4.1.5.1.1 Simple Descriptives

Simple descriptive statistics were applied to purified data in order to obtain results of mean, std. deviation, frequency, histogram with normal distribution, charts etc.

The instrument was designed to apply to employees from IT companies. For this reason there were six alternatives for business area that were related for this sector. They were: software, hardware, consultancy, solution provider, IT infrastructure provider and other. Among 33 responses, none were from hardware companies and solution provider companies. As it was allowed to choose more than one selection in item regarding the business area of the company, there are 2 missing data (6%), 27 (85%) with only one selection, 1 (3%) with two selections and 2 (6%) with three selection of different business areas (Figure 4.1). An interesting thing with the multi-selection respondents was that, they had selected three different business areas which all were exactly the same responses. These selections consisted of: software, consultancy and solution provider.

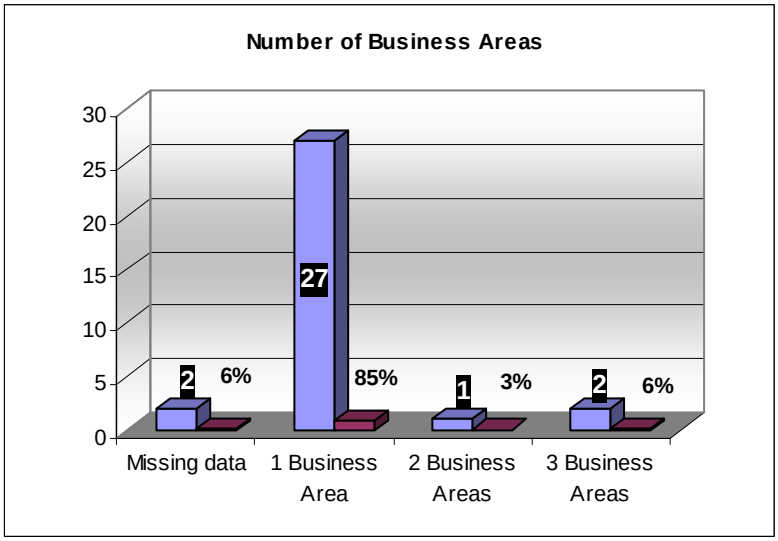


Figure 4.1 - Response Frequency in Business Area

Table 4.11- Statistics for Business Area

Business Area					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Software	6	18,2	19,4	19,4
	Consultancy	4	12,1	12,9	32,3
	IT Infrastructure provider	1	3,0	3,2	35,5
	Other	20	60,6	64,5	100,0
	Total	31	93,9	100,0	
Missing	System	2	6,1		
Total		33	100,0		

The values in Table 2.1 are depicted as a pie-chart in Table 4.2

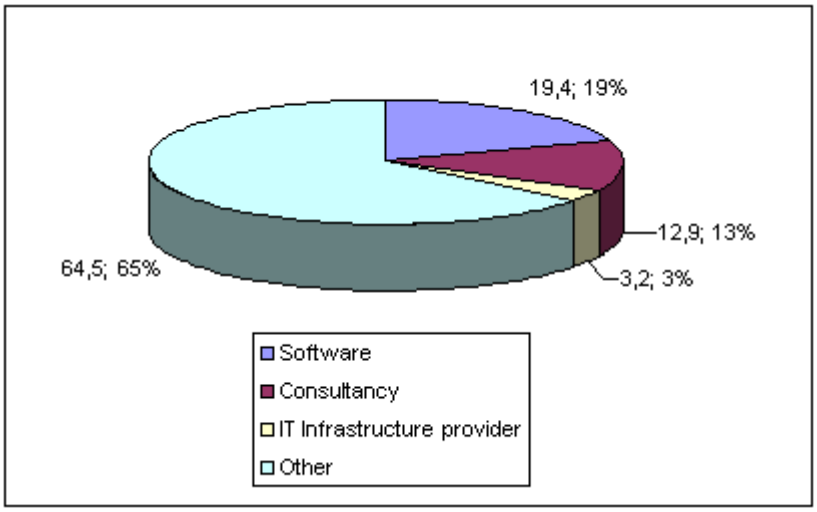


Figure 4.2 - Business Area Distribution

Among 31 responses, 20 of them (60,6%) had selected “other” in the item. The detail of “other” is provided as a graph in Figure 4.3.

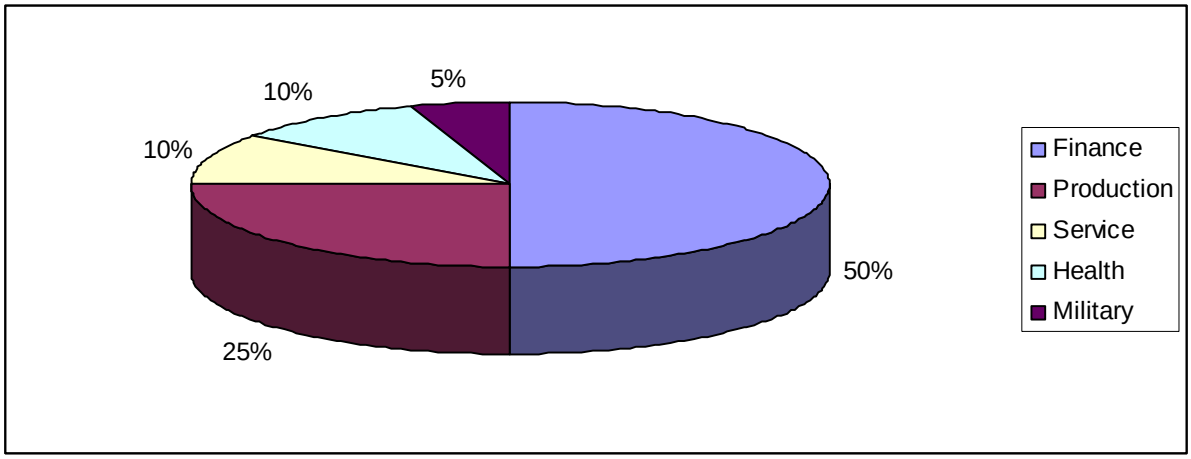


Figure 4.3 - Detailed Distribution of Business Area "other"

The reason that Finance has a considerable weight among the respondents is, the researcher also works in Finance sector and the instrument was asked to be answered among his colleagues also.

The firm size was measured with annual sales volume. Respondents were asked to choose the interval that their company fitted in. Among them, 57,6% were from large companies with annual sales more than 10 million YTL; 12.1% were from small companies with sales less than 500.000 YTL and 24.3% in changes from 500K to 10 million YTL yearly sales volume.

Table 4.12 - Firm Size (Annual Sales Volume)

Sales volume					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-500.000	4	12,1	12,9	12,9
	500K-1million	2	6,1	6,5	19,4
	1 - 2,5 million	3	9,1	9,7	29,0
	2,5 - 5 million	1	3,0	3,2	32,3
	5 - 10 million	2	6,1	6,5	38,7
	10 million +	19	57,6	61,3	100,0
	Total	31	93,9	100,0	
Missing	System	2	6,1		
Total		33	100,0		

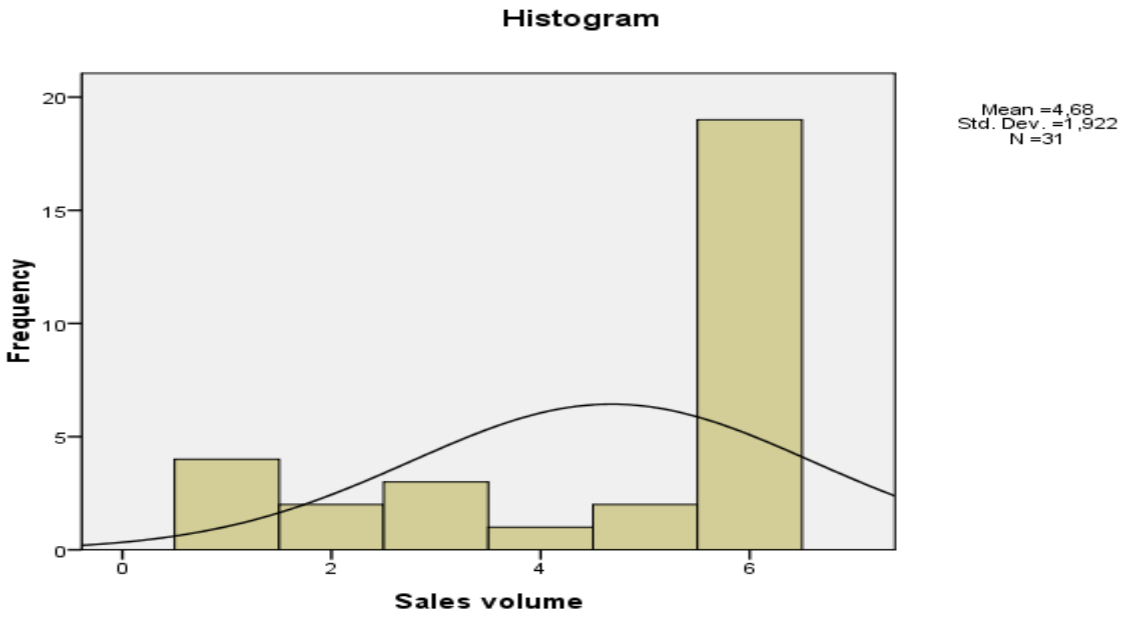


Figure 4.4 - Firms Size Distribution

Legal Status had three different alternatives with values: 1- Corporate, 2-Limited Company, 3-Other. Most of the respondents (66,7%) were from Corporate, with 27,3% from limited company and only 6,1% from other types of organizations.

Table 4.13 - Legal Status of Company

Legal Status					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	22	66,7	66,7	66,7
	2	9	27,3	27,3	93,9
	3	2	6,1	6,1	100,0
	Total	33	100,0	100,0	

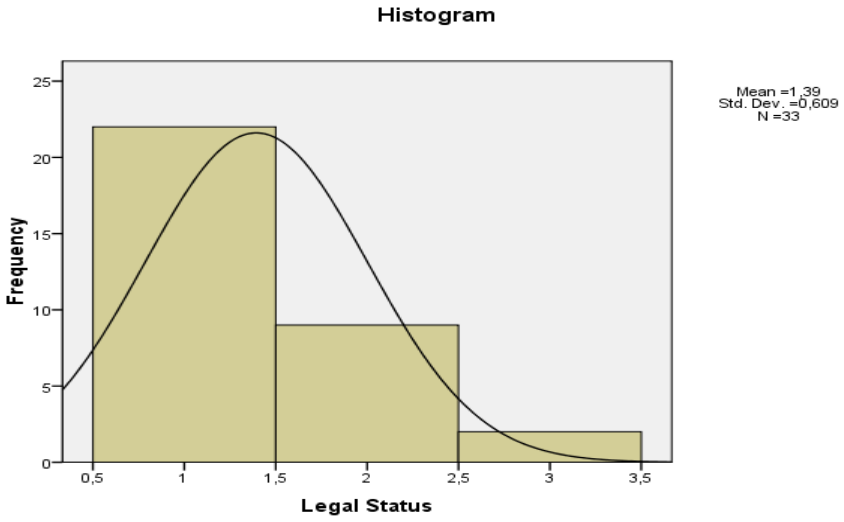


Figure 4.5 - Legal Status Frequency

Age distribution of respondents are provided as bar graphs in Figure 4.5

Table 4.14 - Age Distribution

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Age	33	30	24	54	37,21	7,092	50,297
Valid N (listwise)	33						

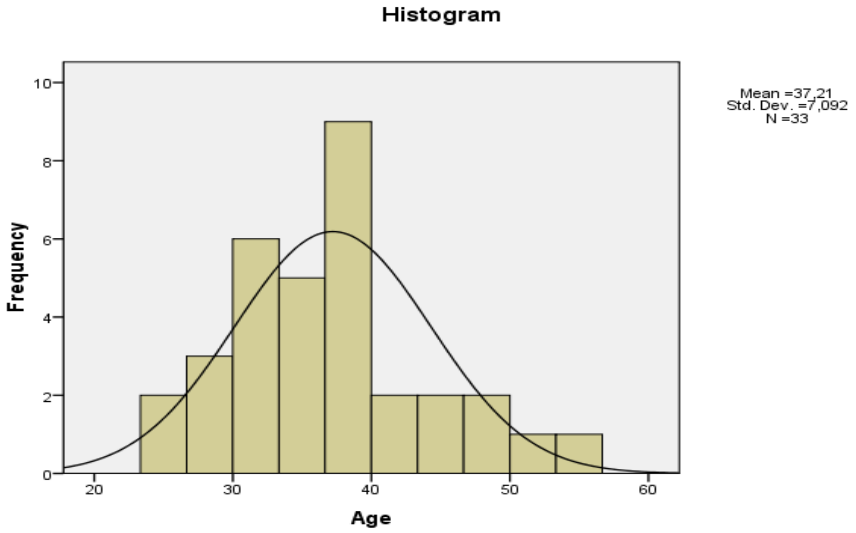


Figure 4.6 - Age Distribution

The respondents' sex distribution seems to be male dominated as 75,8% were male and 24,2 percent were female where details are also provided in Table 4.15 - Sex Distribution.

Table 4.15 - Sex Distribution

Sex					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	24,2	24,2	24,2
	2	25	75,8	75,8	100,0
	Total	33	100,0	100,0	

The item about the position within the organization consists of values Executive Management (33,3%), Top Management reporting to Executives (12,1%), Managers reporting to Top Management (30,3%) and other (15,2%).

Table 4.16 - Position of Respondents in Their Organizations

Position					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	33,3	36,7	36,7
	2	4	12,1	13,3	50,0
	3	10	30,3	33,3	83,3
	4	5	15,2	16,7	100,0
	Total	30	90,9	100,0	
Missing	System	3	9,1		
Total		33	100,0		

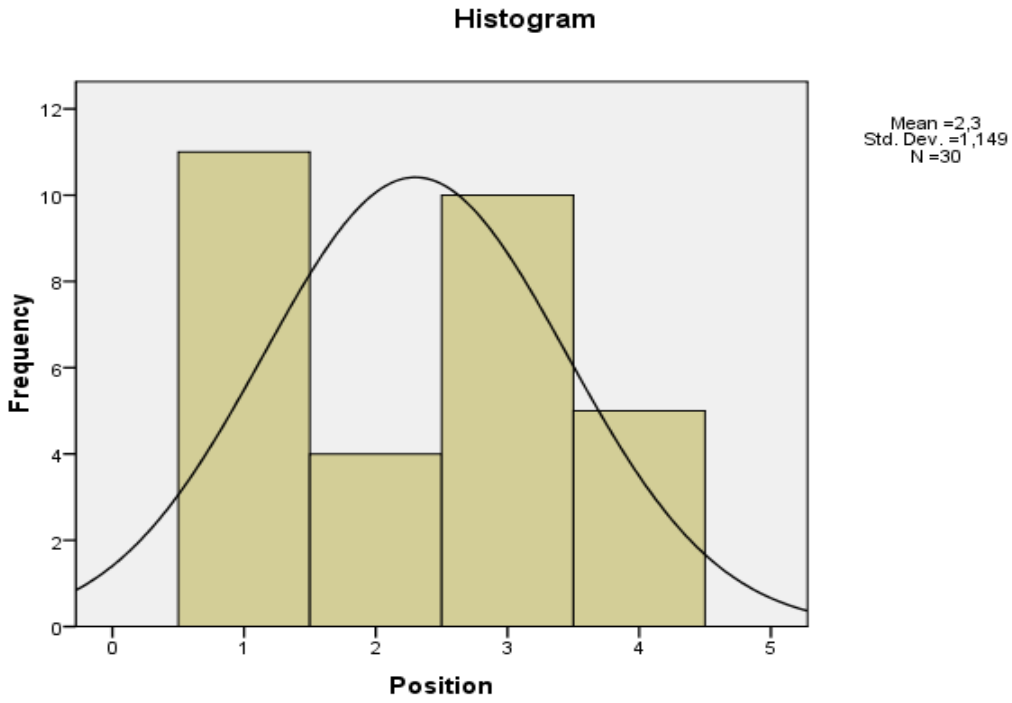


Figure 4.7 - Position of Respondents in Their Organizations

The academic degrees of respondents had the results that they are highly educated, with 1 respondent PhD (3%), 19 respondents with graduate (57,6%), 12 respondents with undergraduate (36,4%) and only 1 with college degree (3%). There were no high school or below degrees among the respondents.

Table 4.17 - Academic Degree of Respondents

Academic Degree					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	3,0	3,0	3,0
	2	19	57,6	57,6	60,6
	3	12	36,4	36,4	97,0
	4	1	3,0	3,0	100,0
	Total	33	100,0	100,0	

Total experience of respondents implies that they were experienced employees. The results in Table 4.18 - Total Experience of Respondents in their Profession shows that 1 respondent (3%) had less than 2 years of experience, 1 (3%) with 2-5 years, 9 (27,3%) with 6-10 years, 11 (33,3%) with 11-15 years, 6 (18,2%) with 16-20 years, and 5 (15,2%) more than 20 years of experience.

Table 4.18 - Total Experience of Respondents in their Profession

Years as a professional					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	3,0	3,0	3,0
	2	1	3,0	3,0	6,1
	3	9	27,3	27,3	33,3
	4	11	33,3	33,3	66,7
	5	6	18,2	18,2	84,8
	6	5	15,2	15,2	100,0
	Total	33	100,0	100,0	

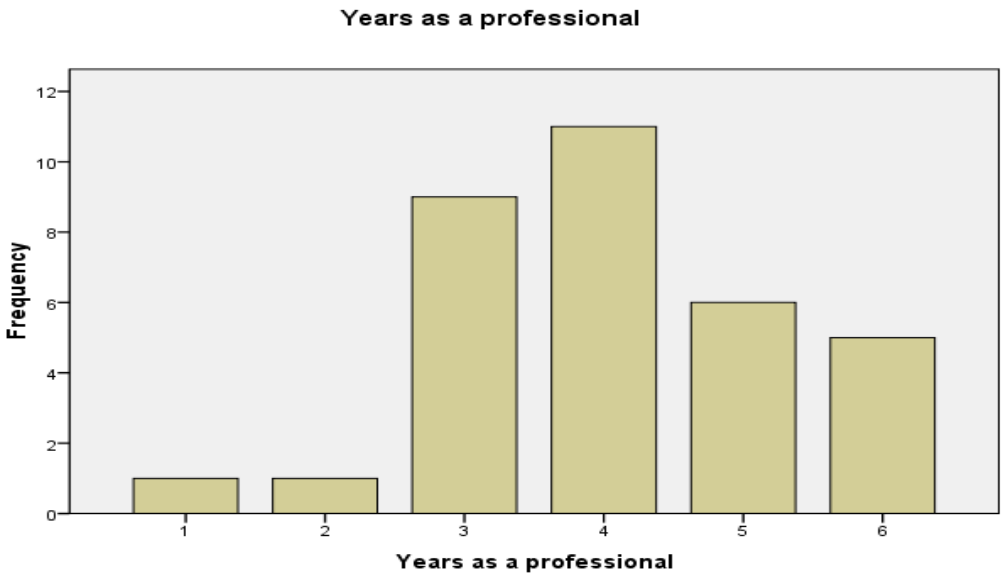


Figure 4.8 - Total Experience of Respondents in Their Profession

4.1.5.1.2 Complex Descriptive Statistics

In order to see the distribution of two variables in the same table, cross-tabulation tables are produced. Also, in order to check the significance and strength of the relationships, non-parametric measures of association is used. Cramer's V is the appropriate statistic to measure the strength of the association between two nominal variables with larger tables. Cramer's V measures the strength of a relationship of two nominal variables when one or both have three or more levels/values. If the association between variables is weak, the value of the statistic will be close to zero and the significance level will be greater than ,05; the usual cutoff to say an association is statistically significant (Morgan and Griego, 1998).

4.1.5.1.2.1 Cross-tabulation and nonparametric association tests

Cross-tabulation and nonparametric association analyses were done between nominal scales: Company Size, Legal Status and Working Experience. Company size is categorized as in Table 4.19 - Annual Sales Volume.

Table 4.19 - Annual Sales Volume

1	2	3	4	5	6
0 – 500K	500K – 1mm	1 - 2,5 mm	2,5 - 5 mm	5 - 10 mm	Above 10 mm

Firm's Legal Status is categorized as in Table 4.20 - Legal Status

Table 4.20 - Legal Status

1	2	3
Corporation	Limited Company	Other

Professional experience is categorized as in Table 4.21 - Total Professional Experience

Table 4.21 - Total Professional Experience

1	2	3	4	5	6
0-1	2-5	6-10	11-15	16-20	20+

Additional analyses were done between Customer Satisfaction, Market Share, General Profitability of Firm and Quality of New Developed Products, and NPD Quality.

1	2	3	4	5	6
Very Unsuccessful	Mostly Unsuccessful	Partly Unsuccessful	Partly Successful	Mostly Successful	Very Successful

4.1.5.1.2.2 Cross-Tabulation and Nonparametric Association between Company Size and Legal Status of the Company

Cross-tabulation table was created for Company Size and Legal Status of the Company depicted Table 4.22. In our case, having 6x3 factorial table, Cramer's V value is close to +1 (,568) and the significance level is ,029 (better than ,05). So there is a strong and significant association between Company Size and Legal Status of the firm.

Table 4.22 - Cross-Tabulation of Company Size vs. Legal Status

Sales volume * Legal Status Crosstabulation						
			Legal Status			Total
			1	2	3	
Sales volume	0-500.000	Count	1	3	0	4
		Expected Count	2,6	1,2	,3	4,0
		% within Sales volume	25,0%	75,0%	,0%	100,0%
	500K-1million	Count	0	2	0	2
		Expected Count	1,3	,6	,1	2,0
		% within Sales volume	,0%	100,0%	,0%	100,0%
	1 - 2,5 million	Count	1	2	0	3
		Expected Count	1,9	,9	,2	3,0
		% within Sales volume	33,3%	66,7%	,0%	100,0%
	2,5 - 5 million	Count	0	1	0	1
		Expected Count	,6	,3	,1	1,0
		% within Sales volume	,0%	100,0%	,0%	100,0%
	5 - 10 million	Count	2	0	0	2
		Expected Count	1,3	,6	,1	2,0
		% within Sales volume	100,0%	,0%	,0%	100,0%
	10 million +	Count	16	1	2	19
		Expected Count	12,3	5,5	1,2	19,0
		% within Sales volume	84,2%	5,3%	10,5%	100,0%
Total		Count	20	9	2	31
		Expected Count	20,0	9,0	2,0	31,0
		% within Sales volume	64,5%	29,0%	6,5%	100,0%

Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	,803	,029
	Cramer's V	,568	,029
N of Valid Cases		31	

4.1.5.1.2.3 Cross-Tabulation and Nonparametric Association between Company Size and Total Professional Experience

Cross-tabulation table was created for **Company Size** and **Total Professional Experience** depicted . In this case, having 6x6 factorial table, Cramer's V value is close to +1 (,519) and the significance level is ,019 (better than ,05). So there is a strong and significant association between Company Size and Total Professional Experience.

Table 4.23 - Company Size vs. Total Professional Experience

Years as a professional * Sales volume Crosstabulation									
			Sales volume						Total
			0-500.000	500K-1million	1 - 2,5 million	2,5 - 5 million	5 - 10 million	10 million +	
Years as a professional	1	Count	0	1	0	0	0	0	1
		Expected Count	,1	,1	,1	,0	,1	,6	1,0
		% within Years as a professional	,0%	100,0%	,0%	,0%	,0%	,0%	100,0%
	2	Count	0	0	0	0	1	0	1
		Expected Count	,1	,1	,1	,0	,1	,6	1,0
		% years as a pro.	,0%	,0%	,0%	,0%	100,0%	,0%	100,0%
	3	Count	1	0	1	0	0	6	8
		Expected Count	1,0	,5	,8	,3	,5	4,9	8,0
		% years as a pro.	12,5%	,0%	12,5%	,0%	,0%	75,0%	100,0%
	4	Count	1	0	1	0	0	8	10
		Expected Count	1,3	,6	1,0	,3	,6	6,1	10,0
		% years as a pro.	10,0%	,0%	10,0%	,0%	,0%	80,0%	100,0%
	5	Count	1	1	1	0	1	2	6
		Expected Count	,8	,4	,6	,2	,4	3,7	6,0
		% years as a pro.	16,7%	16,7%	16,7%	,0%	16,7%	33,3%	100,0%
	6	Count	1	0	0	1	0	3	5
		Expected Count	,6	,3	,5	,2	,3	3,1	5,0
		% years as a pro.	20,0%	,0%	,0%	20,0%	,0%	60,0%	100,0%
Total		Count	4	2	3	1	2	19	31
		Expected Count	4,0	2,0	3,0	1,0	2,0	19,0	31,0
		% within Years as a professional	12,9%	6,5%	9,7%	3,2%	6,5%	61,3%	100,0%

Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	1,161	,019
	Cramer's V	,519	,019
N of Valid Cases		31	

4.1.5.1.2.4 Cross-Tabulation between Customer Satisfaction and Market Share

Cross-tabulation table was created for **Customer Satisfaction** and **Market Share** shown in Table 4.24. Cramer's V value is close to +1 (,528) and the significance level is ,024 (better than ,05). So there is a strong and significant association between Customer Satisfaction and Market Share. It is interesting that there is one 'Very Successful' Customer Satisfaction level with a Market Share 'Mostly Unsuccessful' and one 'Mostly Successful' Customer Satisfaction level with 'Very Unsuccessful' Market Share. Other than these two, rest of the selection was parallel to each other, and almost one third of the responses were 'Mostly Successful' for both dimensions.

Table 4.24 - Customer Satisfaction vs Market Share

Customer satisfaction * Market share Crosstabulation

		Market share						Total
		1	2	3	4	5	6	
Customer satisfaction	3	0	2	0	0	0	2	4
	4	0	2	4	1	3	1	11
	5	1	0	0	3	10	3	17
	6	0	1	0	0	0	0	1
Total		1	5	4	4	13	6	33

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,914	,024
	Cramer's V	,528	,024
N of Valid Cases		33	

4.1.5.1.2.5 Cross-Tabulation between Customer Satisfaction and General Profitability of the Firm

Cross-tabulation table was created for **Customer Satisfaction** and **General Profitability of the Firm** depicted in Table 4.25. In this case, having 6x6 factorial table, Cramer's V value is close to +1 (,666) and the significance level is ,000. So there is a strong and significant association between Customer Satisfaction and General Profitability. There is one answer with 'Very Unsuccessful' Profitability of the Firm but still have a 'Very Successful' Customer Satisfaction. Such a company is at the very beginning of a launch or the respondent misunderstood something. Still the significance of the Cramer's V and Phi values are very good.

Table 4.25 - Customer Satisfaction vs General Profitability of the Firm

Customer satisfaction * General profitability of the firm Crosstabulation								
		General profitability of the firm						Total
		1	2	3	4	5	6	
Customer satisfaction	3	0	1	1	2	0	0	4
	4	0	1	4	4	1	1	11
	5	0	0	2	6	8	1	17
	6	1	0	0	0	0	0	1
Total		1	2	7	12	9	2	33

Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	1,154	,000
	Cramer's V	,666	,000
N of Valid Cases		33	

4.1.5.1.2.6 Cross-Tabulation between the Quality of New Developed Products and NPD Quality

Cross-tabulation table was created for these two items were depicted in Table 4.26. Cramer's V value is close to +1 (,778) and the significance level is ,000. So there is a strong and significant association between **Quality of New Developed Products** and **NPD Quality.** Among 32 responses, 27 of them (%84.37) have the same values both for the quality of new developed products and new product development quality. And among 27, more than half of them (%51.85) are at 'Very Successful' stage.

Table 4.26 - The Quality of New Developed Products vs NPD Quality

The quality of new developed products and services * New product development quality Crosstabulation							
		New product development quality					Total
		2	3	4	5	6	
The quality of new developed products and services	2	1	1	0	0	0	2
	3	0	2	0	0	0	2
	4	0	2	7	0	0	9
	5	0	1	0	14	1	16
	6	0	0	0	0	3	3
Total		1	6	7	14	4	32

Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	1,555	,000
	Cramer's V	,778	,000
N of Valid Cases		32	

4.1.5.1.3 Exploratory-Confirmatory Factor & Reliability Analyses

To apply factor analysis and reliability analysis on the data collected by pilot study, SPSS 16.0 was used. Among these two tests; confirmatory factor analysis was applied to reduce row data. In factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's Tests were applied. KMO measure lists as follows: .90's as outstanding, .80's very good, .70's as average, .60's as tolerable, .50's as poor, below .50 unacceptable.

After having the KMO Measure of Sampling Adequacy as acceptable, the significance was checked through Bartlett's Test of Sphericity. If Bartlett's Test of Sphericity was significant, items with the Measures of Sampling Adequacy less than .50 were dropped by Inter-Correlation Anti–Image Matrices.

The consistency of the remaining variables was used to eliminate items that were not pure in factor analysis. For the means of extraction Principal Component Analysis was used and in order to rotate the factors Varimax with Kaiser Normalization rotation was used. In the Rotated Component Matrix the loaded values of the remaining items were grouped into one or more components.

Reliability is defined as the ability of the scales consistently yields the same response. According to the factor analysis' results a reliability analysis for each scale of the constructs consisting of remaining items was performed. For Cronbach's alpha, a value of above ,70 is often considered to be acceptable for scales validated in past studies. The values above ,60 are deemed sufficient for newly developed scales.

Factors analysis results of the pilot study are depicted in Table 4.27 below:

Table 4.27 - Summary for Factor and Reliability Analyses of Scales

Scale	KMO	Bartlett (Sig.)	# Factors	Explaining Power (%)	Cronbach's α
Market Dynamism	,537	,000	7	75,547	,704
Business Strategies - Market vs. Product	,358	,032	2	67,877	,466
Business Strategies - Technology Usage	,394	,008	2	72,419	,364
Collaboration	,684	,000	1	77,071	,850
Trust	,718	,000	1	81,728	,887
Learning	,636	,000	1	66,111	,740
Participating in boundary spanning structures	,606	,000	1	70,570	,777
Direction and performance information	,636	,000	1	82,331	,892
Centralization	,716	,000	1	80,157	,874
Formalization	,637	,000	1	64,507	,709
T-shaped skills	,562	,000	1	60,839	,664
IT quality	,631	,000	1	80,941	,876
IT support	,639	,000	1	72,249	,793
Socialization	,548	,001	1	58,584	,637
Externalization	,612	,000	1	81,701	,887
Combination	,658	,000	1	80,581	,879
Internalization	,758	,000	1	85,446	,914
Sales Goal Achievement	,738	,000	1	79,056	,866
Profit Expectation Achievement	,635	,000	1	74,767	,830
R&D Capability	,653	,000	1	69,141	,764
Opportunities Created	,654	,000	1	71,652	,798
Overall Performance of NP	,661	,000	1	80,447	,878
Effect of NP on Company	,673	,000	1	68,378	,765
Market Performance	,515	,000	1	60,454	,655
NPD Performance	,634	,000	1	73,657	,813
Financial Performance	,781	,000	2	86,673	,902

4.1.6 Modifications in Questionnaire after Pilot Study

After the application of pilot study, respondents were also asked individually if they have any additional information to share especially on the design of the instrument. The major critics were on the length of the instrument. In addition to this, some items were found to be similar especially in KM Enablers, some others were not clear enough especially in Knowledge Creation, while some items were duplicated within different sections like in New Product Development and Perceived Company Performance.

The major changes made in the final questionnaire are as follows:

The first one is the changing of items for Knowledge Management Enablers. In the pilot study, all variables were measured by four items. This was reduced to three items for each variable in order to eliminate the similar questions which also contributed to shorten the length of the instrument.

The second one is to use the same items for the knowledge creation process, which had been validated and used by Nonaka et al. (1994). They conducted a confirmatory factor analysis to test Nonaka's (1995) organizational knowledge creation model with data collected from 105 Japanese middle managers. Results of the study suggest that the construct of knowledge creation consists of four knowledge conversion processes: socialization, externalization, combination, and internalization. All four knowledge conversion processes explain a high amount of variance in the knowledge creation (Lee and Choi, 2003).

Third change was to simplify items in NPD Capability in coordination with the Perceived Company Performance part, while using the original items of Ulusoy (2008) for Perceived Company Performance.

Finally, the instrument had 113 items instead of 132 items which took around 15 minutes to respond through a web based application.

4.2 Sampling Method

Although SEM is a technique that requires large sample sizes, there is no specific answer to the question of how large a sample needs to be. However, sample sizes less than 100 are considered to be “small” (Kline, 2005).

Small sample size results in statistical tests with very limited that the power. There is greater error in smaller samples as the error of estimation is affected by the sample size. The root mean square error of approximation (RMSEA) measures the error of approximation which is not affected by the small sample size (Kline, 2005). Larger samples have less sampling error than within smaller samples. Absolute sample size in estimation methods are given as below;

1. Small : $N < 100$
2. Medium : $100 < N < 200$
3. Large : $N > 200$

Test statistics are sensitive to sample size and results of some computer simulation studies indicate that improper solutions are made more likely to occur for confirmatory factor analysis (CFA) models with only two indicators per factor and sample sizes less than 100-150 cases (Kline, 2005). In case the model involves more parameters, it requires larger samples. For a complicated path model, a sample size of 200 or even much higher sizes may be necessary. There is no absolute standard in literature about the relation between sample size and path model complexity, however, the following recommendation is offered: a desirable goal is to have the ratio of the number of cases to the number of free parameters be 20:1. For a more realistic target, a 10:1 ratio fits better. Thus, a path model with 20 parameters should have a minimum sample size of 200 cases (Kline, 2005).

This research has 20 parameters with Market Dynamism (1), Business Strategies (1), KM Enablers (10), KM Creation Process (4), NPD Capability (1), and Perceived Company Performance (3) as shown in Figure 3.6. Thus, with a 10:1 ratio, the model requires a minimum sample of 200 cases.

This study will be applied to Information Technologies (IT) companies. The sampling done regarding to their main service background: software, hardware, solution provider

and IT infrastructure provider. As there are many companies spread all over the Turkey on IT business, we used the following equation to calculate adequate sample size (Nişel, 2003).

$$n = \left(\frac{N * \sigma^2}{(N-1)D + \sigma^2} \right)$$

The definitions for the symbols are:

n: Required sample size (to be calculated)

N: Population size

$$\sigma^2 = \left(\frac{Range}{4} \right)^2$$

range = $X_{max} - X_{min}$ (X_{max}: Maximum value of data, X_{min}: Minimum value of data)

$$D = \left(\frac{B^2}{z^2} \right)$$

B: Tolerated error of estimation

z: is the abscissa of the normal curve that cuts off an area at the tails

To calculate the required sample, we use the following values:

N (population size): The population data for 2007 is obtained from Informatics Association of Turkey (Türk Bilişim Derneği), Ankara Branch. Number of employees in IT companies in Turkey is around 150.000 by year end 2007.

Range: Since we are using a Likert scale between 1 and 6, X_{min} and X_{max} are 1 and 6 respectively. So the range becomes 5. B is the tolerance error and if we use 0.20 for B, that means 0.20 is tolerated in the range between 1 and 6. (0,20 = 0,04 % of 5 which is in the acceptable range according to Cochran (1977).

z: it is 1.96 for 95 % confidence level

Applying all in the following formula will yield: $n = \left(\frac{N * \sigma^2}{(N-1)D + \sigma^2} \right) = 150$

4.3 Structural Equation Modeling

Structured Equation Modeling (SEM) is a statistical technique for testing and estimating causal relationships using a combination of statistical data and qualitative causal assumptions. It is a representation of two separate statistical traditions. The first one is factor analysis developed in the disciplines of psychology and psychometrics. The latter is simultaneous equation modeling developed mainly in econometrics, but having an early history in the field of genetics. It was articulated by the geneticist Sewall Wright (1921), the economists Trygve Haavelmo (1943) and Herbert Simon (1953), and formally defined by Judea Pearl (2000) using a calculus of counterfactuals.

SEM offers a means of developing and evaluating ideas about complex (multivariate) relationships. It is this property that makes SEM of interest to the practitioner of science (Grace, 2006). SEM can be defined as a class of methodologies that seeks to represent hypotheses about the means, variance, and covariance of observed data in terms of a smaller number of "structural" parameters defined by a hypothesized underlying model (Kaplan, 2000). To put it in a different phrase, SEM is a combination of methodologies that is used to represent complex models.

In addition to estimation with non-normal variables, many recent developments in structural equation modeling allow researchers to estimate models in the presence of other data-related problems. For example, Muthen et al. (1987) and Allison (1987) have shown how we can use standard structural equation modeling software to estimate the parameters of structural equation models when missing data are not missing completely at random.

SEM encourages confirmatory more and exploratory modeling less; thus, it is suited to theory testing rather than theory development. It usually starts with a hypothesis, represents it as a model, operationalises the constructs of interest with a measurement instrument, and tests the model. The causal assumptions embedded in the model often have falsifiable implications which can be tested against the data. With an accepted theory or otherwise confirmed model, SEM can also be used inductively by specifying the model and using data to estimate the values of free parameters. Often the initial hypothesis requires adjustment in light of model evidence, but SEM is rarely used purely for

exploration.

SEM uses one of three approaches (Garson, 2008):

4. *Strictly confirmatory approach*: A model is tested using SEM goodness-of-fit tests to determine if the pattern of variances and covariances in the data is consistent with a structural (path) model specified by the researcher. However as other unexamined models may fit the data as well or better, an accepted model is only a not-disconfirmed model.
5. *Alternative models approach*: One may test two or more causal models to determine which has the best fit. There are many goodness-of-fit measures, reflecting different considerations, and usually three or four are reported by the researcher. Although desirable in principle, this alternative models approach runs into the real-world problem that in most specific research topic areas, the researcher does not find in the literature two well-developed alternative models to test.
6. *Model development approach*: In practice, much SEM research combines confirmatory and exploratory purposes: a model is tested using SEM procedures, found to be deficient, and an alternative model is then tested based on changes suggested by SEM modification indexes. This is the most common approach found in the literature. The problem with the model development approach is that models confirmed in this manner are post-hoc ones which may not be stable (may not fit new data, having been created based on the uniqueness of an initial dataset). Researchers may attempt to overcome this problem by using a *cross-validation* strategy under which the model is developed using a calibration data sample and then confirmed using an independent validation sample.

As SEM cannot itself draw causal arrows in models or resolve causal ambiguities, theoretical insight and judgment by the researcher maintains its importance.

Among its strengths is the ability to model constructs as latent variables (variables which are not measured directly, but are estimated in the model from measured variables which are assumed to 'tap into' the latent variables). This allows the modeler to explicitly capture the unreliability of measurement in the model, which in theory allows the structural

relations between latent variables to be accurately estimated (Hancock & Mueller, 2006).

The use of SEM entails two interrelated steps. First, the estimation of the *measurement model* refers to the relationships between latent and observable variables. Second, the estimation of the *structural model* specifies linkages between different latent variables (Byrne, 2001).

In SEM, the qualitative causal assumptions are represented by the missing variables in each equation, as well as vanishing covariance among some error terms. These assumptions are testable in experimental studies and must be confirmed judgmentally in observational studies.

Multivariate techniques aim to expand the researcher's explanatory ability and statistical efficiency (Hair et al., 1998). Although, multiple regressions, factor analysis, multivariate analysis of variance and discriminant analysis all provide the researcher with powerful tools for addressing a wide range of managerial and theoretical questions, each technique can examine only a single relationship at a time which is a major and common limitation. Techniques such as multivariate analysis of variance and canonical analysis that allow for multiple dependent variables also represent a single relationship between the dependent and independent variables.

Contrary to other techniques, SEM can examine a series of dependence relationships simultaneously. In cases where one dependent variable becomes an independent variable in subsequent dependence relationships, it is particularly useful. Such relationships of dependent and independent variables is the basis of.

All SEM techniques are distinguished by two characteristics:

1. Estimation of multiple and interrelated dependence relationships, and
2. The ability to represent unobserved concepts in these relationships and account for measurement error in the estimation process.

SEM and other multivariate techniques differ especially in the use of separate relationships

for each set of dependent variables. SEM estimates a series of separate, but interdependent, multiple regression equations simultaneously by specifying the structural model used by the statistical program. The researcher draws upon theory, prior experience, and the research objectives to distinguish which independent variables predict each dependent variable.

SEM models consider that the covariance matrix of the observed variables in a model has a specific structure which can be expressed in terms of a set of parameters that derive from that model (Byrne, 2001). SEM seeks to minimize the differences between the covariances for the sample and the covariances that the model predicts.

The methodology underlying the use of SEM is based on four steps (Kline, 2005).

1. *Specification* consists of the definition of the research hypotheses, either by drawing a diagram of the model, or by formulating a series of equations. These equations define the model's parameters and they correspond to presumed relations between observed or latent variables.
2. Determining whether the model is *identified;* i.e. if it is possible to derive a unique estimate of each model parameter. A model is identified when there are more equations than parameters to be estimated. If a model fails to meet requirements for its identification, attempts to estimate it may not be successful.
3. *Analysis* of the model should be carried out, by obtaining estimates of the model's parameters. Although the most frequently used estimation method is maximum likelihood (ML), this procedure assumes multivariate normality in the variables. Robust estimators are recommendable when the study deals with non-normal variables.
4. *Evaluating* the model fit, which involves determining how adequately the model accounts for the data. Analysis of the model fit can be carried out through the chi-square value. The chi-square will be non-significant if the hypothesized model has a good fit ($p \geq 0.05$). In addition, researchers can use other fit indicators. Because there is no "best" fit index, researchers are advised to use a variety of qualitatively different indices (Byrne, 2001). These indicators are presented in Table 4.28.

Table 4.28 – Fit indicators for SEM models

Fit Test	Good Fit	Moderate Fit
χ^2	$0 \leq \chi^2 \leq 2df$	$2df \leq \chi^2 \leq 3df$
χ^2 / df	$0 \leq \chi^2 /df \leq 2$	$2 \leq \chi^2 /df \leq 3$
p value	$0.05 \leq p \leq 1.00$	$0.01 \leq p \leq 0.05$
GFI	$0.95 \leq GFI \leq 1.00$	$0.90 \leq GFI \leq 0.95$
AGFI	$0.90 \leq AGFI \leq 1.00$	$0.85 \leq AGFI \leq 0.90$
CFI	$0.97 \leq CFI \leq 1.00$	$0.95 \leq CFI \leq 0.97$
RMSEA	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.08$
NFI	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI \leq 0.95$
TLI	$0.95 \leq TLI \leq 1.00$	$0.90 \leq TLI \leq 0.95$

χ^2 : Chi-square; df: Degree of Freedom; GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index ; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; NFI: Normed Fit Index; TLI: Tucker Lewis Index

A SEM model is assessed at various levels: first for the overall model and then for the measurement and structural models separately. Goodness of fit measures is of three types: (1) absolute fit measures, (2) incremental fit measures, or (3) parsimonious fit measures. Absolute fit measures assess only the overall model fit (both structural and measurement models collectively) with no adjustment for the degree of over-fitting that might occur. Incremental fit measures compare the proposed model to another model specified by the researcher. Finally, parsimonious fit measures adjust the measures of fit to provide a comparison between models with differing numbers of estimated coefficients, the purpose being to determine the amount of fit achieved by each estimated coefficient.

The most commonly used and recommended indicators of absolute fit are goodness-of-fit index, GFI (Hancock & Mueller, 2006) and the adjusted goodness-of-fit index, AGFI (Hancock & Mueller, 2006). These two indices measure the relative amount of variance and covariance explained by the model and their values should be as close to unity as possible.

The comparative fit index, CFI (Hancock & Mueller, 2006), which is an index resistant to errors associated with sample size, and the root mean square error: RMSEA (Hancock & Mueller, 2006), which estimates the difference between the original and reproduced covariance matrices in the population.

4.3.1 Measurement models and confirmatory factor analysis

The purpose of a measurement model is to describe how well the observed indicators serve as a measurement instrument for the latent variables. Indicators in measurement models can be viewed as endogenous variables, and the latent factors as exogenous variables. The associated procedure to assess the properties of measurement models is known as Confirmatory Factor Analysis (CFA). CFA models have two main features (Kline, 2005). First, each indicator in the CFA model is represented as having two causes: the latent factor that the indicator is supposed to measure, and all other sources of variance, which are represented by the measurement error term. Second, the measurement error terms are independent of each other and of the latent factors.

The specification of a CFA model (for the case of a single latent factor) involves establishing relationships between the indicators and the latent variable that they measure. In this regard, CFA models require the factor loading of one indicator to be fixed to 1,00 in order to give the latent variable the same metric as the indicators. In this study, all the variables (except for control variables) are considered latent factors (Garson, 2008).

CFA may be used to confirm that the indicators sort themselves into factors corresponding to how the researcher has linked the indicators to the latent variables. Confirmatory factor analysis plays an important role in structural equation modeling. CFA models in SEM are

used to assess the role of measurement error in the model, to validate a multifactorial model, to determine group effects on the factors, and other purposes (Garson, 2008).

Kline (1998) urges SEM researchers always to test the pure measurement model underlying a full structural equation model first, and if the fit of the measurement model is found acceptable, then to proceed to the second step of testing the structural model by comparing its fit with that of different structural models (ex., with models generated by trimming or building, or with mathematically equivalent models). It should be noted this is not yet universal practice.

Mulaik & Millsap (2000) have suggested a more stringent four-step approach to modeling:

1. Common factor analysis to establish the number of latents
2. Confirmatory factor analysis to confirm the measurement model. As a further refinement, factor loadings can be constrained to 0 for any measured variable's crossloadings on other latent variables, so every measured variable loads only on its latent. Schumacker & Jones (2004) note this could be a tough constraint, leading to model rejection.
3. Test the structural model.
4. Test nested models to get the most parsimonious one. Alternatively, test other research studies' findings or theory by constraining parameters as they suggest should be the case. Consider raising the alpha significant level from .05 to .01 to test for a more significant model.

The principal application of CFA is the testing of the scale construct validity (Hancock & Mueller, 2006). Once the four requirements inherent in SEM methodology (specification, identification, analysis and evaluation) have been verified, CFA models should include an interpretation of factor loadings (which represent regression coefficients estimating the direct effects of the factors on the indicators) as well as their statistical significance (Kline, 2005). In should be noted here that CFA models can include a single latent factor, higher-level latent factor (e.g. second-order latent variables) or several latent factors. In this latter case, correlations between latent factors should also be estimated, together with the comparison of a multiple factor model with alternative models.

4.3.2 Structural models

The specification of structural models allows the testing of hypotheses on the causal effects between different latent variables (Dudaroglu, 2008). In these models, exogenous latent variables represent independent latent factors that are not predicted by any variable within the model. While on the other hand, latent endogenous variables are determined by other variables and have a disturbance term that reflects the unexplained variance in this variable due to all unmeasured causes.

Structural model estimation consists of two steps. First one is to assess whether the proposed model fits to the observed data. In case the model does not acceptably fit the data, individual hypotheses cannot be examined. Second one is to evaluate the statistical significance and magnitude of the structural parameters (corresponding to the causal relationships between variables), together with the reliability of the structural equations (through the coefficient of determination R square).

4.3.3 AMOS: A Tool to Test Relationships

Amos provides powerful and easy-to-use structural equation modeling (SEM) software. Researchers can create more realistic models than only using standard multivariate statistics or multiple regression models alone. Using Amos, they can specify, estimate, assess, and present the model in an intuitive path diagram to show hypothesized relationships among variables. This enables user to test and confirm the validity of claims such as "value drives loyalty" in minutes, not hours (www.spss.com).

Amos enables to build models that more realistically reflect complex relationships with the ability to use observed variables such as survey data or latent variables like “satisfaction” to predict any other numeric variable. Structural equation modeling, sometimes called path analysis, helps to gain additional insight into causal models and the strength of variable relationships.

With Amos, researchers can perform estimation with ordered-categorical and censored data, enabling to:

1. Create a model based on non-numerical data without having to assign numerical scores to the data
2. Work with censored data without having to make assumptions other than normality

Researchers can also impute numerical values for ordered-categorical data or censored data, so they can create a complete numerical dataset when one is required. Or, impute values for missing values in the new dataset. They also have the option of estimating posterior predictive distributions to determine probable values for missing or partially missing data in a latent variable model.

5 RESEARCH FINDINGS

This chapter provides the results of statistical analysis employed for this study.

There are five sections in this chapter. The first section provides overall summary and profile of the respondents and their firms on several dimensions by descriptive analysis. Section 5.1 is for **Basic Descriptive Statistics** which were applied to purified data in order to obtain results of mean, standard deviation, frequency, histogram with normal distribution, charts, etc.

Section 5.2 is for **Complex Descriptive Statistics** which were applied to obtain results of crosstabulation and non-parametric association between nominal, ordinal and interval scaled variables. In this section the strengths of relationships between variables were measured. The section also provides factor analysis, a complex associational technique to make data reduction. Results of factor analysis were used to reduce the number of variables to a more manageable and meaningful number of summated scales. Internal consistency reliability of these new scales with Cronbach's α was also checked before actually computing scales.

Section 5.3 is for **Basic Difference Statistics** which were compromised of inferential statistics. T-test was deployed in order to compare two groups and one way ANOVA was used in order to understand the significant differences between three or more groups.

Section 5.4 is for **Basic Associational Statistics** which were for one independent variable and one dependent variable. In a typical associational approach, the independent variable is continuous or has at least five ordered levels or values, still it is possible but not typical to use the associational approach and statistics when one has fewer than five ordered values of the variables and even with unordered nominal variables. Testing correlations for significance is the basic analysis.

Section 5.5 is for Path Analysis. The final section is 5.6 and involves the SEM analysis

5.1 Basic Descriptive Statistics

The initial part for this section is to make sure that the collected data is free of errors. In order to achieve this, descriptives of variables are calculated in a table with the help of SPSS version 16.0 in addition to graphics produced by Microsoft Excel. The output provides the number of subjects (N), the lowest and highest score, mean, and standard deviation for each variable. At the beginning of the data analysis, it is checked to make sure that all means seem reasonable, and also checked that the minimum and maximum are within the appropriate range for each variable. The descriptives table is provided in Appendix 6 - Descriptive Statistics.

For simple descriptive statistics, the following statistics measures are taken in consider.

Three main measures of the center of a distribution are mean, median, and mode. The mean or arithmetic average takes into account all of the available information in computing the central tendency of a frequency distribution. The median or middle score is an appropriate measure of central tendency for ordinal level data.

Variability tells us about the spread or dispersion of scores. The standard deviation, the most common measure of variability, is only appropriate when one has interval level data. Many statistics assume that the data are normally distributed. That is, their frequency distribution is similar to the normal curve, which has five properties (Morgan and Griego, 1998):

a. The normal curve is unimodal. It has one “hump”, and this hump is in the middle of the distribution.
b. The mode or most frequent value is in the middle.
c. The mean, median, and mode are equal.
d. It is symmetric. If you folded the normal curve in half, the right side would fit perfectly with the left side; that is, it is not skewed.
e. It is asymptotic. This means that the extremes never touch the axis.
f. It is neither too peaked nor too flat, that is, it has zero kurtosis.

Skewness and curtosis are important in determining how such a variable's distribution deviates from the distribution of the normal curve. Skewness refers to the lack of symmetry or balance in a frequency distribution. Distributions with a few scores far to the right (high) end, making a long "tail" to the right, have a positive skew and vice versa. Kurtosis measures whether the peak of the distribution is taller or shorter than the ideal normal curve and also whether the tails are shorter or longer than the normal curve. Very peaked curves have positive curtosis. If a frequency distribution of a variable has a large (plus of minus) skewness and/or kurtosis relative to their standard error, that variable is said to deviate from normality. As a rule of thumb, it is said that, if the skewness and/or kurtosis measure is more than 2.5 times its standard error the assumption of normality has been violated.

5.1.1 The Instrument

The instrument used in this study is applied to professionals in Information Technology sector. The sample group was informed with email invitation and asked to respond to the instrument which was applied on a web based environment. This seems to be the correct way of collecting data, as the target group has high capability in web based solutions.

The number of samples that had accessed to the instrument and read the first page (information declaration page) was 1336, where among them 942 of them started to answer the items in the questionnaire which makes a rate of 70.5% . Still only 294 of them completed the instrument which makes a rate of 22%. Both the values and percentages of response to instrument are represented in Figure 5.1.

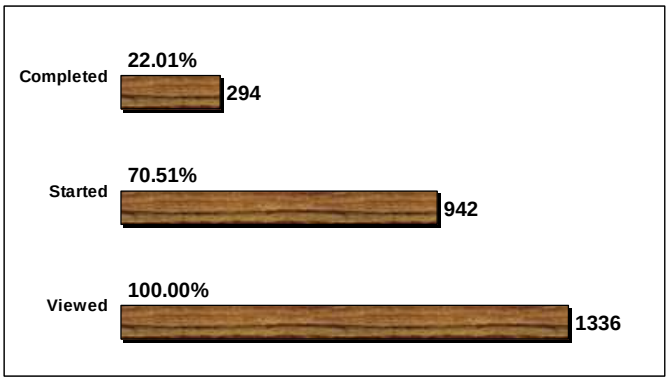


Figure 5.1 - Values for Response to Instrument

The instrument was applied to those who were working in IT sector and in order to reach to a wide sample several methods were used. The first and most effective way was to send direct mails to those whom the researcher knows personally. This also enabled the researcher to follow-up the responses and push those who had not applied the instruments yet. The second effective way was to ask for management team of IT companies. They were asked to send a memo to their team for participating to the instrument. There were three companies whom their management team cooperated in doing so, thus the participation from these companies were higher than the average.

Using mail groups was the third effective way. In addition to mail groups that the researcher was moderating, membership granted for other groups where the group was supposed to have members working in IT sector. Totally 48 groups with 122.458 members were mailed asking for participation to an academic research with an instrument that last about 12-15 minutes to complete. The participants were also asked to be working in IT sector. Among these 48 groups, 33 of them approved the message and the message reached to a potential of 53.395 members. The full list is provided in Appendix 9.

There were 274 answers to company name and only 20 answers were blank. When a pivot table was done for number of responses for each company, detailed analysis achieved: The respondents were from 93 companies; not including the blank responses for company name, as displayed in Figure 5.2.

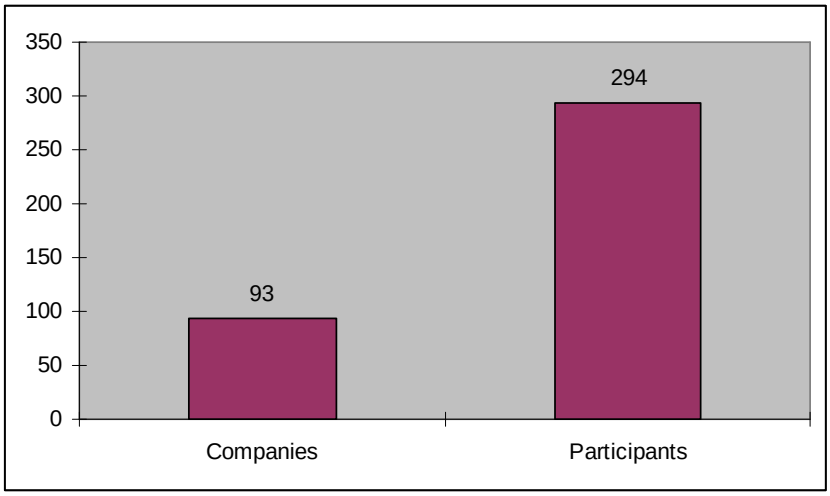


Figure 5.2 - Numbers of Participants and Companies

Among these 93 companies, the ones which had returns 5 and above were displayed in Figure 5.1. Their web pages were also included in the table to enable searching for additional information about these companies if needed in future work. The full list of companies was presented in Appendix 8.

Table 5.1 - Companies with Respondents of 5 and Higher

Full Title of The Company	Respondents	Web address of Company
Intertech Bilgi İşlem ve Pazarlama Ticaret A.Ş.	40	www.intertech.com.tr
VRP Veri Raporlama Programlama A.S	33	www.veripark.com
Bizitek Bilgisayar Yazılım ve İnternet Teknolojileri A.Ş	30	www.bizitek.com
Global Bilgi A.Ş.	15	www.global-bilgi.com.tr
DONE İletişim ve Bilgi Sistemleri	12	www.donetr.com
Banksoft Bilişim Bilgisayar Hizmetleri Ltd. Şti.	10	www.banksoft.com.tr
Ericsson Telekomünikasyon A.Ş.	6	www.ericsson.com.tr
Fujitsu Siemens Computers	6	www.fujitsu-siemens.com
Yaz Bilgi Sistemleri A.Ş.	6	www.yaz.com.tr
Avez Elektronik A.Ş.	5	www.enocta.com
Deksar Multimedya ve Telekomunikasyon A.S.	5	www.dexar.com
Oracle Bilgisayar Sistemleri A.Ş.	5	www.oracle.com/tr

These 12 companies that have respondents five and above have 173 total responses, which makes %58.84 of the instrument.

The respondents were asked to enter a valid email address if they wanted to be informed about the results of the study. Totally 155 respondents were entered their email address and a quick analysis with the data provide an information that 40% of respondents provided their web based email address, while 60% of them used their company mail address.

5.1.2 Descriptives of firms

5.1.2.1 Descriptives for Foundation Year

There are 277 valid data for Foundation year, where respondents were asked to enter the year as four digit data. The oldest company goes back to 1935, while the youngest one is less than 1 years old. The mean of the group is 1993.

Table 5.2 - Statistics for Foundation Year

Statistics

Foundation Year

N	Valid	277
	Missing	17
Mean		1993,03
Std. Deviation		13,473
Variance		181,528
Skewness		-2,753
Std. Error of Skewness		,146
Kurtosis		7,921
Std. Error of Kurtosis		,292
Minimum		1935
Maximum		2008

The histogram diagram is presented in Figure 5.3. Both the chart and the values for skewness and kurtosis validates that this is not a normal distribution as values for skewness and kurtosis both are higher than 2.5 times their standard error.

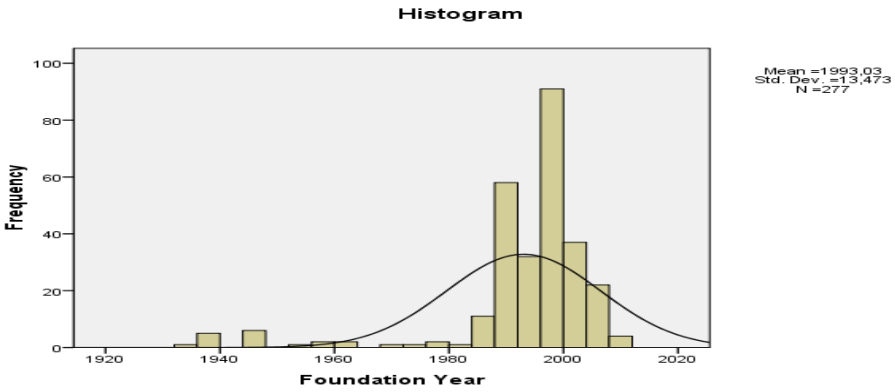


Figure 5.3 - Histogram Chart of Foundation Year

5.1.2.2 Descriptives for Foundation Year Range

As foundation year for companies' changes in a broad range, grouping them was preferred for further analysis. The segmentation was done to differentiate newly founded companies as 0-2 years of age, the rest of the data was divided into groups with 5 years of interval. Keeping in mind that IT sector in the world was accelerated in 1980s in parallel to the developments in technology and boomed up during 1990 with increasing rates in personal computer penetration both in businesses and household, in addition to graphical user interfaces and world wide web. The classification statistics is provided in Table 5.3.

Table 5.3 - Foundation Year Defined with range

Foundation Year defined with range

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-2 year / 2006-2008	15	5,1	5,4	5,4
	3-7 years / 2001-2005	18	6,1	6,5	11,9
	8-12 years / 1996-2000	121	41,2	43,7	55,6
	13-17 years / 1991-1995	74	25,2	26,7	82,3
	18-22 years / 1986-1990	24	8,2	8,7	91,0
	22+ years / ....-1985	25	8,5	9,0	100,0
	Total	277	94,2	100,0	
Missing	7	17	5,8		
Total		294	100,0		

The descriptive statistics for foundation year range are provided in Table 5.4.

Table 5.4 - Statistics for Foundation Year Range

Statistics

Foundation Year defined with range

N	Valid	277
	Missing	17
Mean		3,54
Std. Deviation		1,193
Variance		1,423
Skewness		,271
Std. Error of Skewness		,146
Kurtosis		,193
Std. Error of Kurtosis		,292
Minimum		1
Maximum		6

When the foundation year of the companies are evaluated, it is found that newly founded companies (younger than 3 years old) are only 5%, while it is almost same (6%) for the next 5 years (years 2001-2005). The reason for this might be the economic crisis in Turkey, as it took some time to recover the crisis that happened at February 2001.

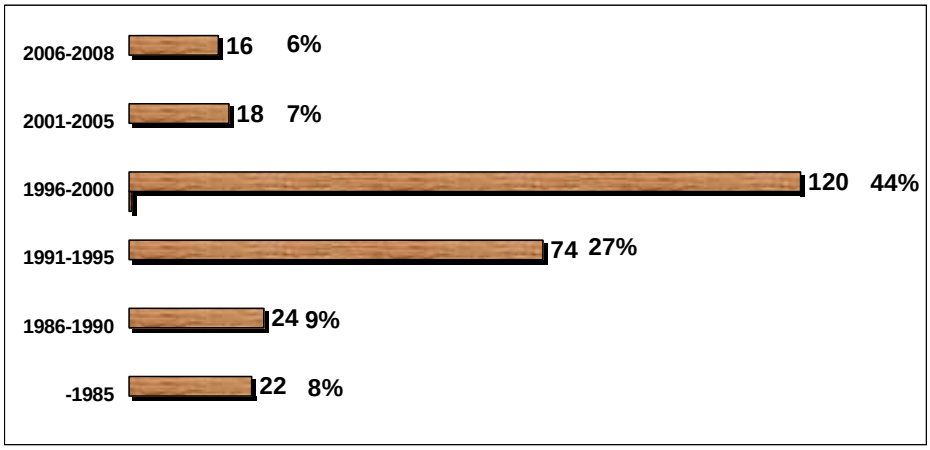


Figure 5.4 - Company Foundation Year Distribution

The booming period is for years 1996 to 2000 (including both years) has a weight of 44%. 27% of the respondents are in companies that was founded between 1991-1995 while 9% and 8% them are in companies that was founded between 1986-1990 and before 1986 respectively. These values are represented in Figure 5.4. This figure is also represented as histogram in Figure 5.5.

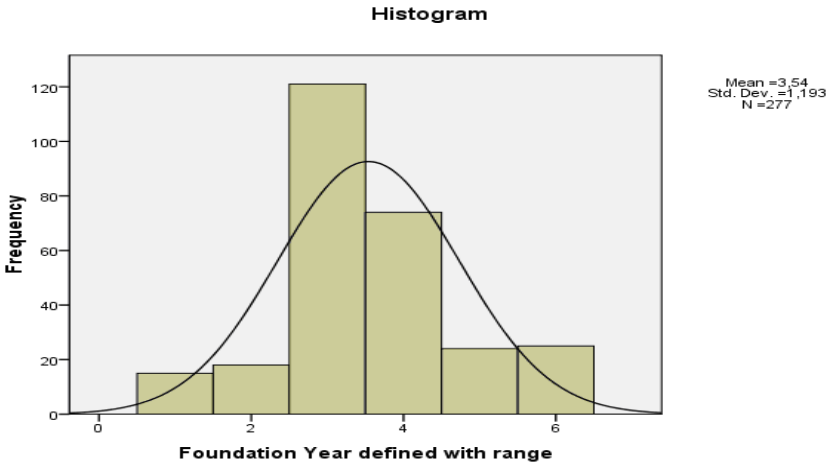


Figure 5.5 - Histogram Chart of Foundation Year Distribution

5.1.2.3 Descriptives for Business Areas

Main business areas for companies are presented in Figure 5.6. As respondents were allowed to choose more than one business area, the total exceeds 100%. The major business area is ‘software’ with 230 responses, followed by ‘solution provider’ with 172 responses. It is evident that, most of the respondents coincide with each other as the sample size is totally 294 and those who had selected ‘other’ (totally 44 samples) had only one selection, thus had no common choices with the rest; making out of 250 (294-44), 230 of them are in ‘software’ business.

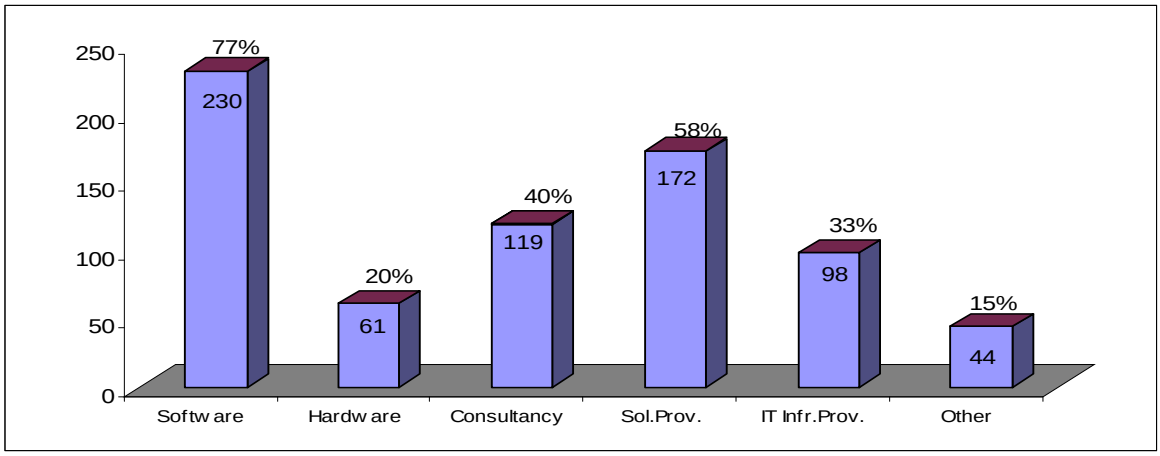


Figure 5.6 - Business Areas for Respondents' Companies

As respondents were allowed to select more than one business area for their companies, the number of business areas for each company is shown in Figure 5.7.

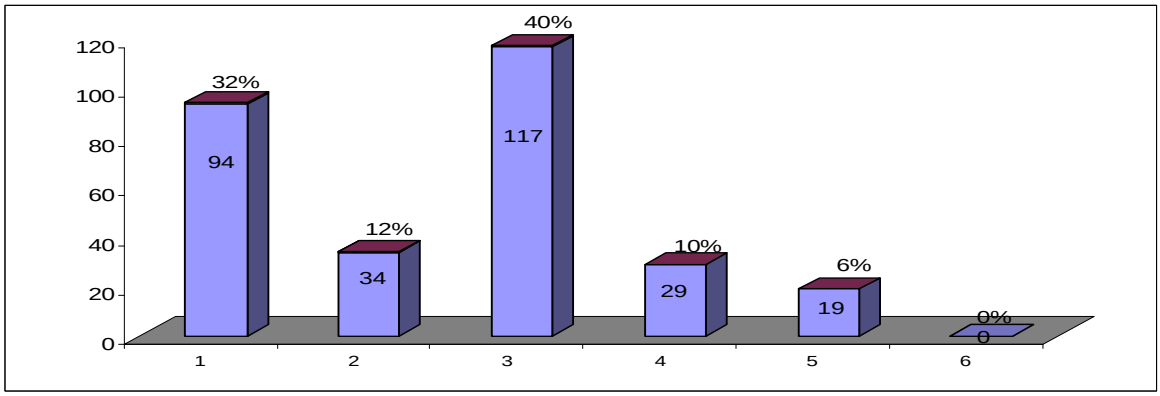


Figure 5.7 - Number of Business Areas for Companies

There are:

a. 94 responses with their companies involved only 1 business area (32%);
b. 34 responses with their companies involved in 2 different business areas (12%);
c. 117 responses with 3 different business areas (40%);
d. 29 companies involved in 4 different business areas (10%) and
e. 19 companies involved in 5 different business areas (6%).
f. There is no company which is involved in 6 different business areas.

The sum of business areas that companies are involved results to 724. The analysis in Figure 5.8 depicts that 32% of these responses are Software, 24% of them are Solution Providers, with 16% Consultancy, 14% IT Infrastructure Provider, 8% Hardware supplier, 3% Telecommunications and 3% Other sectors.

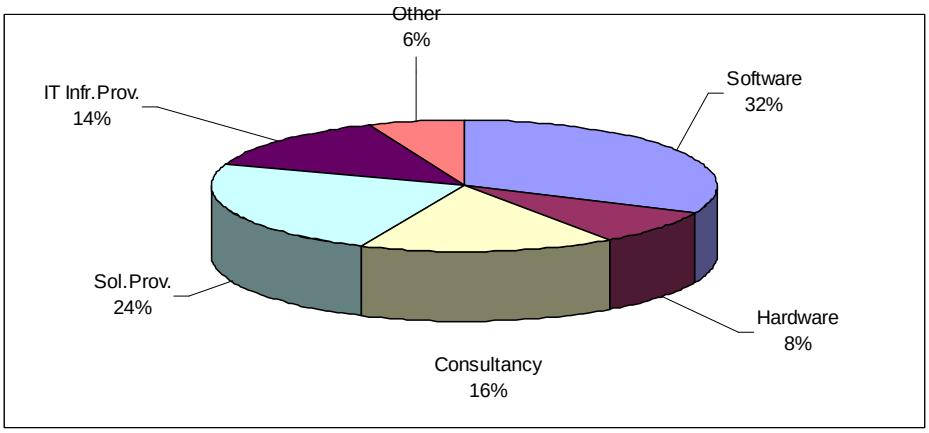


Figure 5.8 - Business Area Distribution

5.1.2.4 Descriptives for Number of Employees

Number of employees for each firm determines how big the firm as one of the variables is. There are six different groups, with number of employees starting from 1-10 (Very Small), and continuing with 11-50 (Small), 51-100 (Medium 1), 101-250 (Medium 2), 251-1000 (Big) and 1000+ (Very Big). The statistics are displayed in Table 5.5.

Table 5.5 - Statistics for Number of Employees with respect to Groups

Number of Employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	19	6,5	6,5	6,5
	11-50	43	14,6	14,7	21,2
	51-100	110	37,4	37,7	58,9
	101-250	60	20,4	20,5	79,5
	251-1000	17	5,8	5,8	85,3
	1000+	43	14,6	14,7	100,0
	Total	292	99,3	100,0	
Missing	System	2	,7		
Total		294	100,0		

38% of respondents (110) are from Middle 1 companies, 21% of them (60) are from Middle 2 companies. The value for respondents from very big companies (1000+) and small companies (11-50) have same value of 15% (43 each). Respondents from very small companies are 7% (19) and respondents from big companies are 6% (17).

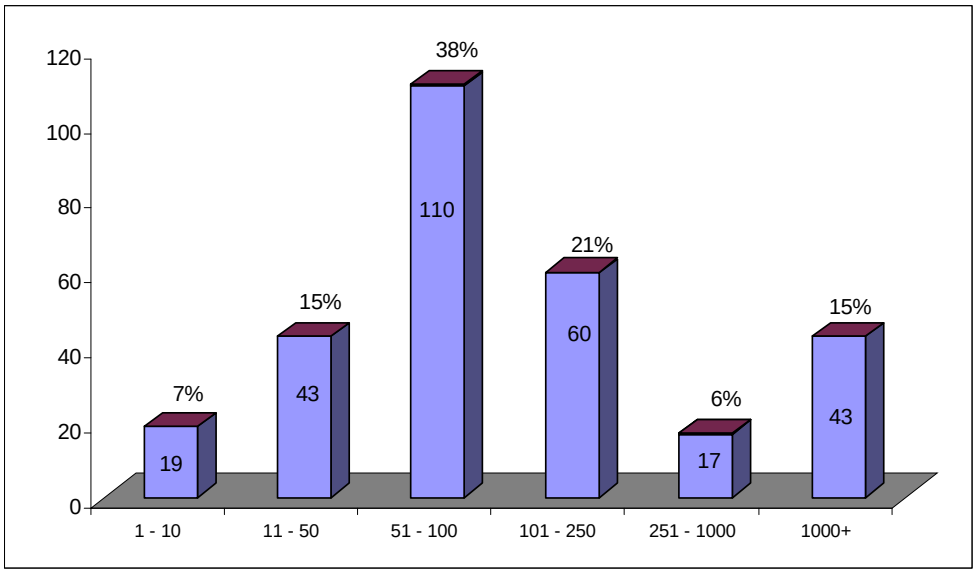


Figure 5.9 - Number of Employees of Firms

There are 292 responses for this item with only 2 missing and mean value is 3,49.

Table 5.6 - Statistics for Number of Employees

Statistics

Number of Employees

N	Valid	292
	Missing	2
Mean		3,49
Median		3,00
Std. Deviation		1,393
Variance		1,941
Skewness		,389
Std. Error of Skewness		,143
Kurtosis		-,469
Std. Error of Kurtosis		,284
Minimum		1
Maximum		6

Figure 5.9 is displayed as a histogram chart in Figure 5.10.

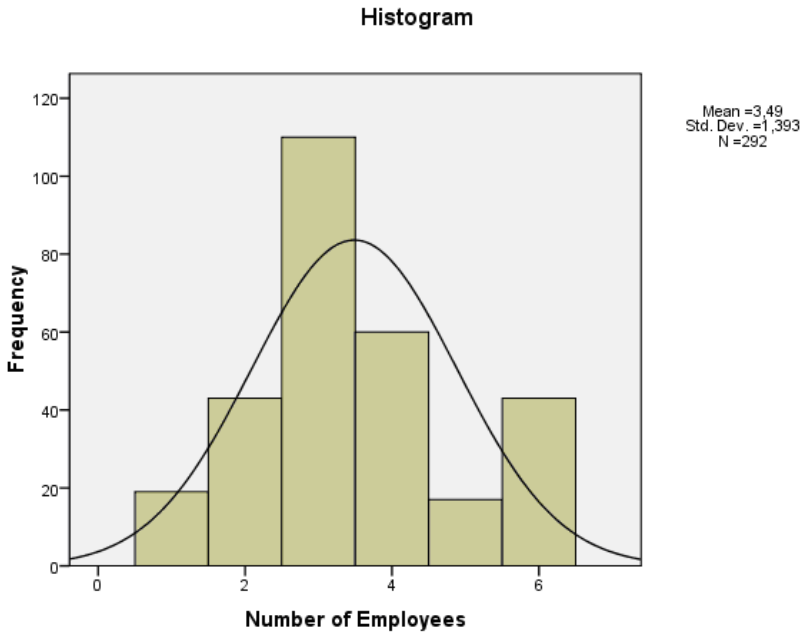


Figure 5.10 - Histogram Chart for Number of Employees

5.1.2.5 Descriptives for Sales Volume

The sales volume (in YTL) of a company is another value to determine how big that company is. This item is group in six where 1 stands for 0-500K, 2 for 500K-1mm, 3 for 1-2,5mm, 4 for 2,5-5mm, 5 for 5-10mm, and 6 for 10+mm all with YTL values. The statistics with the groups are displayed in Table 5.7.

Table 5.7 - Statistics for Sales Volume Groups

		Volume Range (YTL)	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	0-500.000	10	3,4	4,3	4,3
	2	500K-1million	6	2,0	2,6	6,9
	3	1 - 2,5 million	6	2,0	2,6	9,4
	4	2,5 - 5 million	45	15,3	19,3	28,8
	5	5 - 10 million	78	26,5	33,5	62,2
	6	10 million +	88	29,9	37,8	100,0
		Total	233	79,3	100,0	
Missing		System	61	20,7		
Total			294	100,0		

The basic statistics are displayed in Table 5.8 where there are 233 valid responses with mean 4,88.

Table 5.8 - Statistics for Sales Volume

Statistics

Sales volume

N	Valid	233
	Missing	61
Mean		4,88
Median		5,00
Std. Deviation		1,259
Variance		1,586
Skewness		-1,478
Std. Error of Skewness		,159
Kurtosis		2,117
Std. Error of Kurtosis		,318
Minimum		1
Maximum		6

It is interesting to see that, 53% of companies (39 of them) are big companies with a total sales volume higher than 10 million YTL. The currency rate for USD/YTL was around 1,20 for the period of research being done, thus, it is possible to say that these firms have monthly sales volume of 800.000 USD and higher. 14% of firms (10 of them) were mentioned to have a sales volume in between 0-500.000 YTL, and all the other groups have 8% (6 companies).

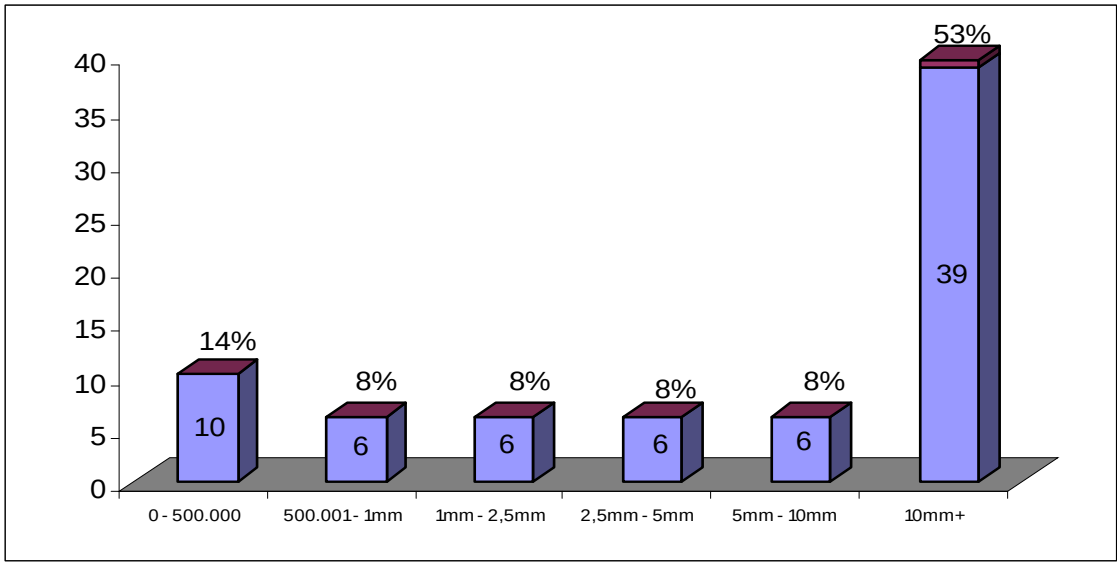


Figure 5.11 - Sales Volume of Firms

These figures are displayed as a histogram chart in Figure 5.12 which shows clearly the skewness to the right and kurtosis.

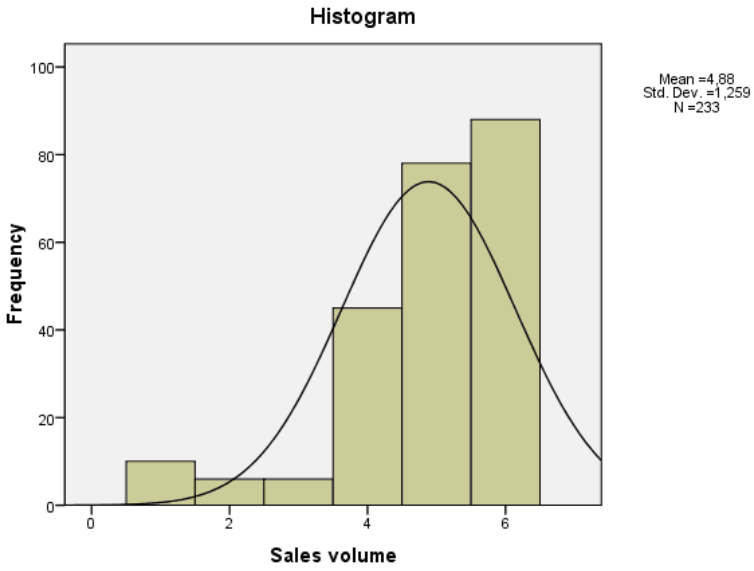


Figure 5.12 - The Histogram Chart for Sales Volume

5.1.2.6 Descriptives for Legal Status

Legal status of firms has three alternatives: corporation, limited or other. The frequencies of these alternatives are displayed in Table 5.9 and almost three quarters of the respondents (72,4%) are working in corporates. The limited companies form 23,4% and the rest is only 3,7%. The answers to the detail of 'other' (3,7% - 11 responses) consists of Government and Individual Proprietorship companies.

Table 5.9 - Statistics for Legal Status Groups

Legal Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Corporate	212	72,1	72,4	72,4
	Limited	70	23,8	23,9	96,2
	Other	11	3,7	3,8	100,0
	Total	293	99,7	100,0	
Missing	System	1	,3		
Total		294	100,0		

The percentage distribution of responses is displayed in Figure 5.13 with a pie chart and in Figure 5.14 with histograms.

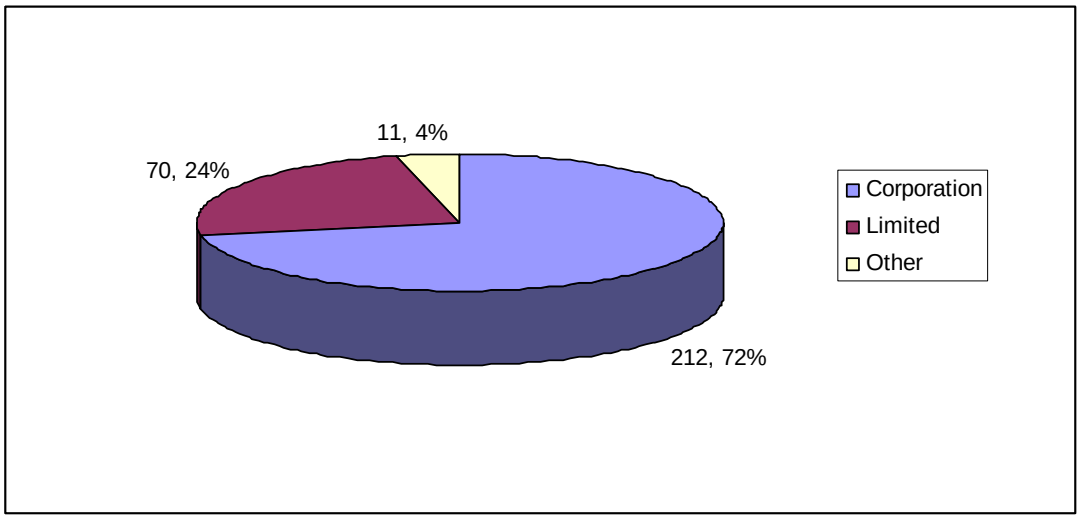


Figure 5.13 - Legal Status of Firms

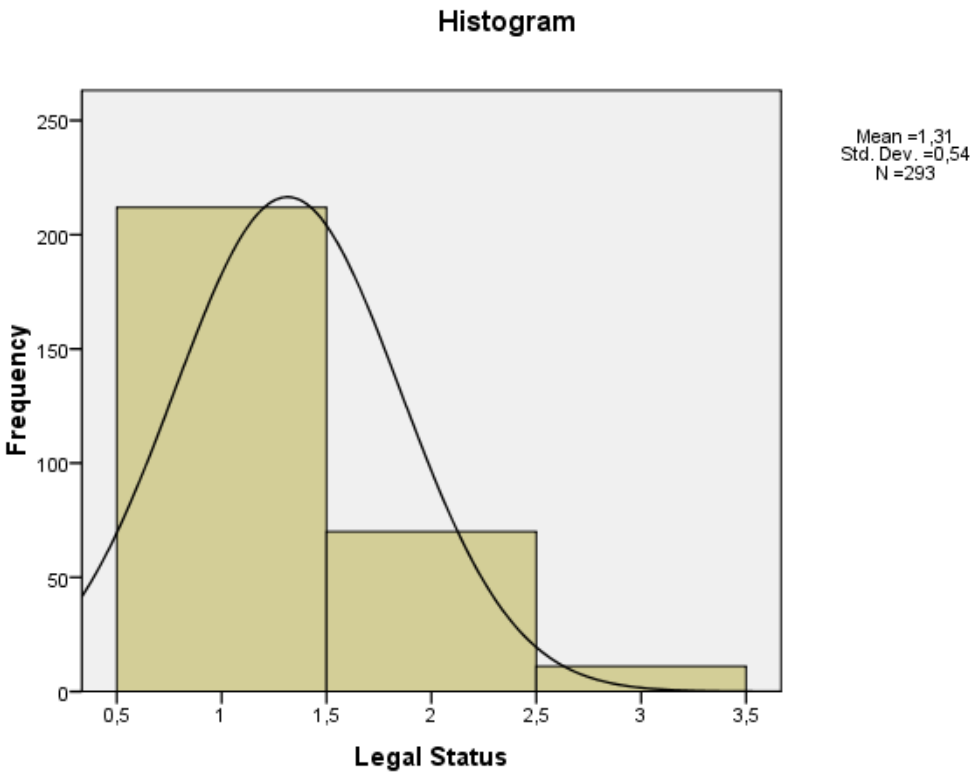


Figure 5.14 – Histogram Chart for Legal Status of Firms

5.1.2.7 Descriptives for Foreign Partnership

Foreign partnership has two choices, ‘yes’ or ‘no’. The statistics table presents that, 63,3% of responses (including missing one) has no foreign partnership. Still, more than one third of respondents are working in companies with foreign partnership.

Table 5.10 - Statistics for Foreign Partnership Responses

Foreign Partner

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	104	35,4	35,9	35,9
	No	186	63,3	64,1	100,0
	Total	290	98,6	100,0	
Missing	System	4	1,4		
Total		294	100,0		

Statistics provides the figures for a very slight negative skewness with standard deviation of 0,480.

Table 5.11 - Statistics for Foreign Partnership

Statistics

Foreign Partner

N	Valid	290
	Missing	4
Mean		1,64
Median		2,00
Std. Deviation		,480
Variance		,231
Skewness		-,593
Std. Error of Skewness		,143
Kurtosis		-1,660
Std. Error of Kurtosis		,285
Minimum		1
Maximum		2

The pie chart of Foreign Partnership distribution (this time without missing values) shows that, among 292 respondents, 104 of them (36%) had foreign shareholder and 186 of them (64%) do not have any foreign shareholder.

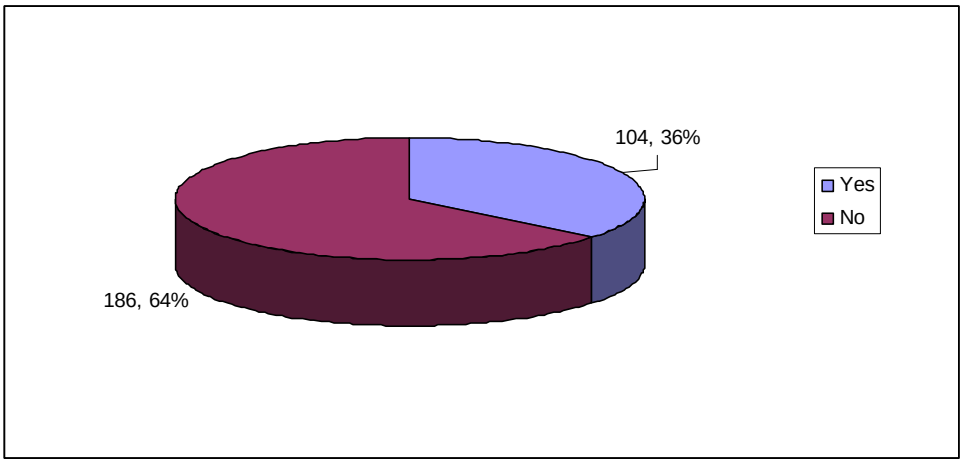


Figure 5.15 - Foreign Shareholder Status

The distribution values show a slight skewness to the right.

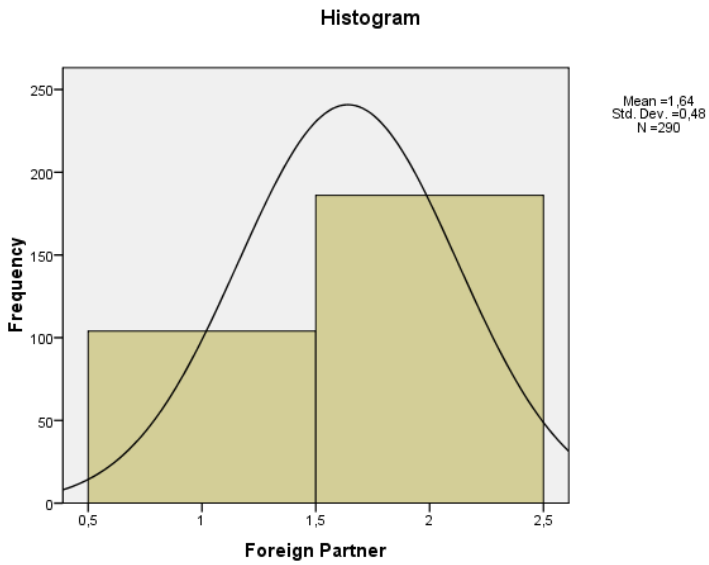


Figure 5.16 - Histogram Chart for Foreign Partnership

5.1.3 Descriptives of Sample Group

5.1.3.1 Descriptives for Gender

The gender has two choices 1-Female and 2-Male. Among 235 responses, 170 of them are male and 65 of them are female, which indicates a male dominated sample group.

Table 5.12 - Statistics for Gender

			Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	Female	65	22,1	27,7	27,7
	2	Male	170	57,8	72,3	100,0
		Total	235	79,9	100,0	
Missing		System	59	20,1		
Total			294	100,0		

Male domination can be better visualized with the following pie chart Gender distribution of respondents are male dominated with 72% male versus 28% female.

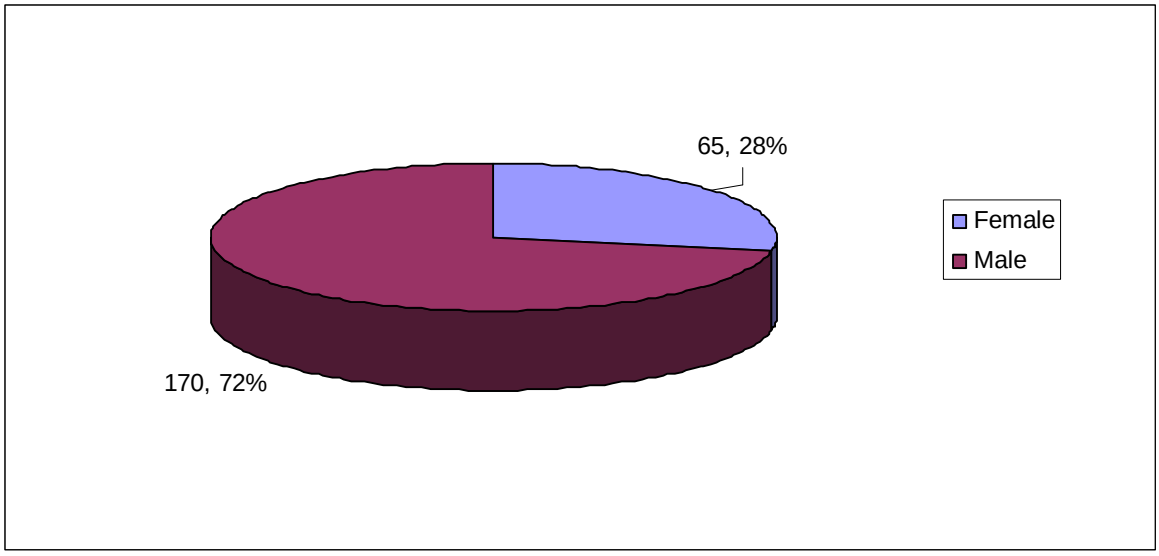


Figure 5.17 - Sex Distribution of Sample Group

5.1.3.2 Descriptives for Age

The sample group was asked to enter the data for their age which the responses differs from 20 to 64. The mean of the group is 43,41 which also has a close value for median (31,50). These values are presented in Table 5.13 - Statistics for Age.

Table 5.13 - Statistics for Age

Statistics

SI6 Age

N	Valid	228
	Missing	66
Mean		32,41
Median		31,50
Std. Deviation		6,967
Variance		48,543
Skewness		1,221
Std. Error of Skewness		,161
Kurtosis		2,381
Std. Error of Kurtosis		,321
Minimum		20
Maximum		64

Age distribution of respondents show that the sample group is relatively young with 44% of them was under 30 years of age. There are two major groups with 29% of total sample group each; age range 26-30 and 31-35 having a sum of 58%.

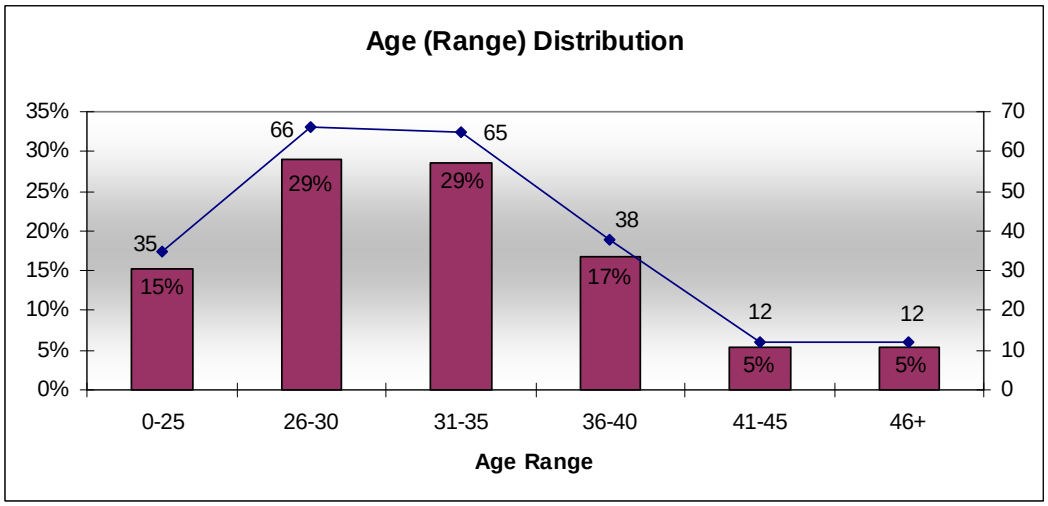


Figure 5.18 - Age Distribution of Sample Group

Figure 5.19 shows more in details the distribution of sample group with intervals of 2 years for each bar. There is skewness to the left with a relatively high curtosis.

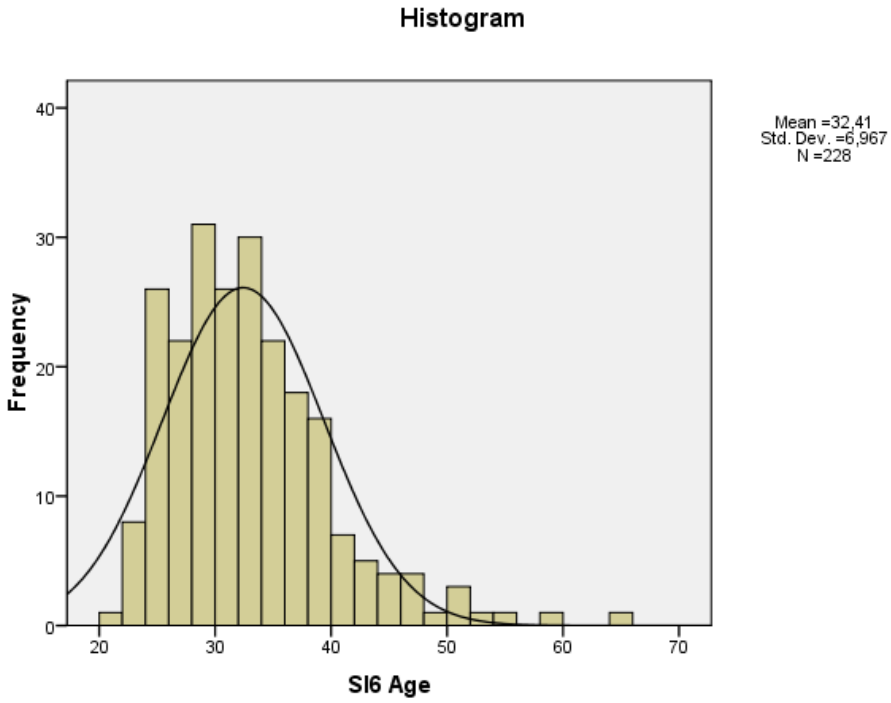


Figure 5.19 - Histogram Chart for Age

5.1.3.3 Descriptives for Academic Degree

The academic degrees of sample group has 5 alternatives with a decreasing rank starting from 1-PhD, and continuing by 2-Graduate, 3-Undergraduate, 4-Associate, 5-High School and 6-Primary School. The biggest choice is with ‘undergraduate’ degree (58,2%) followed up by ‘graduate’ degree (30.0%). The rest three choices are sum up to only 11,8%. This means that, relative to the country population at the given ages, the sample group is highly educated.

Table 5.14 - Statistics for Academic Degrees

SI8 Academic Degree

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD	5	1,7	2,1	2,1
	Graduate	71	24,1	30,0	32,1
	Undergraduate	138	46,9	58,2	90,3
	Associate	14	4,8	5,9	96,2
	High School	9	3,1	3,8	100,0
	Total	237	80,6	100,0	
Missing	System	57	19,4		
Total		294	100,0		

The mean of the sample group is 2,79 which is a lower value than 3 (undergraduate) which also shows the weight of education as lower values stands for higher academic degree.

Table 5.15 - Basic Statistics for Academic Degree

Statistics

SI8 Academic Degree

N	Valid		237
	Missing		57
Mean			2,79
Median			3,00
Std. Deviation		,745	
Variance		,555	
Skewness		,603	
Std. Error of Skewness		,158	
Kurtosis			1,530
Std. Error of Kurtosis		,315	
Minimum			1
Maximum			5

The sample group can be accepted as highly educated as 96% of the group has an academic degree equal or higher to university education including associate degree for two-year education of university. Also, almost one third (30%) of the total sample group has a master or graduate degree.

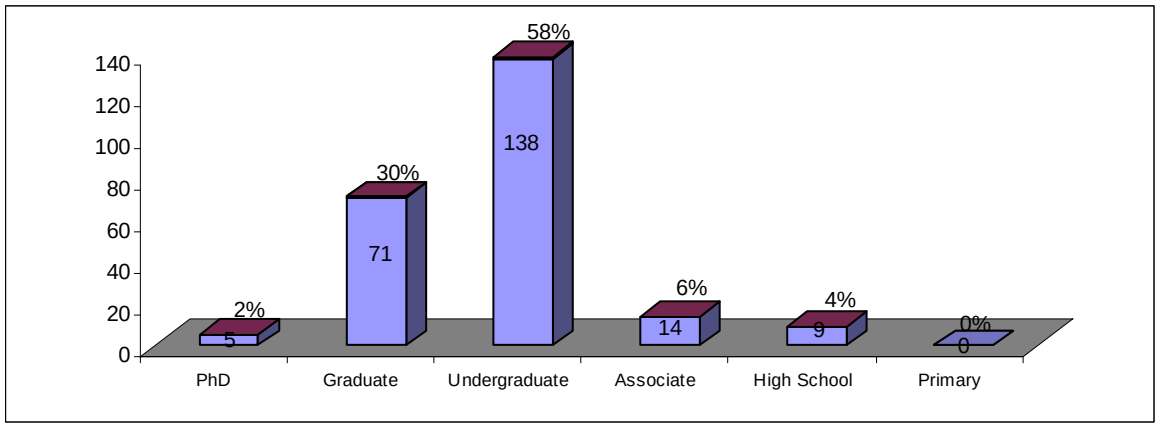


Figure 5.20 - Academic Background of Sample Group

The histogram chart displays the same distribution with a normal distribution line.

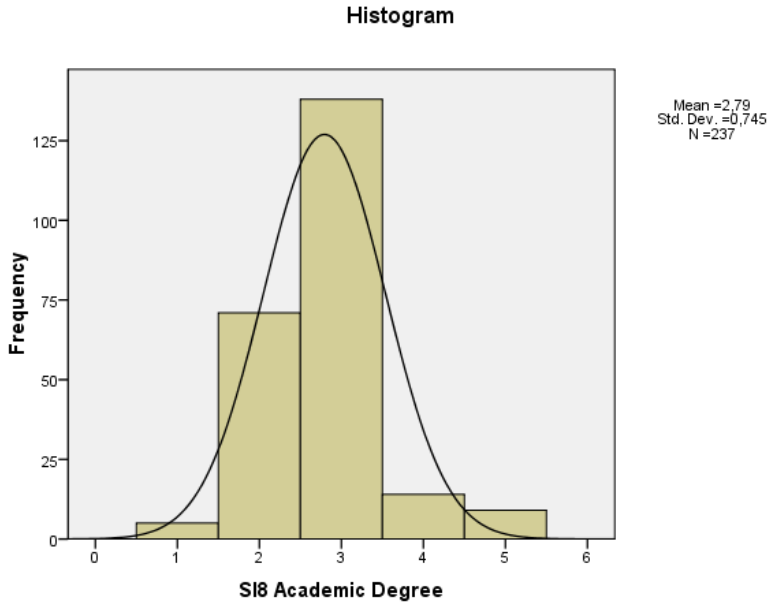


Figure 5.21 - Histogram Chart for Academic Degree

5.1.3.4 Descriptives for Professional Experience

The sample group was asked to provide data for their professional life in three subgroups: 1-Total professional life, 2-Professional life in that sector, 3-Professional life in that company. The basic statistics are provided in Table 5.16 – Basic Statistics for Professional Life where mean values gets smaller as experience shift from total to sector and then to last company.

Table 5.16 – Basic Statistics for Professional Life

Statistics

		SI1 Years as a professional	SI2 Years in this sector	SI3 Years in this company
N	Valid	234	230	226
	Missing	60	64	68
Mean		3,25	2,93	2,22
Median		3,00	3,00	2,00
Std. Deviation		1,333	1,286	1,021
Variance		1,777	1,655	1,042
Skewness		,197	,392	,440
Std. Error of Skewness		,159	,160	,162
Kurtosis		-,556	-,325	-,500
Std. Error of Kurtosis		,317	,320	,322
Minimum		1	1	1
Maximum		6	6	5

The statistics with respect to choices are provided in the following table-figure combination. The frequency of higher years gets smaller as the experience narrows up to company. Having different values for 0-1 year choice within items indicates that there is a turnover in this sector, but in order to have a meaningful comparison, either more than one sector should be evaluated, or company base comparison shall be done. This can be a research topic by itself for further analysis in the future.

Table 5.17 - Statistics with Histogram Chart for Total Professional Experience

SI1 Years as a professional					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-1	22	7,5	9,4	9,4
	2-5	51	17,3	21,8	31,2
	6-10	60	20,4	25,6	56,8
	11-15	63	21,4	26,9	83,8
	16-20	23	7,8	9,8	93,6
	20+	15	5,1	6,4	100,0
	Total	234	79,6	100,0	
Missing	System	60	20,4		
Total		294	100,0		

It is possible to see the shift in the graphs to left as we go from “years as a professional” to “years in this sector” to “years in this company”.

Table 5.18 - Statistics with Histogram Chart for Sectoral Professional Experience

SI2 Years in this sector					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-1	32	10,9	13,9	13,9
	2-5	58	19,7	25,2	39,1
	6-10	69	23,5	30,0	69,1
	11-15	45	15,3	19,6	88,7
	16-20	17	5,8	7,4	96,1
	20+	9	3,1	3,9	100,0
	Total	230	78,2	100,0	
Missing	System	64	21,8		
Total		294	100,0		

It is interesting to observe that, experience in the last company has 89,8% totally for 0-10 years and it is almost equally distributed within the three groups.

Table 5.19 - Statistics with Histogram Chart for Last Company Experience

SI3 Years in this company					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-1	67	22,8	29,6	29,6
	2-5	70	23,8	31,0	60,6
	6-10	66	22,4	29,2	89,8
	11-15	19	6,5	8,4	98,2
	16-20	4	1,4	1,8	100,0
	Total	226	76,9	100,0	
Missing	System	68	23,1		
Total		294	100,0		

The professional experience distribution of sample group is depicted in Figure 5.22 with details of Total Professional Life, Professional Life in that Sector, and Professional Life in That Company. The main group for total professional life is 10-14 years of experience, while it is 6-9 years of experience in that sector and 2-5 years of experience in that specific company.

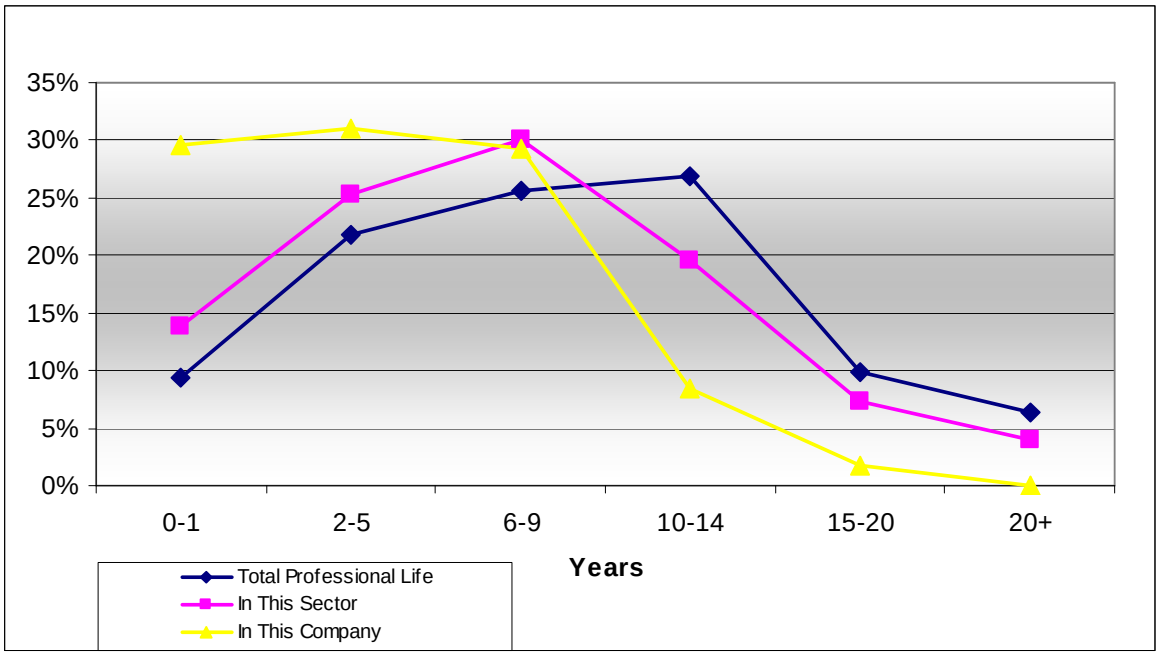


Figure 5.22 - Professional Experience

5.1.3.5 Descriptives for Position in Company

The respondents were asked to indicate at which management level they were in their company. The choices were:

1. Top Management (CEO, Executives, Directors reporting to CEO, etc.)
2. Senior Management (Managers reporting to Top Management)
3. Medium Level Management (Managers reporting to Senior Management)
4. Other Employees

The sample group consists of a higher percentage for management level employees (54,4) than employees who do not directly report to medium to higher level of management

(45,6).

Table 5.20 - Statistics for Position in Company

SI4 Position in Company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Top Management	37	12,6	15,4	15,4
	Senior Management	28	9,5	11,6	27,0
	Direct Reporting to Senior Management	66	22,4	27,4	54,4
	Other	110	37,4	45,6	100,0
	Total	241	82,0	100,0	
Missing	System	53	18,0		
Total		294	100,0		

Management level of sample group is depicted in Figure 5.23. Among them, 45% of the total group is not in management level, while 15% of them are at Top Management level.

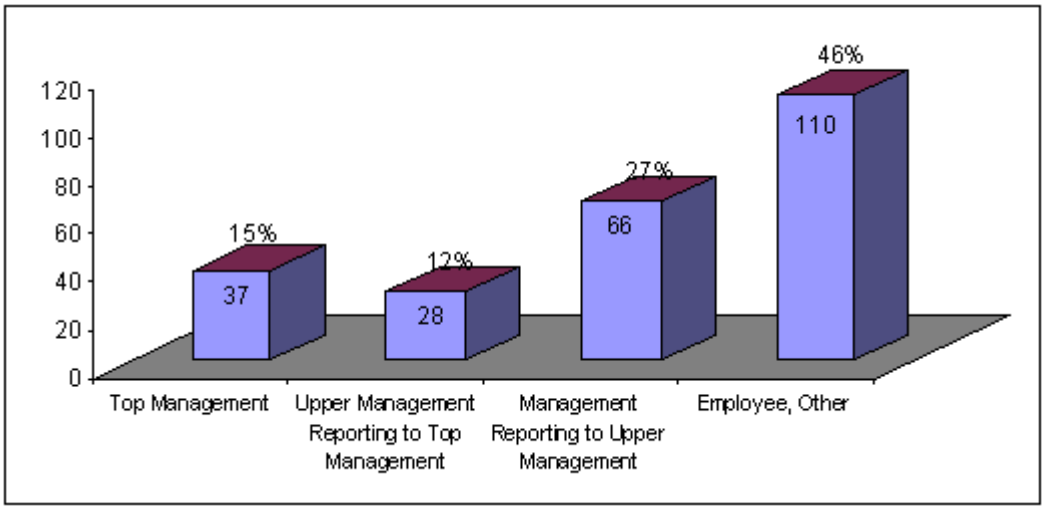


Figure 5.23 - Management Level of Sample Group Within Their Company

The same data is visualized by histogram in the below chart which also shows the normal distribution line.

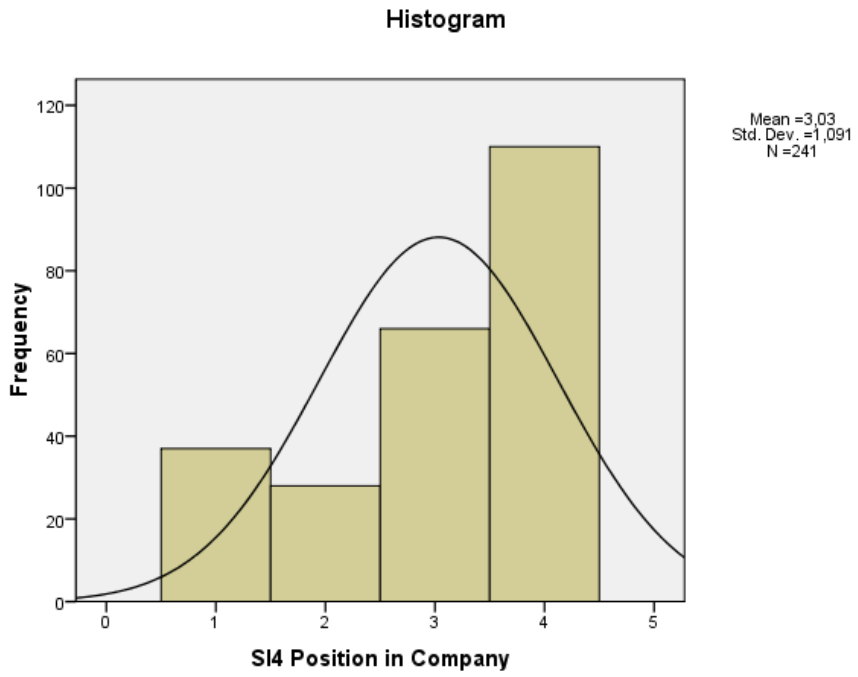


Figure 5.24 - Histogram Chart for Position in Company

5.1.3.6 Descriptives for Business Line

The departments that sample group is working within their company is divided into five. As IT companies are targeted, 'software development' department was chosen intentionally which covers up coding, testing, etc. Also 'R&D' and 'Product Development' departments were accepted to be one, for not confusing the respondents in which they fit well. However, 'Marketing/Sales' and 'after sales support' were differentiated, especially for Call Center employees which provide support for their products.

Table 5.21 - Statistics For Business Line

SI5 Business Line

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Marketing/Sales	36	12,2	15,4	15,4
	After Sales Support/Service	12	4,1	5,1	20,5
	R&D / Product Development	32	10,9	13,7	34,2
	Software Development	80	27,2	34,2	68,4
	Other	74	25,2	31,6	100,0
	Total	234	79,6	100,0	
Missing	System	60	20,4		
Total		294	100,0		

The basic statistics indicate that totally 234 responses were acquired with a mean of 3,62 and median 4. This is supported with a negative skewness value.

Table 5.22 – Basic Statistics For Business Line

Statistics

SI5 Business Line

N	Valid	234
	Missing	60
Mean		3,62
Median		4,00
Std. Deviation		1,379
Variance		1,903
Skewness		-,826
Std. Error of Skewness		,159
Kurtosis		-,553
Std. Error of Kurtosis		,317
Minimum		1
Maximum		5

Software development is the major group with 34% of respondents. Marketing and Sales department has 15% of weight, and R&D Department including all product development activities has 14% of weight. After sales service department has 5% and has the minimum weight with respect to others. The “other” group consists of people working either in supporting departments like HR, accounting, etc., or top managers, who do not fit

themselves to any of the other four departments. This group has a weight of 32%.

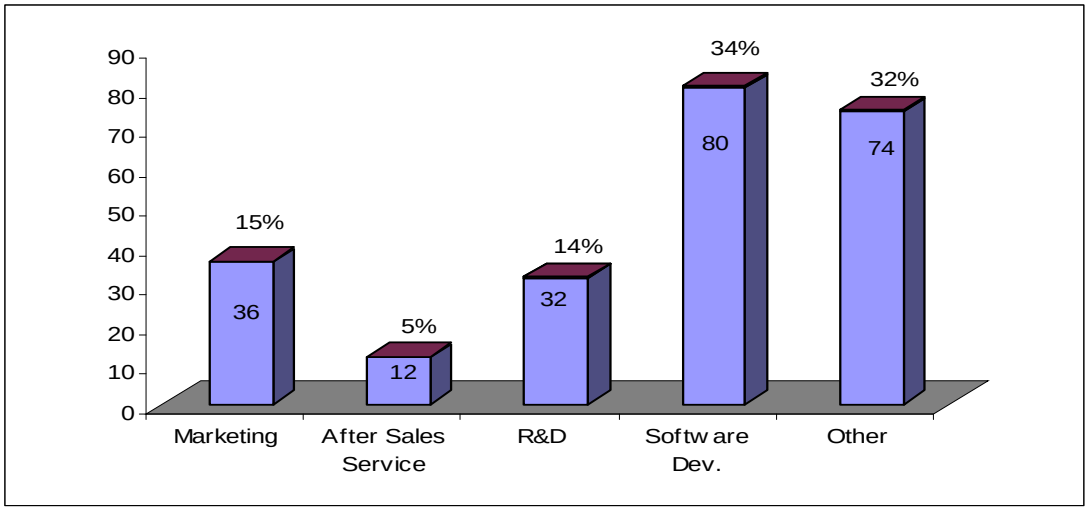


Figure 5.25 - Department in Company

The points that were highlighted in basic statistics are visualized by histogram chart including the normal distribution line.

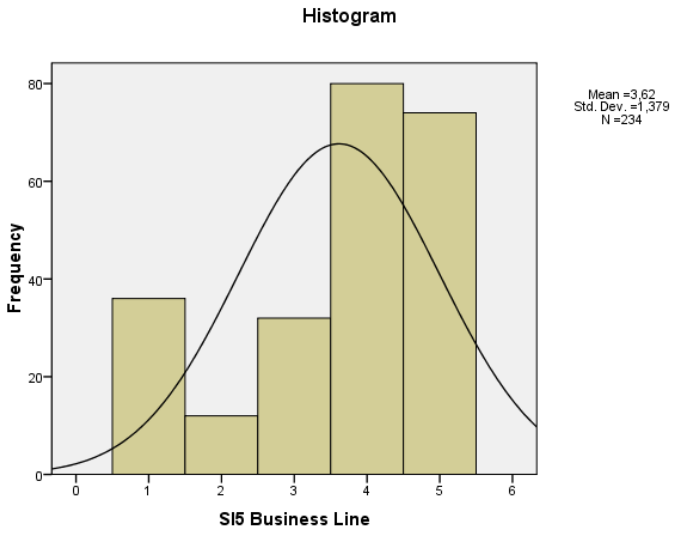


Figure 5.26 – Histogram Chart for Business Lines in Company

5.2 Complex Descriptive Statistics

In order to see the distribution of two variables in the same table, cross-tabulation tables are produced. Also, in order to check the significance and strength of the relationships, non-parametric measures of association is used. Cramer's V is the appropriate statistic to measure the strength of the association between two nominal variables with larger tables. Cramer's V measures the strength of a relationship of two nominal variables when one or both have three or more levels/values. If the association between variables is weak, the value of the statistic will be close to zero and the significance level will be greater than ,05; the usual cutoff to say that an association is statistically significant (Morgan and Griego, 1998).

5.2.1 Cross-tabulation and nonparametric association tests:

Cross-tabulation and nonparametric association analyses were done between **Sales Volume, Legal Status, Working Experience, Position in Company, Academic Degree, Business Line,** and **Gender**.

The first research question is: **Is there is a significant association between Sales Volume and Legal Status of the Firm?**

Although Cramer's V value is lower than 0,5; it is close to that value and as significance is granted by a 0,000 value, we can conclude that **there is a significant relation at medium strength between legal status and sales volume of companies**.

Table 5.23 - Cross-Tabulation of Legal Status versus Company Size

Legal Status * Sales volume Crosstabulation

			Sales volume						Total
			0-500.000	500K-1million	1 - 2,5 million	2,5 - 5 million	5 - 10 million	10 million +	
Legal Status	Corporate	Count	3	1	2	42	77	49	174
		Expected Count	7,5	4,5	4,5	33,6	58,2	65,7	174,0
		% of Total	1,3%	,4%	,9%	18,0%	33,0%	21,0%	74,7%
	Limited	Count	5	5	4	3	1	34	52
		Expected Count	2,2	1,3	1,3	10,0	17,4	19,6	52,0
		% of Total	2,1%	2,1%	1,7%	1,3%	,4%	14,6%	22,3%
	Other	Count	2	0	0	0	0	5	7
		Expected Count	,3	,2	,2	1,4	2,3	2,6	7,0
		% of Total	,9%	,0%	,0%	,0%	,0%	2,1%	3,0%
Total		Count	10	6	6	45	78	88	233
		Expected Count	10,0	6,0	6,0	45,0	78,0	88,0	233,0
		% of Total	4,3%	2,6%	2,6%	19,3%	33,5%	37,8%	100,0%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Legal Status * Sales volume	233	79,3%	61	20,7%	294	100,0%

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,602	,000
	Cramer's V	,426	,000
N of Valid Cases		233	

The values in Table 5.23 allows us to interpret that, the discrepancies between counts and expected values are quite high, which indicates that there is association among them. The count values are higher than expected values for limited companies in 0-500K, 500K-1mm, 1-2,5mm and +10mm. Just for two groups, 2,5-5mm and 5-10mm the count figures are very low than the expected. These figures are just the opposite for corporate companies.

The second research question is: **Is there a significant association between company status and professional experience of participants?**

This relation is not significant as the value for significance is greater than 0,5. Thus, there is no significant relation between company size and total professional experience. We can

conclude that, company size does not have any evidence in employing experienced staff.

The third research question is: **Is there a significant association between Academic Degree and Position in Company.**

There is **relatively weak significant relation between academic degree and position within the company.** The discrepancies between counts and expected count for top management and for senior management are more than moderate which indicates significance among them.

Table 5.24 Crosstabulation Position in Company * Academic Degree

Position in Company * Academic Degree Crosstabulation

			Academic Degree					Total
			PhD	Graduate	Undergraduate	Associate	High School	
Position in Company	Top Management	Count	2	16	18	1	0	37
		Expected Count	,6	11,2	21,7	2,2	1,3	37,0
		% of Total	,9%	6,8%	7,7%	,4%	,0%	15,7%
	Senior Management	Count	0	9	18	0	0	27
		Expected Count	,5	8,2	15,9	1,6	,9	27,0
		% of Total	,0%	3,8%	7,7%	,0%	,0%	11,5%
	Direct Reporting to Senior Management	Count	1	21	36	6	0	64
		Expected Count	1,1	19,3	37,6	3,8	2,2	64,0
		% of Total	,4%	8,9%	15,3%	2,6%	,0%	27,2%
	Other	Count	1	25	66	7	8	107
		Expected Count	1,8	32,3	62,8	6,4	3,6	107,0
		% of Total	,4%	10,6%	28,1%	3,0%	3,4%	45,5%
Total		Count	4	71	138	14	8	235
		Expected Count	4,0	71,0	138,0	14,0	8,0	235,0
		% of Total	1,7%	30,2%	58,7%	6,0%	3,4%	100,0%

Case Processing Summary

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Position in Company * Academic Degree	235	79,9%	59	20,1%	294	100,0%

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,307	,036
	Cramer's V	,177	,036

The fourth research question is: **Is there a significant association between Position in Company and Gender?**

The result from Cramer's V is positive with **a moderate and significant relation between gender and position within the company**. The discrepancies between count and expected count marks one point for mentioning: **the top management actual value for male is higher than expected and female value is much lower than expected.** This is an indication of male dominant environment at top management level.

Table 5.25 Crosstabulation Position in Company * Sex

Position in Company * Sex Crosstabulation

			Sex		Total
			Female	Male	
Position in Company	Top Management	Count	3	34	37
		Expected Count	10,3	26,7	37,0
		% of Total	1,3%	14,6%	15,9%
	Senior Management	Count	7	20	27
		Expected Count	7,5	19,5	27,0
		% of Total	3,0%	8,6%	11,6%
	Direct Reporting to Senior Management	Count	16	47	63
		Expected Count	17,6	45,4	63,0
		% of Total	6,9%	20,2%	27,0%
	Other	Count	39	67	106
		Expected Count	29,6	76,4	106,0
		% of Total	16,7%	28,8%	45,5%
Total		Count	65	168	233
		Expected Count	65,0	168,0	233,0
		% of Total	27,9%	72,1%	100,0%

Case Processing Summary

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Position in Company * Sex	233	79,3%	61	20,7%	294	100,0%

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,223	,009
	Cramer's V	,223	,009

The fifth research question is: **Is there a significant association between Gender and Business line.**

The results show that, there is **relatively weak, but a significant relation between gender and business line the respondents working in their companies**. There are more male respondents than expected in R&D and Software Development departments. Parallel to this finding, there are less female respondents in these two departments, while, more female respondents are present in Marketing/Sales and Other departments.

Table 5.26 Crosstabulation Sex * Business Line

Sex * Business Line Crosstabulation

			Business Line					
			Marketing /Sales	After Sales Support/Service	R&D / Product Development	Software Development	Other	Total
Sex	Female	Count	15	3	5	13	29	65
		Expected Count	10,1	3,4	9,0	21,7	20,8	65,0
		% of Total	6,5%	1,3%	2,2%	5,6%	12,6%	28,1%
	Male	Count	21	9	27	64	45	166
		Expected Count	25,9	8,6	23,0	55,3	53,2	166,0
		% of Total	9,1%	3,9%	11,7%	27,7%	19,5%	71,9%
Total		Count	36	12	32	77	74	231
		Expected Count	36,0	12,0	32,0	77,0	74,0	231,0
		% of Total	15,6%	5,2%	13,9%	33,3%	32,0%	100,0%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Sex * Business Line	231	78,6%	63	21,4%	294	100,0%

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,256	,005
	Cramer's V	,256	,005
N of Valid Cases		231	

The last research question for cross tabulation is: **Is there a significant association between Business line and position in company?**

The results show no significant association between business line and position in the company.

Table 5.27 Case Processing Summary for Position in Company * Business Line

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Position in Company * Business Line	232	78,9%	62	21,1%	294	100,0%

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,270	,152
	Cramer's V	,156	,152
N of Valid Cases		232	

5.2.2 Exploratory and Confirmatory Factor Analysis and Reliability Analyses

To apply factor analysis and reliability analysis on the data collected, SPSS 16.0 was used. Among these two tests; confirmatory factor analysis was applied to reduce raw data. In factor analysis, Determinant value should be more than 0,00001 as in case this value is close to zero, collinearity possibility is accepted to be too high. Kaiser-Meyer-Olkin (KMO) and Bartlett's Tests were applied. KMO measure lists as follows: .90's as outstanding, .80's very good, .70's as average, .60's as tolerable, .50's as poor, below .50 unacceptable (Morgan and Griego, 1998).

After having the KMO Measure of Sampling Adequacy as acceptable, the significance was checked through Bartlett's Test of Sphericity. If Bartlett's Test of Sphericity was significant, items with the Measures of Sampling Adequacy less than .50 were dropped by Inter-Correlation Anti–Image Matrices.

The consistency of the remaining variables was used to eliminate items that were not pure in factor analysis. For the means of extraction Principal Component Analysis was used and in order to rotate the factors Varimax with Kaiser Normalization rotation was used. In the Rotated Component Matrix the loaded values of the remaining items were grouped into one or more components.

Reliability is defined as the ability of the scales consistently yields the same response. According to the factor analysis' results a reliability analysis for each scale of the constructs consisting of remaining items was performed. For Cronbach's alpha, a value of above ,70 is often considered to be acceptable for scales validated in past studies. The values above ,60 are deemed sufficient for newly developed scales.

In item-total statistics table, the column corrected item-total correlation gives us the correlation of each specific item with the sum/total of the other items in the scales. If this correlation is moderate of high, 0,40 or above, the item is probably at least moderately correlated with most of the other items and will make a good component of this summated rating scale. Items with lower item-total correlations do not fit into this scale as well, psychometrically. If the item-total correlation is negative or very low, less than0,20, it is

wise to examine the item for wording problems and conceptual fit. It might be good to modify or delete such items.

The purpose of a measurement model is to describe how well the observed indicators serve as a measurement instrument for the latent variables. Indicators in measurement models can be viewed as endogenous variables, and the latent factors as exogenous variables. The associated procedure to assess the properties of measurement models is known as Confirmatory Factor Analysis (CFA). CFA models have two main features. First, each indicator in the CFA model is represented as having two causes: the latent factor that the indicator is supposed to measure, and all other sources of variance, which are represented by the measurement error term. Second, the measurement error terms are independent of each other and of the latent factors. The specification of a CFA model (for the case of a single latent factor) involves establishing relationships between the indicators and the latent variable that they measure.

The principal application of CFA is the testing of the scale construct validity. Once the four requirements inherent in SEM methodology (specification, identification, analysis and evaluation) have been verified, CFA models should include an interpretation of factor loadings (which represent regression coefficients estimating the direct effects of the factors on the indicators) as well as their statistical significance. It should be noted here that CFA models can include either a single latent factor, higher-level latent factor (e.g. second-order latent variables) or several latent factors. In this latter case, correlations between latent factors should also be estimated, together with the comparison of a multiple factor model with alternative models.

5.2.2.1 Factor analysis for Market Dynamism

When factor analysis was run in SPSS, the following results were obtained. Determinant is equal to 0,004 which is higher than 0,00001. KMO is 0,782 which higher than 0,7 and significance is granted. Three factors are extracted while MD16 Customer consciousness and MD17 Current Product items were dropped for future studies.. The reliability tests of the new factors have Cronbach's Alpha values higher than 0,70.

Table 5.28 - Rotated Component Matrix of Market Dynamism

Rotated Component Matrix[a]

		Component		
		1	2	3
Competitive Intensity	MD4 many rivals	,808		
	MD3 price competition	,779		
	MD2 Competition	,748		
	MD6 Change in Strategies&actions	,492		
	MD5 dominant competitior	,453		
	MD1 Growth of Sector	,438		
Dynamism	MD15 Customer needs		,763	
	MD19 Applied Technologies		,674	
	MD14 Customer demands		,637	
	MD18 Technological change		,569	
	MD13 Many Different and Complicated Products		,560	
	MD20 Find Qualified Work Power		,449	
	MD12 Many İmported Competing Products		,425	
Product Uncertainty	MD9 Easily Copying New Products			,737
	MD11 Products Diminish Fast			,705
	MD10 Competing Product are very Similar			,701
	MD8 High New Product Supply			,570
	MD7 Many Potential Customers			,450
	Cronbach's Alpha	,735	,703	,707

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,782
Bartlett's Test of Sphericity	Approx. Chi-Square	1,530E3
	df	190
	Sig.	,000

When the model was run in AMOS, the result of the calculation was indicated as "*the model is probably unidentified. In order to achieve identifiability, it will probably be necessary to impose 1 additional constraint.*" In order to decide whether a parameter is identified, or whether an entire model is identified, Amos examines the rank of the matrix of approximate second derivatives, and of some related matrices. The method used is similar to that of McDonald and Krane (1977) where there are some objections to this approach in principle (Bentler & Weeks, 1980; McDonald, 1982). There are also practical problems in determining the rank of a matrix in borderline cases. With complex models, the researcher should rely on the software's (AMOS) numerical determination which is accepted to be pretty good at assessing identifiability in practice. Thus, the CFA for Market Dynamism could not be completed.

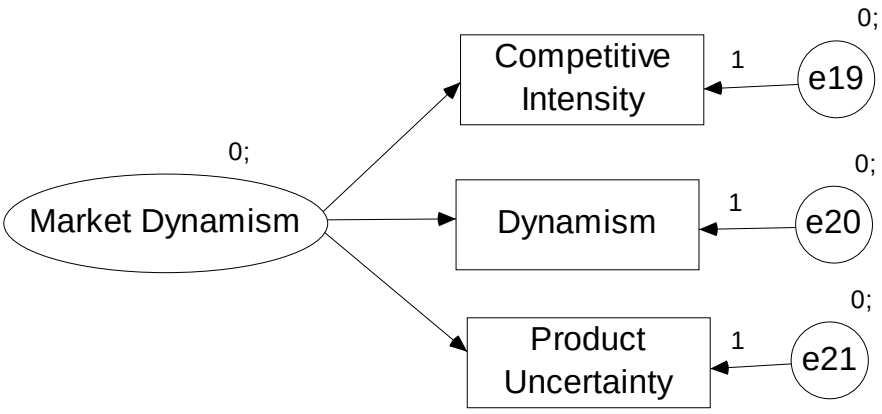


Figure 5.27 - Path Diagram of Market Dynamism

5.2.2.2 Factor Analysis for Business Strategies

Factor analysis for Business Strategies was performed through 14 items. First, factor analyses for items 1-8 were performed. The determinant value is 0,393 and KMO is 0,767 which are good values. The result of the reliability test was a Cronbach's Alpha value of 0,687 which is below 0,7 and total variance explained by the factor is 40,550%. BS8 Small investments item is dropped from the model which had a component value of 0,152 in the component matrix for future research.

After having the tests redone, all conditions were met: the determinant value is 0,425 which are higher than minimum value of 0,00001; KMO value is 0,766, higher than 0,7; and Cronbach's Alpha value is 0,711. Also, total variance explained by the factor increased to 46,876%. All figures are given in Table 5.29.

Table 5.29 - Results of Relability Analysis for Business Strategies

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
Business Strategies	BS6 Variation	,763	46,876	,711
	BS5 Focusing	,715		
	BS4 Quality	,682		
	BS7 Big investments	,663		
	BS3 Price	,588		
	BS8 Small Investments	,588		
		Total	46,876	
		KMO Measure of Sampling Adequacy		,766
		Bartlett's Test of Sphericity		
		Approx, Chi-Square		248,908
		Df		15
		Sig.		,000

Table 5.30 - Results of EFA and CFA for Business Strategies

Factor	EFA Loadings	CFA Loadings	t
Business Strategies	(Cronbach's α = 0,711)		
BS6 Variation	,759	,730	4,046 ***
BS5 Focusing	,706	,639	3,984 ***
BS4 Quality	,666	,553	3,879 ***
BS7 Big investments	,661	,534	3,843 ***
BS3 Price	,571	,432	3,619 ***
BS8 Small Investments	,390	,285	
$\chi^2(9; N=294)=13,579$; p =,138; CFI=,981; RMSEA=,042; NFI=,949			
* p< ,05 ** p< ,01 *** p< ,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index			

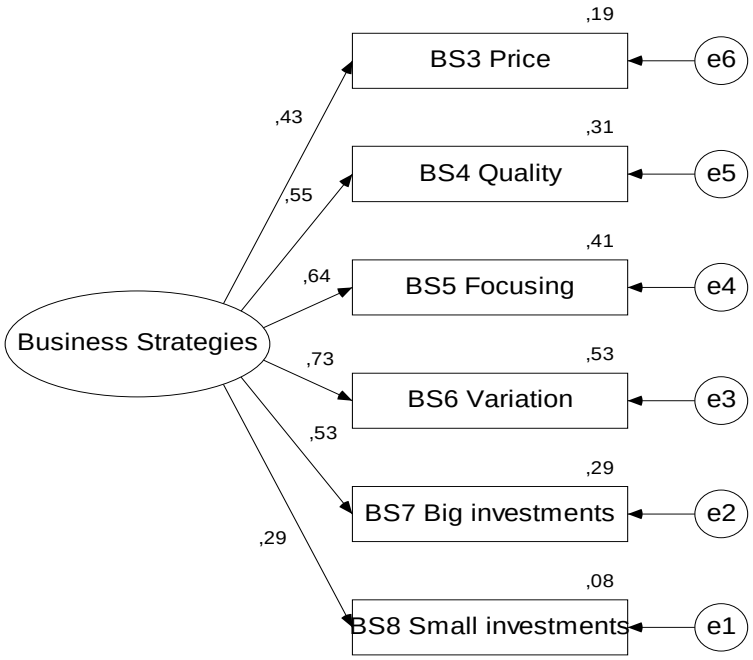


Figure 5.28 - Path Diagram of Business Strategies

For the other two constructs we had eight variables in **Business Strategies**, factor analysis were run for both constructs and they were inadequate as both have KMO value less than 0,7. Thus, all variables BS09 to BS16 were dropped from the model for further study.

5.2.2.3 Factor Analysis for Knowledge Management Enablers

There are totally 10 constructs in KME, and when we apply factor analysis to them all, we got 6 factors as with KMO value of 0,926, but with a determinant value = 2,00E-010 which is *,0000000002. This value is far less than required value which is 0,00001. Such small values that are close to zero are indicators of collinearity. In order to avoid collinearity, factor analyses were done for each construct separately, as there were four constructs: Culture, Structure, People, and Technology.

5.2.2.3.1 Factor analysis for Culture

Culture construct in KME has five variables and as each variable is measured with three items. Explanatory factor analysis was applied to these twelve items and although the KMO value was fine, determinant value was 0.000, thus the analysis was not relevant. In order to evaluate the analysis for a further valid result seeking, rotated component matrix was evaluated. There were two variables (cross-functional teams, and, problem solving teams) which were contributing to more than one factor at a significant value (higher than 0,4). In order to have a clear factor table, they were extracted from the analysis and the test was redone.

This time, determinant value is 0,0000824 which are higher than 0,000001 which enabled the researcher to continue on the research with other control points. KMO value is 0,912 which is a good value. Three factors were extracted which explains the model with 73,731%.

Table 5.31 - Results of Reliability Analysis for Culture subscale in KME

Rotated Component Matrix[a]

		Component			
		1		2	Cronbach's Alpha
Mutual Trust	KME4 other members' intentions and behaviors	,859			,934
	KME2 supportive Members	,852			
	KME6 relationships on reciprocal faith	,830			
	KME5 others' ability	,820			
	KME1 Collaboration level	,779			
	KME3 collaborate across organizational units	,767			
Direction and performance information	KME20 informed on departments goals and performance		,884		,912
	KME19 informed on personal goals and performance		,838		
	KME21 informed on company goals and performance		,825		
Learning	KME10 job rotation			,830	,776
	KME12 job training			,737	
	KME11 informal individual development			,611	
	KME9 Knowledge-sharing networks			,582	
	Total Variance Explained	34,864	20,669	18,198	73,731

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,912
Bartlett's Test of Sphericity	Approx. Chi-Square	2,396E3
	df	78
	Sig.	,000

When the model was run in AMOS, the result of the calculation was indicated as “the model is probably unidentified. In order to achieve identifiability, it will probably be necessary to impose 1 additional constraint.” Thus, the CFA for KME could not be completed.

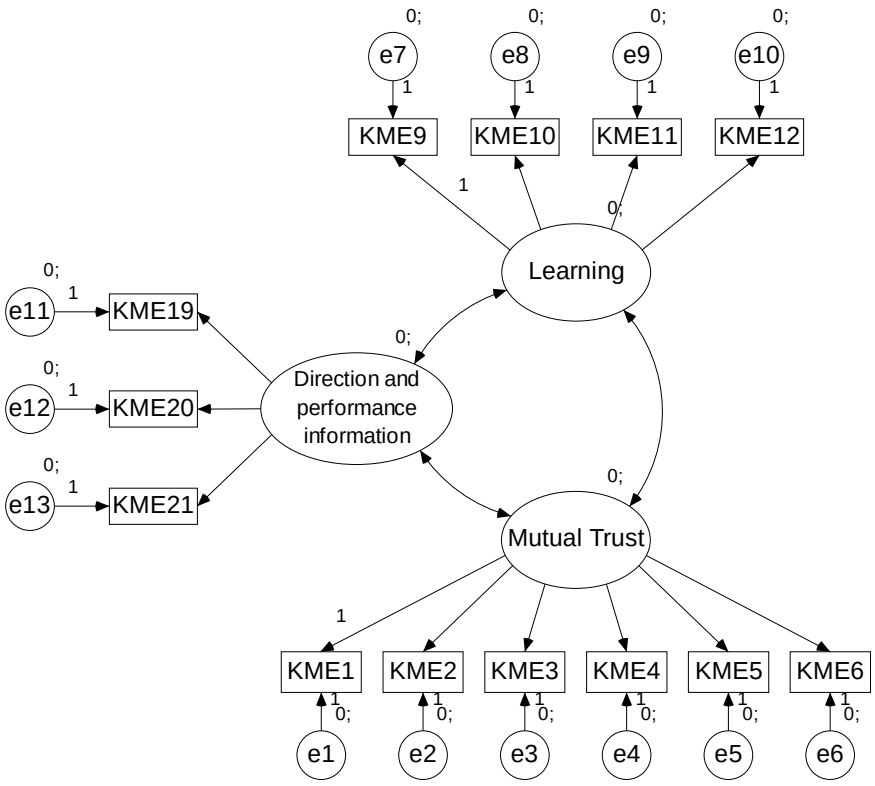


Figure 5.29 - Path Diagram of Culture subscale of KME

5.2.2.3.2 Factor Analysis for Structure

There were two variables initially for Structure construct in Knowledge Management Enablers, which each had three items each. These items were analyzed in Factor Analysis together and the results were as follows:

Determinant was equal to 0,203 and KMO was 0,677, and even though the KMO value is mediocre, it is accepted to be a valid value. These two factors explain the model at 65,970%.

Table 5.32 - Results of EFA for Structure subscale in KME

Rotated Component Matrix[a]

		Component		
		1	2	Cronbach's Alpha
Centralization	KME14 S1 get approval before making decisions	,889		,829
	KME15 S1 ask their supervisors before action	,849		
	KME13 S1 not encouraged to make their own decisions	,836		
Formalization	KME17 S2 obey and apply the rules		,782	,590
	KME16 S2 Written rules and procedures		,775	
	KME18 S2 Signed legal agreements		,605	
Total Variances Explained		37,964	28,006	65,970

Applying EFA to the remaining six items, a new determinant value of 0,079 was achieved which was valid. The KMO value was 0,784 with total variance explained %70,153. These new variables were named as Direction and Performance Information, and Formalization.

Table 5.33 - Results of EFA and CFA for Structure subscale in KME

Factor	EFA Loadings	CFA Loadings	t
Centralization	(Cronbach's α = ,829)		
KME14 get approval before making decisions	,889	,850	11,575 ***
KME15 ask their supervisors before action	,849	,804	11,584 ***
KME13 not encouraged to make their own decisions	,836	,702	
Formalization	(Cronbach's α = ,590)		
KME16 Written rules and procedures	,782	,639	4,641 ***
KME17 obey and apply the rules	,775	,699	4,388 ***
KME18 Signed legal agreements	,605	,400	
$\chi^2(8; N=294)=21,600$; p =,006; CFI=,969; RMSEA=,076; NFI=,952			
* p< ,05 ** p< ,01 *** p< ,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

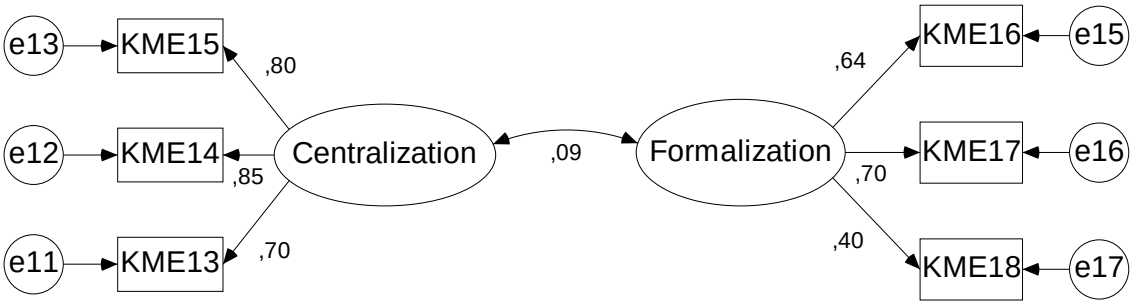


Figure 5.30 - Path Diagram of Structure subscale of KME

5.2.2.3.3 Factor Analysis for People

When the factor analysis was held for the three items that stands for one variable (T-shaped skills) for People subgroup, we obtain the following results:

Determinant is equal to 0,354 which is valid, and KMO is 0,680. Although it is expected to have KMO values higher than 0,7; values in between 6,00 and 6,99 can also be accepted. It was also accepted in this research to have this variable as valid, keeping in mind that, the explanatory power of the factor is also 72,109%. The factor was named T-shaped Skills.

Table 5.34 - Results of Reliability Analysis for People subscale in KME

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
T-shaped Skills	KME23 make suggestion about others' task	,893	72,109	,806
	KME22 understand other task	,849		
	KME24 communicate well with other department members	,803		
	Total			
	KMO Measure of Sampling Adequacy			,680
	Bartlett's Test of Sphericity	Approx, Chi-Square		272,566
		Df		3
		Sig.		,000

Table 5.35 - Results of EFA and CFA for People subscale in KME

Factor	EFA Loadings	CFA Loadings	t
T-shaped Skills	(Cronbach's α = ,790)		
KME23 make suggestion about others' task	,893	,900	10,354 ***
KME22 understand other task	,849	,743	
KME24 communicate well with other department members	,803	,651	9,970 ***
$\chi^2(0; N=294)=,000$; p = can not be computed; CFI=1,000; RMSEA= ; NFI=1,000			
* $p<$,05 ** $p<$,01 *** $p<$,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

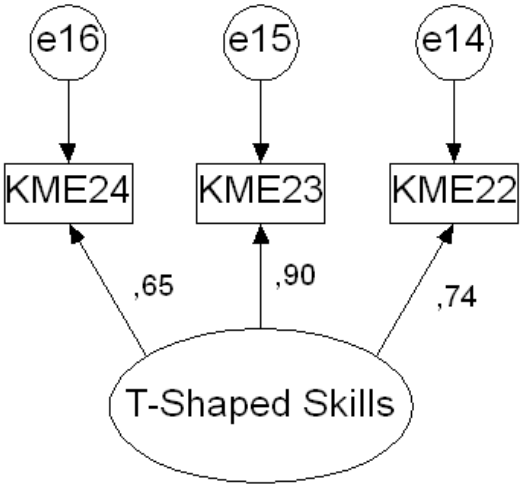


Figure 5.31 - Path Diagram of People subscale of KME

5.2.2.3.4 Factor analysis for IT

There were two constructs for IT and totally six items related with them. When factor analysis was done for these six items, they end up to only one variable with determinant 0,13 and KMO 0,902. The reliability of this factor is granted as Cronbach's Alpha value is ,916 and it was higher than the required value. The new factor was named as IT support.

Table 5.36 - Results of Reliability Analysis for IT subscale in KME

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
IT	KME26 T1 IT support for communication	,893	71,060	,916
	KME27 T1 IT support for searching information	,884		
	KME28 T2 computer tools help people to work together	,883		
	KME25 T1 IT support for collaborative works	,869		
	KME30 T2 state of the art computer tools	,803		
	KME29 T2 easy computer access to information	,710		
		Total		
	KMO Measure of Sampling Adequacy			,902
	Bartlett's Test of Sphericity	Approx, Chi-Square		1,127E3
		Df		15
		Sig.		,000

Table 5.37 - Results of EFA and CFA for IT subscale in KME

Factor	EFA Loadings	CFA Loadings	t
IT Support	(Cronbach's α = ,790)		
KME26 T1 IT support for communication	,893	,892	19,920 ***
KME27 T1 IT support for searching information	,884	,871	19,056 ***
KME28 T2 computer tools help people to work together	,883	,845	18,034 ***
KME25 T1 IT support for collaborative works	,869	,864	
KME30 T2 state of the art computer tools	,803	,724	14,017 ***
KME29 T2 easy computer access to information	,710	,620	11,262 ***
$\chi^2(9; N=294)=41,450$; p =,000; CFI=,971; RMSEA= ,111 ; NFI=,964			
* p< ,05 ** p< ,01 *** p< ,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

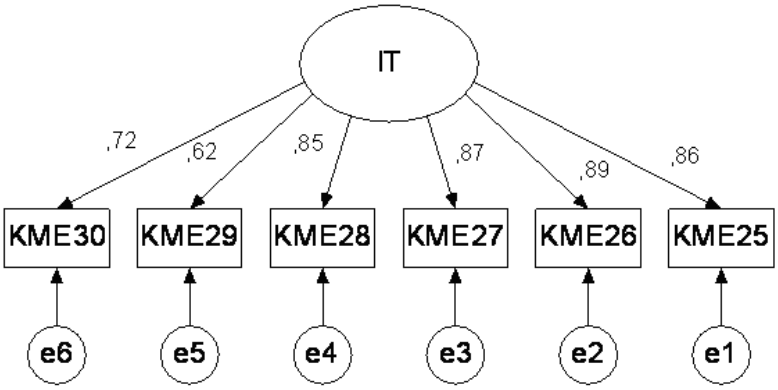


Figure 5.32 - Path Diagram of IT subscale of KME

5.2.2.4 Factor Analysis for Knowledge Creation Process

There are totally four variables in this group with 19 items. When factor analysis applied to all 19 items, a very high KMO value (0,938) is obtained but determinant value is 0,00000017 which is lower than 0,00001; so this test is not valid. Before analyzing all four constructs separately, CFA is done where the results are depicted in Figure 5.33.

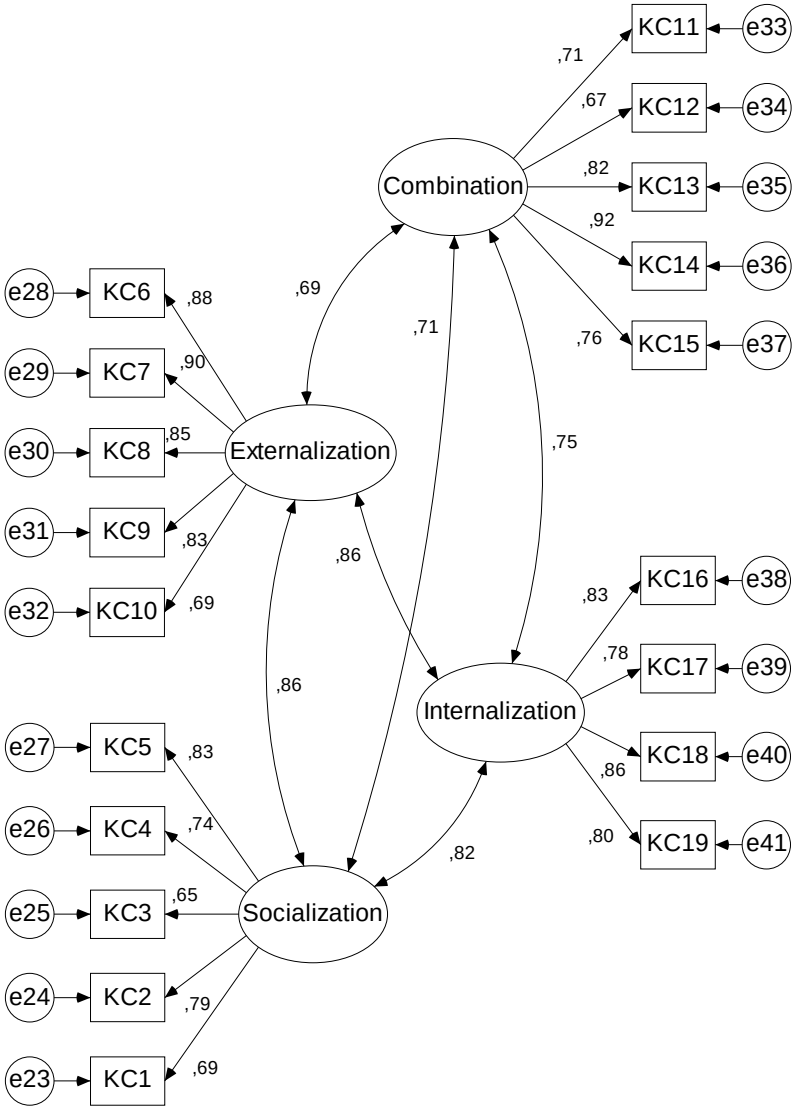


Figure 5.33 - Path Diagram of KCP

χ^2(146; *N*=294)=541,855; *p* =,000; CFI=,896; RMSEA= ,096 ; NFI=,864
CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;

5.2.2.4.1 Exploratory Factor Analysis for Socialization

First variable was Socialization and factor analysis results were positive with determinant value 0,111 and KMO 0,846. The reliability test is positive as Cronbach's Alpha value is 0,857.

Table 5.38 - Results of Reliability Analysis for Socialization subscale in KCP

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
Socialization	KC2 S Sharing experience with suppliers and customers	,846	64,194	,857
	KC4 S Finding new strategies by wandering inside firm	,822		
	KC5 S Enabling understanding of craftsmanship and expertise	,822		
	KC1 S Gathering Information from sales and production sites	,780		
	KC3 S Engaging in dialogue with competitors	,732		
		Total		
		KMO Measure of Sampling Adequacy		,846
	Bartlett's Test of Sphericity	Approx, Chi-Square		562,159
		Df		10
		Sig.		,000

Table 5.39 - Results of EFA and CFA for Socialization subscale in KCP

Factor	EFA Loadings	CFA Loadings	t
Socialization	(Cronbach's α = ,790)		
KC2 S Sharing experience with suppliers and customers	,846	,818	12,089 ***
KC4 S Finding new strategies by wandering inside firm	,822	,762	11,367 ***
KC5 S Enabling understanding of craftsmanship and expertise	,822	,766	11,421 ***
KC1 S Gathering Information from sales and production sites	,780	,724	
KC3 S Engaging in dialogue with competitors	,732	,641	11,421 ***
$\chi^2(5; N=294)=24,689$; p =,000; CFI=,965; RMSEA= ,116 ; NFI=,957			
* p< ,05 ** p< ,01 *** p< ,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

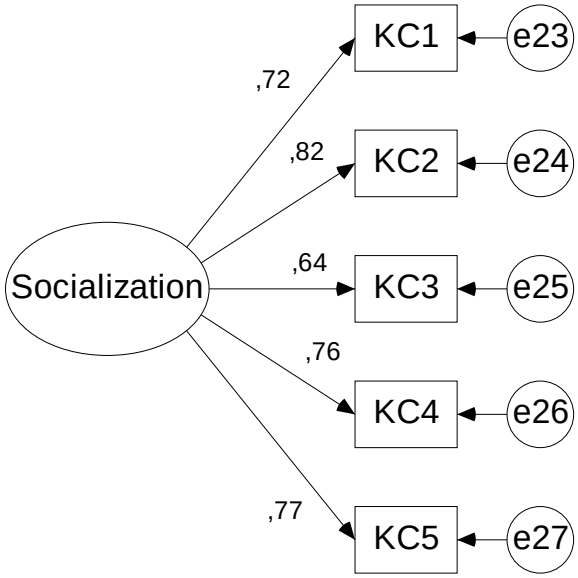


Figure 5.34 - Path Diagram of Socialization subscale in KCP

5.2.2.4.2 Factor Analysis for Externalization

Second variable is Externalization and both determinant value (0,024) and KMO value (0,879) were good for the calculated factor. The reliability of the factor analysis is granted with a Cronbach's Alpha value of 0,919.

Table 5.40 - Results of Reliability Analysis for Externalization subscale in KCP

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
Externalization	KC7 E Using deductive and inductive thinking	,911	75,777	,919
	KC6 E Creative and essential dialogue	,890		
	KC8 E Using metaphors for concept creation	,885		
	KC9 E Exchanging various ideas and dialogues	,880		
	KC10 E Subjective opinions	,781		
		Total		
		KMO Measure of Sampling Adequacy		,879
	Bartlett's Test of Sphericity	Approx, Chi-Square		936,089
		Df		10
		Sig.		,000

Table 5.41 - Results of EFA and CFA for Externalization subscale in KCP

Factor	EFA Loadings	CFA Loadings	t
Externalization	(Cronbach's α = ,790)		
KC7 E Using deductive and inductive thinking	,911	,910	20,821 ***
KC6 E Creative and essential dialogue	,890	,874	
KC8 E Using metaphors for concept creation	,885	,862	18,657 ***
KC9 E Exchanging various ideas and dialogues	,880	,831	17,569 ***
KC10 E Subjective opinions	,781	,677	12,676 ***
$\chi^2(5; N=294)=21,824$; p =,001; CFI=,982; RMSEA= ,107 ; NFI=,977			
* p< ,05 ** p< ,01 *** p< ,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

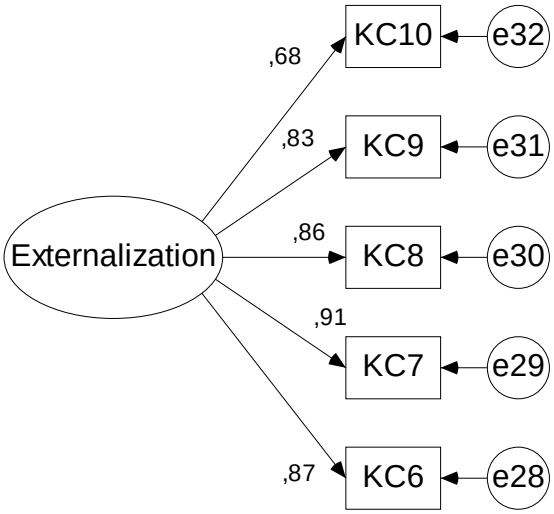


Figure 5.35 - Path Diagram of Externalization subscale in KCP

5.2.2.4.3 Factor Analysis for Combination

The third variable is Combination. Both determinant value (0,067) and KMO value (0,826) are valid. The explanatory power of the factor was 66,432%. Cronbach's Alpha value is 0,867 which is higher than 0,7.

Table 5.42 - Results of Reliability Analysis for Combination subscale in KCP

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
Combination	KC14 C Building materials by gathering management figures	,923	66,432	,867
	KC13 C Building databases on products	,855		
	KC11 C Using literature and simulation during planning strategies	,771		
	KC15 C Transmitting newly created concepts	,769		
	KC12 C Creating manuals and documents on products	,743		
		Total		
		KMO Measure of Sampling Adequacy		,826
	Bartlett's Test of Sphericity	Approx, Chi-Square		680,912
		Df		10
		Sig.		,000

Table 5.43 - Results of EFA and CFA for Combination subscale in KCP

Factor	EFA Loadings	CFA Loadings	t
Combination	(Cronbach's α = ,790)		
KC14 C Building materials by gathering management figures	,923	,953	13,160 ***
KC13 C Building databases on products	,855	,820	11,980 ***
KC11 C Using literature and simulation during planning strategies	,771	,678	
KC15 C Transmitting newly created concepts	,769	,703	10,476 ***
KC12 C Creating manuals and documents on products	,743	,690	10,272 ***
$\chi^2(5; N=294)=25,589$; p =,000; CFI=,971; RMSEA= ,119 ; NFI=,965			
* p< ,05 ** p< ,01 *** p< ,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

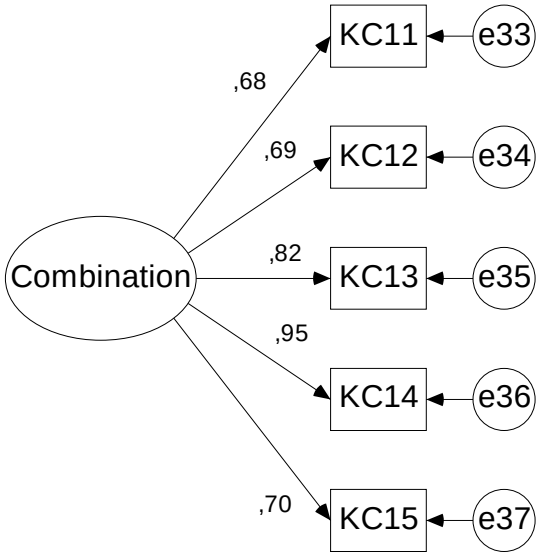


Figure 5.36 - Path Diagram of Combination subscale in KCP

5.2.2.4.4 Factor Analysis for Internalization

The last variable was Internalization with determinant value 0,1 and KMO value 0,822; and both values were valid. The explanatory power of the factor was 75,273%. Cronbach's Alpha value is 0,888 and it is higher than 0,7 which enables reliability of the factor.

Table 5.44 - Results of Reliability Analysis for Internalization subscale in KCP

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
Internalization	KC18 I Sharing new values and thoughts	,894	75,273	,888
	KC16 I Enactive liasoning activities by cross-functional teams	,861		
	KC17 I Forming teams as a model	,861		
	KC19 I Sharing management visions through communications	,854		
		Total		
		KMO Measure of Sampling Adequacy		,822
	Bartlett's Test of Sphericity	Approx, Chi-Square		591,040
		Df		6
		Sig.		,000

Table 5.45 - Results of EFA and CFA for Internalization subscale in KCP

Factor	EFA Loadings	CFA Loadings	t
Internalization	(Cronbach's α = ,790)		
KC18 I Sharing new values and thoughts	,894	,871	15,202 ***
KC16 I Enactive liasoning activities by cross-functional teams	,861	,798	
KC17 I Forming teams as a model	,861	,803	13,937 ***
KC19 I Sharing management visions through communications	,854	,803	13,930 ***
$\chi^2(2; N=294)=13,460$; p =,001; CFI=,981; RMSEA= ,140 ; NFI=,978			
* $p<$,05 ** $p<$,01 *** $p<$,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

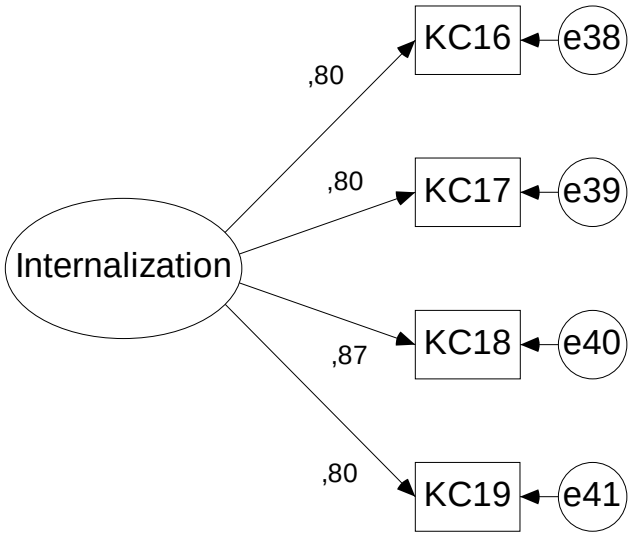


Figure 5.37 - Path Diagram of Internalization subscale in KCP

5.2.2.5 Factor Analysis for New Product Development Capability

There were totally nine variables in the instrument and when factor analysis was applied to them we had a determinant value of 0,005 and KMO value of 0,882 which both were valid. The reliability of the factor is granted with Cronbach's Alpha of 0,905.

Table 5.46 - Results of Reliability Analysis for NPD Capability

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
NPD Capability	NPDC3 New product development speed	,832	57,441	,905
	NPDC8 New product development quality	,800		
	NPDC2 Introducing new products before competitors	,791		
	NPDC7 New product development flexibility	,789		
	NPDC4 New product development cost	,779		
	NPDC1 The quality of new developed products and services	,755		
	NPDC5 New product development sales	,702		
	NPDC9 Lessons learned during new product development	,682		
	NPDC6 Profits from new developed products	,673		
		Total		
		KMO Measure of Sampling Adequacy		,882
	Bartlett's Test of Sphericity	Approx, Chi-Square		1,314E3
		Df		36
		Sig.		,000

Table 5.47 - Results of EFA and CFA for NPD Capability

Factor	EFA Loadings	CFA Loadings	t
NPD Capability	(Cronbach's α = ,790)		
NPDC3 New product development speed	,832	,825	12,646 ***
NPDC8 New product development quality	,800	,755	11,603 ***
NPDC2 Introducing new products before competitors	,791	,772	11,863 ***
NPDC7 New product development flexibility	,789	,765	11,752 ***
NPDC4 New product development cost	,779	,746	11,451 ***
NPDC1 The quality of new developed products and services	,755	,714	
NPDC5 New product development sales	,702	,632	9,732 ***
NPDC9 Lessons learned during new product development	,682	,626	9,621 ***
NPDC6 Profits from new developed products	,673	,608	9,333 ***
χ^2(27; *N*=294)=214,734; *p* =,000; CFI=,854; RMSEA= ,154 ; NFI=,839			
* *p*< ,05 ** *p*< ,01 *** *p*< ,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

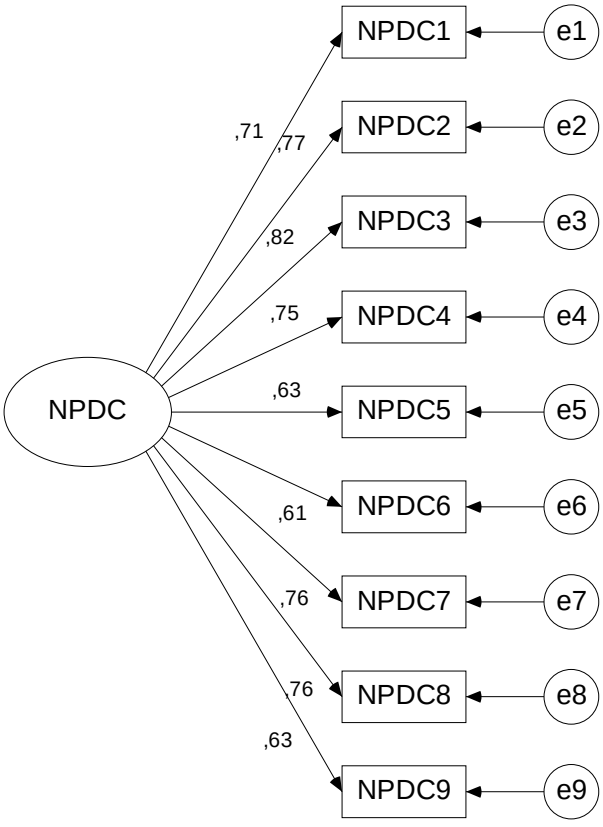


Figure 5.38 - Path Diagram of NPD Capability

5.2.2.6 Factor Analysis for Perceived Company Performance

There were three variables in Perceived Company Performance with 10 items. After factor analysis was applied to them we had two factors with determinant value 0,001 and KMO value 0,877. The Reliability of the new factors was granted with Cronbach's Alpha value of 0,913. The new variables were named as Financial Performance and Qualitative Performance

Table 5.48 - Results of Reliability Analysis for Perceived Company Performance

Factor	Question	Factor Loadings	Total Variance Exp. (%)	Reliability Cronbach α
Financial Performance	PCP9 FP Return on assets (Profit/Total Assets)	,917	36,514	,913
	PCP10 FP General profitability of the firm	,902		
	PCP8 FP Return on sales (Profit/Total sales)	,890		
	PCP2 MP Total sales	,681		
	PCP3 MP Market share	,617		
Qualitative Performance	PCP4 PSP Product/Service quality	,838	70,331	
	PCP6 PSP Product/Service flexibility	,818		
	PCP7 FP Product/Service delivery speed	,746		
	PCP1 MP Customer satisfaction	,710		
	PCP5 PSP Product/Service cost	,673		
		Total		
Bartlett's Test of Sphericity		KMO Measure of Sampling Adequacy		,877
		Approx, Chi-Square		1,764E3
		Df		45
		Sig.		,000

Factor Correlations

	Estimate	t	p
Financial Performance ←→ Qualitative Performance	,626	6,683	,000

Table 5.49 - Results of EFA and CFA for Perceived Company Performance

Factor	EFA Loadings	CFA Loadings	t
Financial Performance	(Cronbach's α = ,913)		
PCP9 FP Return on assets (Profit/Total Assets)	,917	,934	26,160 ***
PCP10 FP General profitability of the firm	,902	,927	
PCP8 FP Return on sales (Profit/Total sales)	,890	,912	24,483 ***
PCP2 MP Total sales	,681	,683	13,428 ***
PCP3 MP Market share	,617	,635	11,988 ***
Qualitative Performance	(Cronbach's α = ,913)		
PCP4 PSP Product/Service quality	,838	,754	9,992 ***
PCP6 PSP Product/Service flexibility	,818	,831	10,719 ***
PCP7 FP Product/Service delivery speed	,746	,764	10,097 ***
PCP1 MP Customer satisfaction	,710	,643	
PCP5 PSP Product/Service cost	,673	,782	10,267 ***
$\chi^2(34; N=294)=255,634$; p =,000; CFI=,880; RMSEA=,149; NFI=,886			
* $p<$,05 ** $p<$,01 *** $p<$,001 CFI=Comparative Fit Index; RMSEA=Root Mean Square Error Approximation; NFI=Normed Fit Index;			

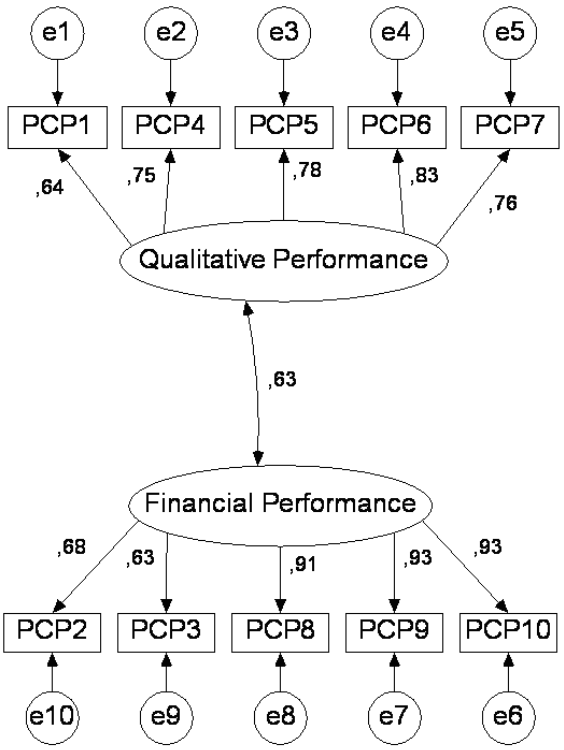


Figure 5.39 - Path Diagram of Perceived Company Performance

5.3 Basic Difference Statistics

These statistics are done for one independent and one dependent variable. Independent variable usually has a few values (ordered or not).

Table 5.50 - Selection of an Appropriate Inferential Statistic for Basic Difference Questions (Morgan and Griego, 1998)

	Scale of Measurement of Dependent Variable	COMPARE	One Factor or Independent Variable with 2 Categories or Levels/Groups/Samples		One Independent Variable 3 or more Categories or Levels or Groups	
			Independent Samples or Groups (Between)	Repeated Measures or Related Samples (Within)	Independent Samples or Groups (Between)	Repeated Measures or Related Samples (Within)
Parametric Statistics	Dependent Variable Approximates Interval or Ratio Data and Assumptions Not Markedly Violated	MEANS	Independent Samples t Test or One-Way ANOVA	Paired Samples t Test	One-Way ANOVA	GLM Repeated Measures ANOVA
Non Parametric Statistics	Dependent Variables Clearly Ordinal (or Ranked) Data or ANOVA Assumptions Markedly Violated	MEDIAN OR RANKS	Mann-Whitney	Wilcoxon	Kruskal-Wallis	Friedman
	Dependent Variable Nominal (Categorical) Data	COUNTS	Chi-square	McNemar	Chi-square	Cochran Q Test

One of the determinants of which statistics to use has to do with statistical assumptions (Morgan and Griego, 1998). If the dependent variable is approximately distributed and measured on a scale that at least approximates interval data, the researcher can use the parametric *t* test. If these assumptions are markedly violated, one should use a nonparametric test as shown in Table 5.50 (Morgan and Griego, 1998).

5.3.1 Statistics with respect to gender

When we compare Academic Degree, In Which Department (Business Line) the Sample working, and the Position in Company (all dependent variables) with respect to Gender (independent variable), we used a nonparametric equivalent of the t Test which is Mann-Whitney as all these variables are accepted as ordinal. It is also preferred to apply *t* test just to compare the results of different tests, if the data is accepted to be approximately interval.

The fist table Ranks shows the mean or average ranks for males and females on each of the three dependent variables. The program ranks 234, 231 and 233 samples from highest to lowest so that, in contrast to typical ranking procedure, a high mean rank indicates the group scored higher.

Table 5.51 Ranks with respect to gender

Ranks

	SI7 Sex	N	Mean Rank	Sum of Ranks
SI8 Academic Degree	Female	65	123,98	8058,50
	Male	169	115,01	19436,50
	Total	234		
SI5 Business Line	Female	65	121,77	7915,00
	Male	166	113,74	18881,00
	Total	231		
SI4 Position in Company	Female	65	138,30	8989,50
	Male	168	108,76	18271,50
	Total	233		

The Test Statistics table provides the Mann-Whitney U and the approximate significance level or *p*. Here we should note that, the mean ranks of the gender differ significantly on Position in Company but not on Academic Degree or Business Line. Having a higher mean rank of Position in Company means females are working in lower ranks than males.

Table 5.52 Independent samples t test

Test Statistics[a]

	SI8 Academic Degree	SI5 Business Line	SI4 Position in Company
Mann-Whitney U	5071,500	5020,000	4075,500
Wilcoxon W	19436,500	18881,000	18271,500
Z	-1,028	-,854	-3,197
Asymp. Sig. (2-tailed)	,304	,393	,001

a. Grouping Variable: SI7 Sex

When independent samples *t* test was applied to the same data with the acceptance of assumption that the dependent variable is approximately normally distributed and measured on a scale that at least approximates interval data.

The first table shows descriptive statistics for gender with respect to other variables. Means for SI8 and SI5 are very close to each other but their standard deviation is similar only in SI8. SI5 has different standard deviation for gender just like SI4, which has also different means.

Table 5.53 Descriptive statistics for gender

Group Statistics

	SI7 Sex	N	Mean	Std. Deviation	Std. Error Mean
SI8 Academic Degree	Female	65	2,86	,747	,093
	Male	169	2,76	,750	,058
SI5 Business Line	Female	65	3,58	1,629	,202
	Male	166	3,62	1,287	,100
SI4 Position in Company	Female	65	3,40	,862	,107
	Male	168	2,88	1,149	,089

The second table provides two statistical tests. The first is Levene test for the assumption that the variances of the two groups are equal. If F test does not have a value less than or equal to 0.05 which means 'it is not significant' (as in SI8), the assumption is not violated and values for "equal variances assumed" line are used for the t test and related statistics.

However, if Levene's F is statistically significant (as in SI5 and SI4), then variances are significantly different and the assumption of equal variances is violated. In these cases, the "equal variance not assumed" lines are used.

The results can be stated as:
t(232)=0,898, p=0,370; Although the assumption is not violated for equality of variances, there is no difference on the means of SI8 for participants in the two groups.

t(97)=-0,159, p=0,874; Although the assumption is not violated for equality of variances, there is no difference on the means of SI5 for participants in the two groups.

Table 5.54 Independent samples test for gender

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SI8 Academic Degree	Equal variances assumed	,144	,704	,898	232	,370	,098	,109	-,117	,314
	Equal variances not assumed			,900	116,529	,370	,098	,109	-,118	,314
SI5 Business Line	Equal variances assumed	12,385	,001	-,176	229	,860	-,036	,203	-,437	,365
	Equal variances not assumed			-,159	96,847	,874	-,036	,225	-,483	,411
SI4 Position in Company	Equal variances assumed	8,585	,004	3,337	231	,001	,525	,157	,215	,835
	Equal variances not assumed			3,779	154,183	,000	,525	,139	,251	,799

t(154)=3,779, p=0; The assumption is violated for equality of variances, thus, "equal variances not assumes" values are used. The inspection of the two group means indicates that **the average value for position in company of female is significantly higher than average value for position in company of male**. The difference between the means is 0,525 points on a 4 point test. The positive sign indicates that the first group (female) has the higher average score. The 95% confidence interval tells us that 95 times out of 100 the

true (population) difference will fall between 0,251 points and 0,799 points. As an additional information; if both the “upper” and “lower” bounds have the same sign (either + or -) we know that the difference is statistically significant.

The choices for SI4 Position in Company was: 1: Top Management (CEO, Executives, Director or Managers direct reporting to CEO), 2: Senior Management (Managers reporting to Top Management), 3: Middle Management (Managers reporting to Senior Management) and 4: Other. As, higher value for position in company indicates lower levels at organizational hierarchy, average value for Position in Company of female being significantly higher than average value for Position in Company of male, indicates female professionals are at lower levels relative to male professionals in the organizational hierarchy.

The analysis of Mann-Whitney U test with Gender versus professional life of: a) total, b) in the sector, c) in the final company; the following results were obtained:

There is a significant difference in Years in the Sector with respect to Gender. Males have higher mean rank meaning higher years of experience in the sector.

Table 5.55 Ranks with respect to gender and experience

Ranks

	SI7 Sex	N	Mean Rank	Sum of Ranks
SI1 Years as a professional	Female	64	104,02	6657,00
	Male	162	117,25	18994,00
	Total	226		
SI2 Years in this sector	Female	63	96,52	6081,00
	Male	159	117,43	18672,00
	Total	222		
SI3 Years in this company	Female	62	97,88	6068,50
	Male	156	114,12	17802,50
	Total	218		

Test Statistics[a]

Table 5.56 Independent samples test for experience

	SI1 Years as a professional	SI2 Years in this sector	SI3 Years in this company
Mann-Whitney U	4577,000	4065,000	4115,500
Wilcoxon W	6657,000	6081,000	6068,500
Z	-1,404	-2,247	-1,792
Asymp. Sig. (2-tailed)	,160	,025	,073

a. Grouping Variable: SI7 Sex

5.3.2 Statistics with respect to Company Type

When we compare factors evaluated in the previous analysis with respect to company type (only for those corporate or limited, omitting other), the following results obtained:

There is a significant relation between Time Span of Strategic Plan and the company type, with corporates having higher mean rank -meaning longer periods- for time span of strategic plans than limited companies.

Also, for Formalization factor, the mean rank values are higher for corporates meaning they are more formalized than limited companies.

Table 5.57 Ranks with respect to company type

Ranks

	Legal Status	N	Mean Rank	Sum of Ranks
Time Span of Strategic Plan	Corporate	119	76,04	9048,50
	Limited	26	59,10	1536,50
	Total	145		
KME_F3_Formalization	Corporate	200	140,68	28137,00
	Limited	64	106,92	6843,00
	Total	264		

Table 5.58 Independent samples test for company type

Test Statistics[a]

	Time Span of Strategic Plan	KME_F3_Formalization
Mann-Whitney U	1185,500	4763,000
Wilcoxon W	1536,500	6843,000
Z	-2,018	-3,100
Asymp. Sig. (2-tailed)	,044	,002

a. Grouping Variable: Legal Status

5.3.3 Statistics with respect to Foreign Partnership

The mean rank of foreign partnership differs significantly on the factors in the table below. This means that, when there is foreign partnership, foundation years go further back in time (the age of the company is higher); and for all the other dependent variables, they have higher values (more positive responses).

Table 5.59 Ranks with respect to foreign partnership

Ranks

	Foreign Partner	N	Mean Rank	Sum of Ranks
Foundation Year defined with range	Yes	93	176,58	16422,00
	No	177	113,92	20163,00
	Total	270		
MD_F1_Competitive_intensity	Yes	104	163,30	16983,00
	No	186	135,55	25212,00
	Total	290		
MD_F2_Dynamism	Yes	104	166,03	17267,50
	No	186	134,02	24927,50
	Total	290		
BS_F1	Yes	104	170,58	17740,00
	No	184	129,76	23876,00
	Total	288		
KME_F3_Formalization	Yes	96	147,61	14170,50
	No	173	128,00	22144,50
	Total	269		
NPDC_F1_NPD Capability	Yes	94	143,84	13520,50
	No	164	121,28	19890,50
	Total	258		

Table 5.60 Independent samples test for foreign partnership

Test Statistics[a]

	Foundation Year defined with range	MD_F1_ Competitive intensity	MD_F2_ Dynamism	BS_F1	KME_F3_ Formalization	NPDC_F1 _NPD Capability
Mann-Whitney U	4410,000	7821,000	7536,500	6,856E3	7093,500	6360,500
Wilcoxon W	20163,000	25212,000	24927,500	2,388E4	22144,500	19890,500
Z	-6,458	-2,711	-3,123	-4,003	-1,993	-2,340
Asymp. Sig. (2-tailed)	,000	,007	,002	,000	,046	,019

a. Grouping Variable: Foreign Partner

5.3.4 Statistics with respect to Number of Employees

There are six different groups in number of employees and group 2 (11-50 employees) and group 6 (1000+ employees) both have the same number of responses, 43. As the groups are representing very different types of companies, they were chosen for this analysis, and the following results were obtained.

Collaboration has a higher mean rank in Group 2 than Group 6 and this is the only variable that they are leading. All of the other variables in the table have higher mean ranks in Group 6 (bigger company with 1000+ employees) than Group 2. Among them, it worth to mention; NPD Capability and Financial Performance for big companies (Group 6) supersede small ones (Group 2)

Table 5.61 Ranks with respect to number of employees

Ranks

	Number of Employees	N	Mean Rank	Sum of Ranks
Foundation Year defined with range	11-50	40	33,94	1357,50
	1000+	38	45,36	1723,50
	Total	78		
BS_F1	11-50	43	33,52	1441,50
	1000+	43	53,48	2299,50
	Total	86		
KME_F1_Collaboration	11-50	38	45,25	1719,50
	1000+	41	35,13	1440,50
	Total	79		
KME_F2_Learning	11-50	38	34,41	1307,50
	1000+	41	45,18	1852,50
	Total	79		
KME_F4_Direction and performance information	11-50	37	33,77	1249,50
	1000+	41	44,67	1831,50
	Total	78		
NPDC_F1_NPD Capability	11-50	33	29,24	965,00
	1000+	40	43,40	1736,00
	Total	73		
PCP_F1_ Financial Performance	11-50	32	23,50	752,00
	1000+	39	46,26	1804,00
	Total	71		

Table 5.62 Independent samples test for number of employees

Test Statistics[a]

	Foundation Year defined with range	BS_F1	KME_F1_ Collaboration	KME_F2_ Learning	KME_F4_ Direction and performance information	NPDC_F1_ NPD Capability	PCP_F1_ Financial Performance
Mann-Whitney U	537,500	495,500	579,500	566,500	546,500	404,000	224,000
Wilcoxon W	1357,500	1,442E3	1440,500	1307,500	1249,500	965,000	752,000
Z	-2,351	-3,716	-1,964	-2,094	-2,145	-2,847	-4,643
Asymp. Sig. (2-tailed)	,019	,000	,050	,036	,032	,004	,000

a. Grouping Variable: Number of Employees

When the same test was run by changing Group 2 with Group 3 (51-100 employees) and keeping Group 6 (1000+ employees); only four of the above seven variables calculated to have different mean ranks significantly.

Table 5.63 Independent samples test for number of employees – Groups 2 and 3

Test Statistics

	Foundation Year defined with range	BS_F1	KME_F1_ Collaboration	KME_F2_ Learning	KME_F4_ Direction and performance information	NPDC_F1_ NPD Capability	PCP_F1_ Financial Performance
Mann-Whitney U	1756,500	1,688E3	1389,500	1936,500	1611,000	1809,000	1591,000
Wilcoxon W	7321,500	7,683E3	2250,500	7396,500	6967,000	6960,000	6641,000
Z	-1,137	-2,688	-3,339	-,862	-2,234	-,967	-1,694
Asymp. Sig. (2-tailed)	,255	,007	,001	,389	,025	,334	,090

a. Grouping Variable: Number of Employees

5.3.5 Statistics with respect to Business Lines

The respondents were asked in which Business Line they were working with choices: a) Marketing/Sales, b) After Sales Service, c) R&D/Product Development, d) Software (coding, etc.), e) Other.

When the analyses were run for a-c, a-d, and c-d, the following results obtained. As there were only 12 responses to after sales service, this analysis was not applied to it.

Respondents working in Marketing/Sales department have higher mean rank values than those in R&D/Product Development department. When we compare Marketing/Sales with Software department, KME_F1_Collaboration and PCP_F1_Financial Performance variables dropped but this time MD_F1_Competition and KME_F6_IT variables entered the variables that have significant mean rank differences. To further the analysis, when R&D and Software were compared no significant differences obtained.

Table 5.64 Ranks with respect to business lines

Ranks

	SI5 Business Line	N	Mean Rank	Sum of Ranks
BS_F1	Marketing/Sales	36	40,44	1456,00
	R&D / Product Development	31	26,52	822,00
	Total	67		
KME_F1_Collaboration	Marketing/Sales	36	38,68	1392,50
	R&D / Product Development	31	28,56	885,50
	Total	67		
KME_F2_Learning	Marketing/Sales	36	39,26	1413,50
	R&D / Product Development	31	27,89	864,50
	Total	67		
KME_F4_Direction and performance information	Marketing/Sales	36	41,56	1496,00
	R&D / Product Development	31	25,23	782,00
	Total	67		
KCP_F1_Socialization	Marketing/Sales	36	40,39	1454,00
	R&D / Product Development	30	25,23	757,00
	Total	66		
KCP_F4_Internalization	Marketing/Sales	36	39,85	1434,50
	R&D / Product Development	31	27,21	843,50
	Total	67		
PCP_F1_Financial Performance	Marketing/Sales	36	37,69	1357,00
	R&D / Product Development	29	27,17	788,00
	Total	65		

Table 5.65 Independent samples test for business lines

Test Statistics[a]

	BS_F1	KME_F1_ Collaboration	KME_F2_ Learning	KME_F4_ Direction and performance information	KCP_F1_ Socialization	KCP_F4_ Internalization	PCP_F1_Financial Performance
Mann-Whitney U	326,000	389,500	368,500	286,000	292,000	347,500	353,000
Wilcoxon W	822,000	885,500	864,500	782,000	757,000	843,500	788,000
Z	-2,923	-2,133	-2,390	-3,460	-3,207	-2,664	-2,243
Asymp. Sig. (2-tailed)	,003	,033	,017	,001	,001	,008	,025

a. Grouping Variable: SI5 Business Line

Table 5.66 Ranks with respect to business lines

Ranks

	SI5 Business Line	N	Mean Rank	Sum of Ranks
MD_F1_Competitive intensity	Marketing/Sales	36	68,39	2462,00
	Software Development	80	54,05	4324,00
	Total	116		
BS_F1	Marketing/Sales	36	68,19	2455,00
	Software Development	80	54,14	4331,00
	Total	116		
KME_F2_Learning	Marketing/Sales	36	69,93	2517,50
	Software Development	79	52,56	4152,50
	Total	115		
KME_F4_Direction and performance information	Marketing/Sales	36	70,54	2539,50
	Software Development	79	52,28	4130,50
	Total	115		
KME_F6_IT	Marketing/Sales	36	67,29	2422,50
	Software Development	79	53,77	4247,50
	Total	115		
KCP_F1_Socialization	Marketing/Sales	36	72,78	2620,00
	Software Development	79	51,27	4050,00
	Total	115		
KCP_F4_Internalization	Marketing/Sales	36	67,06	2414,00
	Software Development	79	53,87	4256,00
	Total	115		

Table 5.67 Independent samples test for business lines

Test Statistics[a]

	MD_F1_ Competitive intensity	BS_F1	KME_F2_ Learning	KME_F4_ Direction and performance information	KME_F6 _IT	KCP_F1_ Socialization	KCP_F4_ Internalization
Mann-Whitney U	1084,000	1,091E3	992,500	970,500	1087,500	890,000	1096,000
Wilcoxon W	4324,000	4,331E3	4152,500	4130,500	4247,500	4050,000	4256,000
Z	-2,134	-2,087	-2,599	-2,746	-2,023	-3,221	-1,976
Asymp. Sig. (2-tailed)	,033	,037	,009	,006	,043	,001	,048

a. Grouping Variable: SI5 Business Line

5.3.6 Statistics with respect to Position in the Company

The respondents were asked to state their level within the company as a) Top Management, b) Managers reporting to Top Management, c) Employees reporting to Managers, d) Employees, other. When analysis were run within these groups, it was found that the groups a-b, b-c, and, c-d had no significant mean differences. Top Management and Employees Reporting to Managers have significant mean differences in KME_F1_Collaboration, KME_F5_T-shaped Skills, KME_F6_IT, and KCP_F2_Extenalization, where in all cases, Top Management is more positive.

Table 5.68 Ranks with respect to position in the company

Ranks

	SI4 Position in Company	N	Mean Rank	Sum of Ranks
KME_F1_Collaboration	Top Management	36	60,89	2192,00
	Direct Reporting to Senior Management	65	45,52	2959,00
	Total	101		
KME_F5_T-shaped Skills	Top Management	36	59,43	2139,50
	Direct Reporting to Senior Management	65	46,33	3011,50
	Total	101		
KME_F6_IT	Top Management	36	60,47	2177,00
	Direct Reporting to Senior Management	65	45,75	2974,00
	Total	101		
KCP_F2_Extenalization	Top Management	36	61,31	2207,00
	Direct Reporting to Senior Management	65	45,29	2944,00
	Total	101		

Table 5.69 Independent samples test for positions in the company

Test Statistics[a]

	KME_F1_Collaboration	KME_F5_T-shaped Skills	KME_F6_IT	KCP_F2_Extenalization
Mann-Whitney U	814,000	866,500	829,000	799,000
Wilcoxon W	2959,000	3011,500	2974,000	2944,000
Z	-2,535	-2,164	-2,428	-2,638
Asymp. Sig. (2-tailed)	,011	,030	,015	,008

a. Grouping Variable: SI4 Position in Company

When Top Management is compared with Employees not in management position, three new variables entered to the solution when compared with the previous analysis. These are KME_F3_Formalization, KME_F4_Direction and Performance information and PCP_F1_Financial Performance. Employees thought that Formalization is higher, Direction and Performance information is lower and Financial Performance is better with respect to Top Management.

Table 5.70 Ranks with respect to position in the company

Ranks

	SI4 Position in Company	N	Mean Rank	Sum of Ranks
KME_F1_Collaboration	Top Management	36	86,36	3109,00
	Other	107	67,17	7187,00
	Total	143		
KME_F3_Formalization	Top Management	36	59,82	2153,50
	Other	107	76,10	8142,50
	Total	143		
KME_F4_Direction and performance information	Top Management	36	88,11	3172,00
	Other	108	67,30	7268,00
	Total	144		
KME_F5_T-shaped Skills	Top Management	36	85,26	3069,50
	Other	108	68,25	7370,50
	Total	144		
KME_F6_IT	Top Management	36	90,06	3242,00
	Other	108	66,65	7198,00
	Total	144		
KCP_F2_Extenalization	Top Management	36	85,06	3062,00
	Other	107	67,61	7234,00
	Total	143		
PCP_F1_Financial Performance	Top Management	36	58,65	2111,50
	Other	105	75,23	7899,50
	Total	141		

Table 5.71 Independent samples test for positions in the company

Test Statistics[a]

	KME_F1_ Collaboration	KME_F3_ Formalization	KME_F4_ Direction and performance information	KME_F5_ T-shaped Skills	KME_F6_ IT	KCP_F2_ Externalization	PCP_F1_ Financial Performance
Mann-Whitney U	1409,000	1487,500	1382,000	1484,500	1312,000	1456,000	1445,500
Wilcoxon W	7187,000	2153,500	7268,000	7370,500	7198,000	7234,000	2111,500
Z	-2,416	-2,054	-2,612	-2,131	-2,925	-2,193	-2,121
Asymp. Sig. (2-tailed)	,016	,040	,009	,033	,003	,028	,034

a. Grouping Variable: SI4 Position in Company

When we do analysis in between Senior Management and Employees other than managerial positions, the only significant mean rank is in Direction and Performance information, as Senior Managers thought that, it is done better than other employees thought.

Table 5.72 Ranks with respect to position in the company

Ranks

	SI4 Position in Company	N	Mean Rank	Sum of Ranks
KME_F4_Direction and performance information	Senior Management	28	90,39	2531,00
	Other	108	62,82	6785,00
	Total	136		

Table 5.73 Independent samples test for position in the company

Test Statistics[a]

	KME_F4_Direction and performance information
Mann-Whitney U	899,000
Wilcoxon W	6785,000
Z	-3,321
Asymp. Sig. (2-tailed)	,001

a. Grouping Variable: SI4 Position in Company

5.4 Basic Associational Statistics

5.4.1 Correlations

The correlations are examined to see linear relationships between the variables or constructs. The presentation of the correlation coefficients begins with those between the constructs of each of the variables. The Pearson correlation is a parametric statistic used when both variables are at least interval scale. In case the data is ranked or when other assumptions (such as normality of the data) are markedly violated, nonparametric analysis should be applied equivalent of the Pearson correlation coefficient (such as Spearman's rho or Kendall's tau). The Kendall's tau is said to deal with ties in a better way than the Spearman rho. The data in this research is accepted as ordinal, however, it is possible to accept them to be at least approximately interval (Morgan and Griego, 1998). For factors derived in the previous chapters of this research, test for Pearson correlation is applied.

In order to determine if there exist any correlations between factors, the Pearson product-moment correlation coefficient (r) was conducted. It indicates the degree that quantitative variables are linearly related in a sample. The significance test for (r) evaluates whether there is a linear relationship between the two variables. The statistical test used in this part of the study was Pearson's correlation coefficient. The significance level was set initially at $p < ,05$. As there are 18 variables, the correlations become 153 and the odds that at least one could be statistically significant by chance gets very high. The Bonferroni correction applied to be conservative as it is designed to keep the significance level at 0,05 for the whole study. Thus, the new value for p becomes, $0,05/153 = 0,000327$. Table 5.74 displays all the factors in one table.

Table 5.74 - Pearson correlation coefficients for Factors

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Competitive Intensity	1,00																
2	Dynamism	0,35	1,00															
3	Product Uncertainty	0,44	0,29	1,00														
4	Business Strategies				1,00													
5	Mutual Trust					1,00												
6	Learning				0,34	0,48	1,00											
7	Formalization				0,36		0,41	1,00										
8	Centralization					-0,22			1,00									
9	Dir and Perf Info				0,34	0,49	0,52	0,38	-0,25	1,00								
10	T-shape skills				0,33	0,46	0,58	0,36		0,58	1,00							
11	IT Support				0,34	0,51	0,41	0,45		0,53	0,64	1,00						
12	Socialization			0,21	0,43	0,53	0,55	0,36	-0,23	0,60	0,59	0,61	1,00					
13	Externalization				0,33	0,54	0,55	0,30	-0,28	0,53	0,53	0,56	0,76	1,00				
14	Combination				0,38	0,35	0,46	0,52		0,48	0,52	0,58	0,65	0,66	1,00			
15	Internalization				0,37	0,46	0,56	0,39		0,51	0,55	0,58	0,72	0,79	0,70	1,00		
16	NPD Capability				0,53	0,42	0,42	0,38		0,37	0,43	0,43	0,56	0,51	0,58	0,55	1,00	
17	Financial Performance				0,50	0,29	0,31	0,29		0,23	0,27	0,31	0,37	0,32	0,37	0,35	0,68	1,00
18	Qualitative Performance				0,46	0,46	0,44	0,35		0,37	0,39	0,42	0,56	0,53	0,55	0,55	0,74	0,65

All correlations are significant at the 0.05 level (2-tailed) with Bonferroni correction 0,05/153=0,00033

5.5 Hypotheses Test Results

5.5.1 Path Analysis

The hypotheses developed in this research were tested by utilizing structural equations modeling (SEM) and AMOS 16.0 used as the statistical software to test the causal relationships in addition to SPSS 16.0. AMOS (Analysis of Moment Structures) is an easy-to-use software for visual SEM. With this tool, the model could be quickly specified, viewed, and modified graphically using simple drawing tools. After the model specified graphically, the software performed the computations and displayed the results both graphically and in text form. Table 5.75 contains the important statistical findings of the AMOS output. The table summarizes the values that were found as the results in path analysis for each hypothesis. These results are also explained in details in the following pages.

Table 5.75 - Parameter Estimates for Measurement Relationships and Causal Paths

		b	t
Competitive Intensity	Business Strategies	0,165	2,567 *
Dynamism	Learning	0,136	3,004 **
Product Uncertainty	Socialization	0,077	2,150 *
Business Strategies	Mutual Trust	0,193	3,384 ***
Business Strategies	Learning	0,329	5,999 ***
Business Strategies	Formalization	0,352	6,463 ***
Business Strategies	Dir. & Perf. Information	0,335	6,142 ***
Business Strategies	T-shaped Skills	0,321	5,864 ***
Business Strategies	IT Support	0,328	5,990 ***
Business Strategies	Socialization	0,536	8,623 ***
Business Strategies	Externalization	0,471	6,393 ***
Business Strategies	Combination	0,505	7,341 ***
Business Strategies	Internalization	0,568	7,326 ***
Business Strategies	NPD Capability	0,571	11,071 ***
Business Strategies	Financial Performance	0,568	9,744 ***
Business Strategies	Qualitative Performance	0,436	8,740 ***
Mutual Trust	Socialization	0,158	3,842 ***
Mutual Trust	Externalization	0,17	4,517 ***
Mutual Trust	NPD Capability	0,276	4,874 ***
Mutual Trust	Financial Performance	0,187	3,083 ***
Mutual Trust	Qualitative Performance	0,328	5,973 ***
Learning	Socialization	0,31	6,321 ***
Learning	Externalization	0,325	6,474 ***
Learning	Combination	0,193	3,72 ***
Learning	Internalization	0,386	7,847 ***
Learning	Financial Performance	0,136	2,213 *
Learning	Qualitative Performance	0,194	3,505 ***
Centralization	Externalization	-0,077	- 2,379 *
Formalization	Combination	0,259	6,459 ***
Formalization	NPD Capability	0,246	4,588 ***
Formalization	Financial Performance	0,198	3,394 ***
Formalization	Qualitative Performance	0,206	3,925 ***
IT Support	Socialization	0,395	7,905 ***
IT Support	Externalization	0,332	6,515 ***
IT Support	Combination	0,385	7,376 ***
IT Support	Internalization	0,408	8,296 ***
IT Support	NPD Capability	0,183	3,161 ***
Socialization	NPD Capability	0,28	,499 ***
Socialization	Financial Performance	0,204	3,683 ***
Socialization	Qualitative Performance	0,274	6,864 ***
Combination	NPD Capability	0,302	7,508 ***
Combination	Financial Performance	0,19	3,679 ***
Combination	Qualitative Performance	0,236	6,341 ***
NPD Capability	Financial Performance	0,705	13,784 ***
NPD Capability	Qualitative Performance	0,652	16,866 ***

**** p < 0,001; ** p<0,01; * p<0,05*

5.5.1.1 Path Analysis for Market Dynamism and Business Strategies

It was hypothesized (Hypothesis 1) that Market Dynamism has a significant positive impact on Business Strategies. After factor analysis, three factors were found for Market Dynamism. The results of path analysis indicate that Competitive Intensity has positive relationship with Business Strategies. The path diagram is displayed in Figure 5.40.

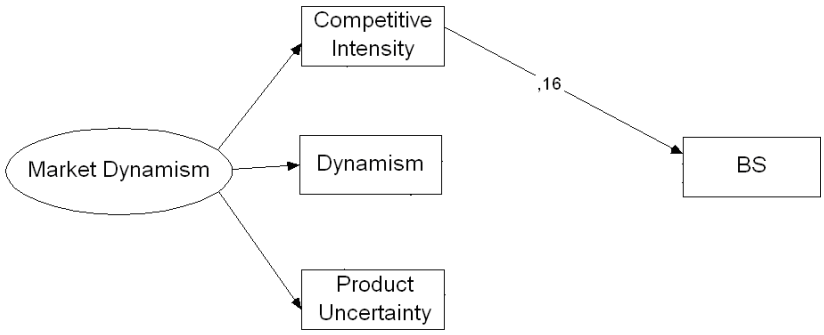


Figure 5.40 - Path Diagram for Market Dynamism and Business Strategies

5.5.1.2 Path Analysis for Market Dynamism and KM Enablers

The proposed model had no direct relation with Market Dynamism and KM Enablers, hence, no hypothesis were developed for the relationship among them. However, path analysis showed that, there is such a relation. Among three factors of Market Dynamism, Dynamism has positive relationship with Learning at 99.99% confidence level. The path diagram for the model is displayed in Figure 5.41.

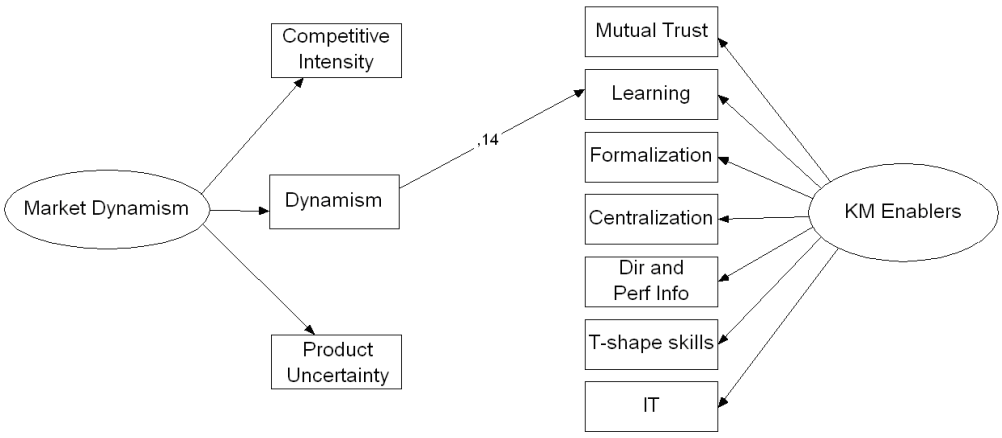


Figure 5.41 - Path Diagram for Market Dynamism and KM Enablers

5.5.1.3 Path Analysis for Market Dynamism and KCP

The proposed model had no direct relation with Market Dynamism and KCP, hence, no hypothesis were developed for the relationship among them. However, path analysis showed that, there is such a relation. Product uncertainty has positive relationships with socialization at 99.99% confidence level. The path diagram for the model is displayed in Figure 5.42.

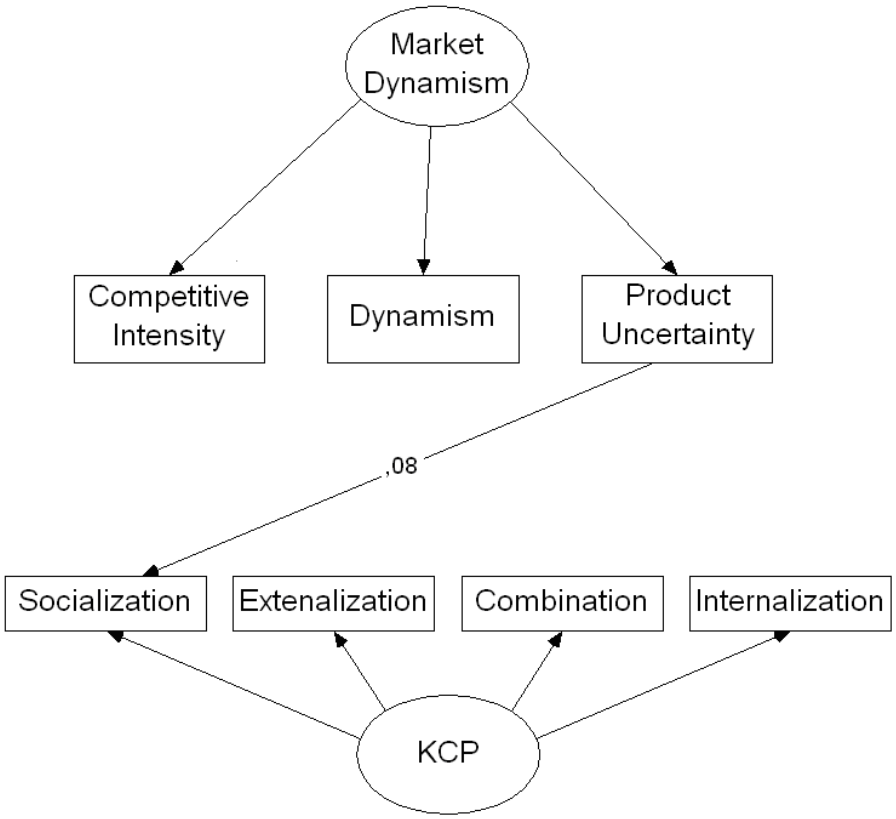


Figure 5.42 - Path Diagram for Market Dynamism and Knowledge Creation Process

5.5.1.4 Path Analysis for Market Dynamism and NPD Capability

It was hypothesized (Hypothesis 2) that Market Dynamism has a significant positive impact on NPD Capability. Although the proposed model had no factors for Market Dynamism, after factor analysis, it was found to have three factors. The results indicate no relationship between any of the factors of Market Dynamism and NPD Capability. The path diagram is displayed in Figure 5.43. Finally, Hypothesis 2 is rejected according to the path analysis.

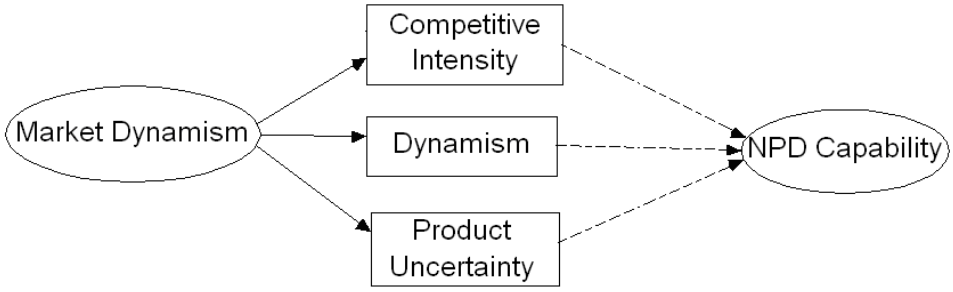


Figure 5.43 - Path Diagram for Market Dynamism and NPD Capability

5.5.1.5 Path Analysis for Market Dynamism and Perceived Company Performance

It was hypothesized (Hypothesis 3) that Market Dynamism has a significant positive impact on Perceived Company Performance. The results indicate no relationship between any factors of Market Dynamism and Perceived Company Performance. The path diagram is displayed in Figure 5.44. Finally, Hypothesis 3 is rejected.

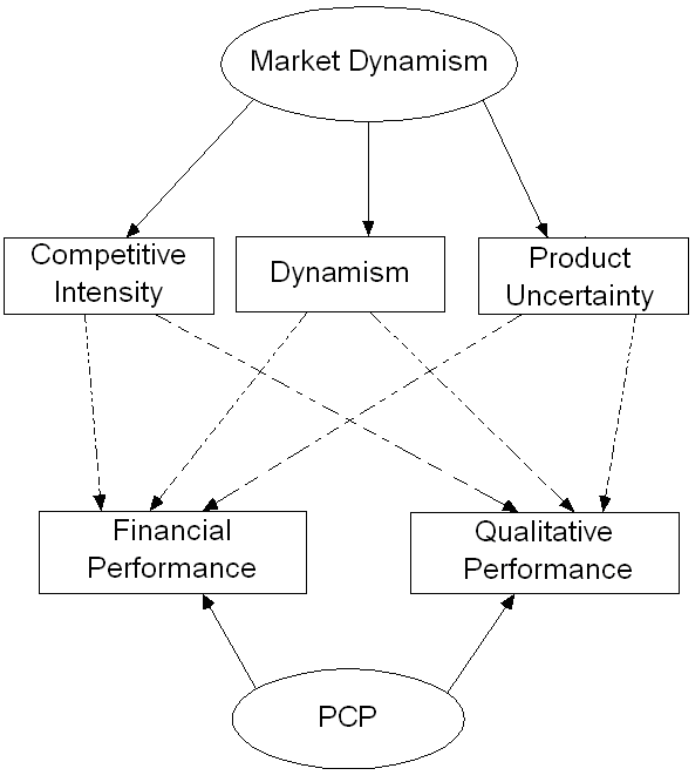


Figure 5.44 - Path Diagram for Market Dynamism and Perceived Company Performance

5.5.1.6 Path Analysis for Business Strategies and KM Enablers

It was hypothesized (Hypothesis 4) that Business Strategies would positively affect each component of KM Enablers (i.e., mutual trust, learning, participating in boundary spanning structures, direction and performance information, centralization, formalization, t-shaped skills, IT quality, and IT support). Business Strategies was measured by means of KM Enablers according to the EFA and CFA results. This indicates a positive relationship between Business Strategies and six factors or KM Enablers (mutual trust, learning, direction and performance information, formalization, t-shaped skills, and IT) at 99.99% confidence level. The path diagram for the model is displayed in Figure 5.45. Hypothesis 4 with a, c, f, g, h, and j are accepted.

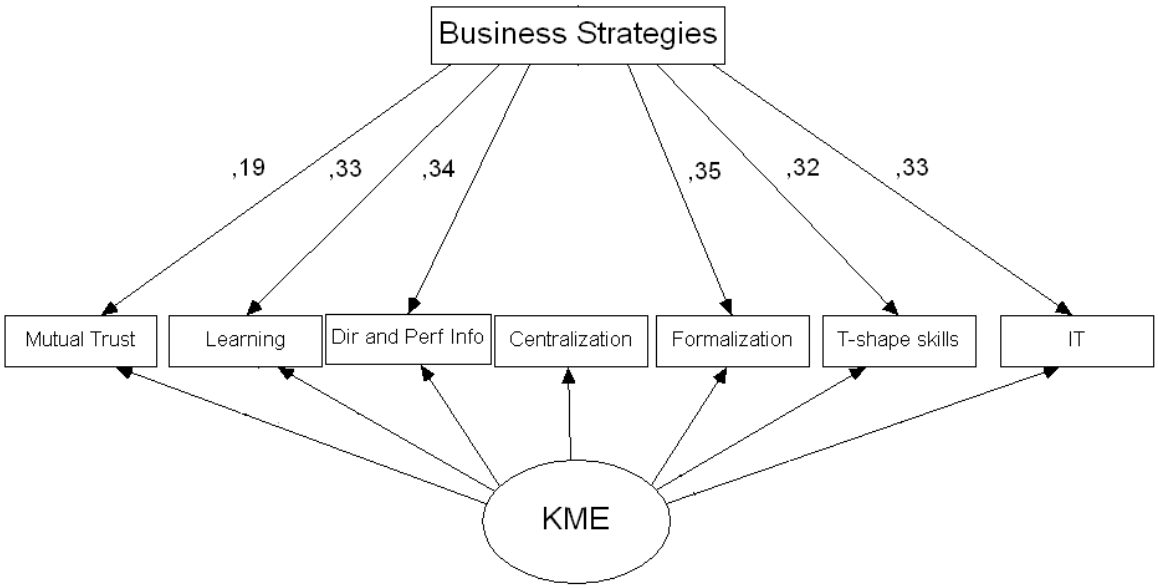


Figure 5.45 - Path Diagram for Business Strategies and KM Enablers

5.5.1.7 Path Analysis for Business Strategies and KCP

It was hypothesized (Hypothesis 5) that Business Strategies have a significant positive impact on KCP. The results indicate positive relationships between Business Strategies and all four factors of KCP at 99.99% confidence level. The path diagram is displayed in Figure 5.46. Finally, Hypothesis 5 is accepted for a, b, c and d.

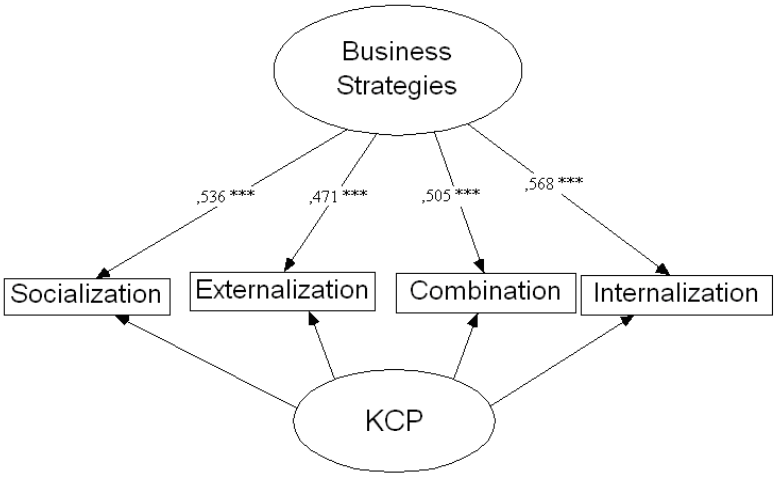


Figure 5.46 - Path Diagram for Business Strategies and Knowledge Creation Process

5.5.1.8 Path Analysis for Business Strategies and NPD Capability

It was hypothesized (Hypothesis 6) that Business Strategies have a significant positive impact on NPD Capability. The results indicate positive relationship between Business Strategies and NPD Capability at 99.99% confidence level. The path diagram is displayed in Figure 5.47. Finally, Hypothesis 6 is accepted.

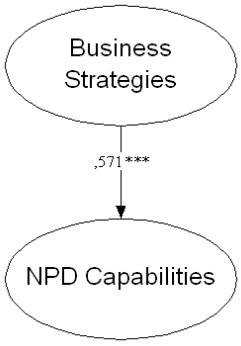


Figure 5.47 - Path Diagram for Business Strategies and NPD Capabilities

5.5.1.9 Path Analysis for Business Strategies and Perceived Company Performance

It was hypothesized (Hypothesis 7) that Business Strategies have a significant positive impact on Perceived Company Performance. The results indicate positive relationships between Business Strategies and both factors of **Perceived Company Performance** at 99.99% confidence level. The path diagram is displayed in Figure 5.48. Finally, Hypothesis 7 is accepted.

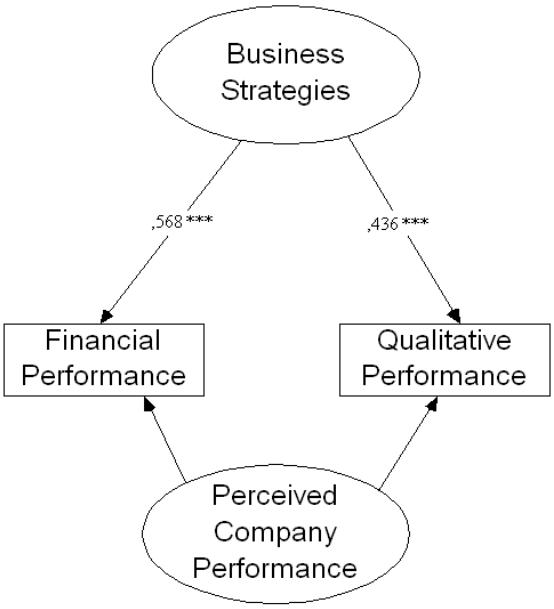


Figure 5.48 - Path Diagram for Business Strategies and Perceived Company Performance

5.5.1.10 Path Analysis for KM Enablers and KCP

It was hypothesized (Hypothesis 8) that KM Enablers would positively affect KCP. The results indicate positive relationships between factors of KM Enablers and KCP at 99.99% confidence level. Mutual trust has relationships with socialization and externalization, learning and IT have relationships with all four factors of KCP, centralization has relationship with externalization, and formalization has relationship with combination. The path diagram is displayed in Figure 5.49. Finally, Hypothesis 8 is accepted for aa, ab, ca, cb, cc, cd, eb, fc, ja, jb, jc, and jd.

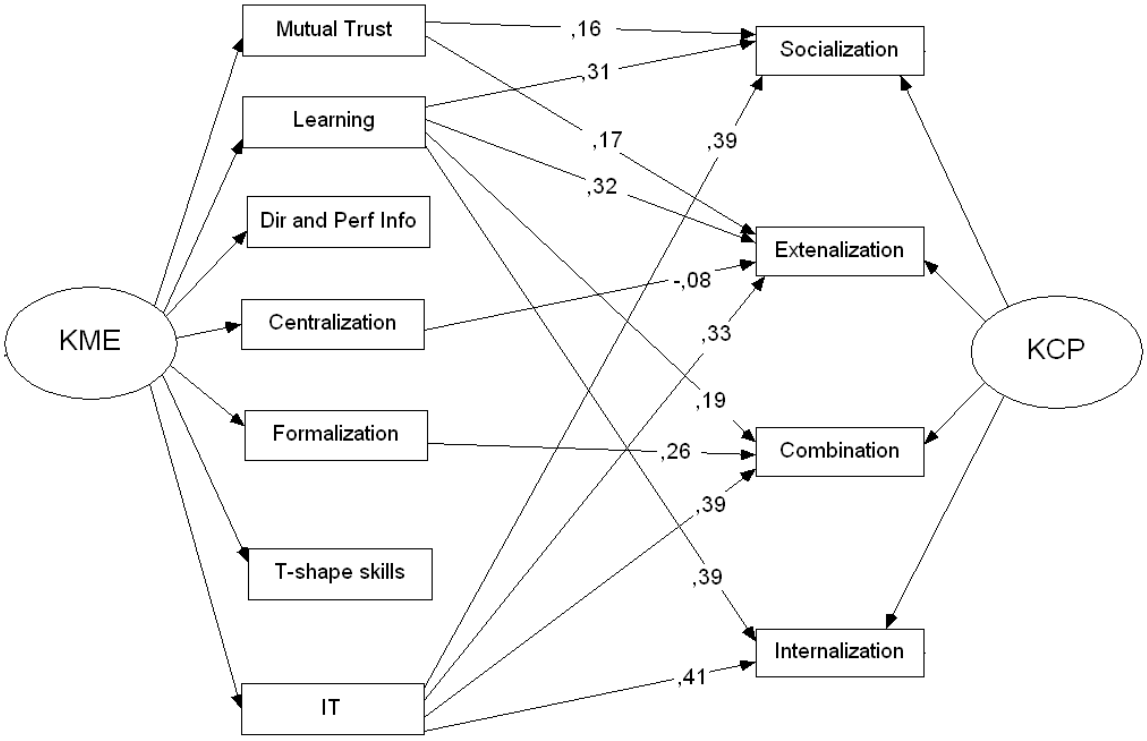


Figure 5.49 - Path Diagram for KM Enablers and Knowledge Creation Process

5.5.1.11 Path Analysis for KM Enablers and NPD Capability

It was hypothesized (Hypothesis 9) that KM Enablers would positively affect NPD Capabilities. The results indicate positive relationships between factors of KM Enablers and NPD Capability at 99.99% confidence level. Three factors of KM Enablers, mutual trust, formalization and IT have positive relationships between them and NPD Capabilities at 99.99% confidence level. The path diagram for the model is displayed in Figure 5.50. Finally, Hypothesis 9 is accepted for a, f and j.

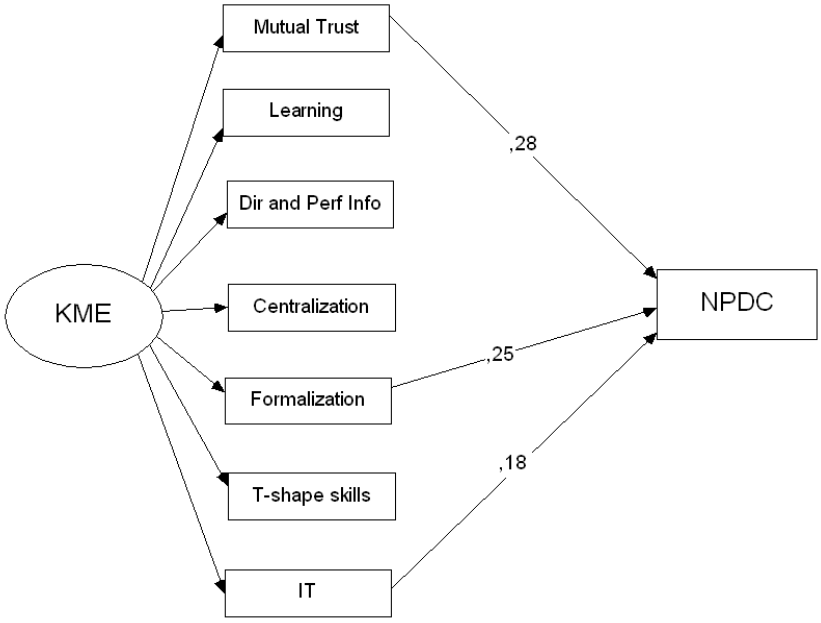


Figure 5.50 - Path Diagram for KM Enablers and NPD Capabilities

5.5.1.12 Path Analysis for KM Enablers and Perceived Company Performance

The proposed model had no direct relation with KM Enablers and Perceived Company Performance, hence, no hypothesis were developed for the correlation among them. However, path analysis showed that, there is such a relation. Three factors of KM Enablers, have positive relationships between them and Perceived Company Performance at 99.99% confidence level. Mutual trust, learning and formalization have relationships with both Qualitative Performance and Financial Performance. The path diagram for the model is displayed in Figure 5.51.

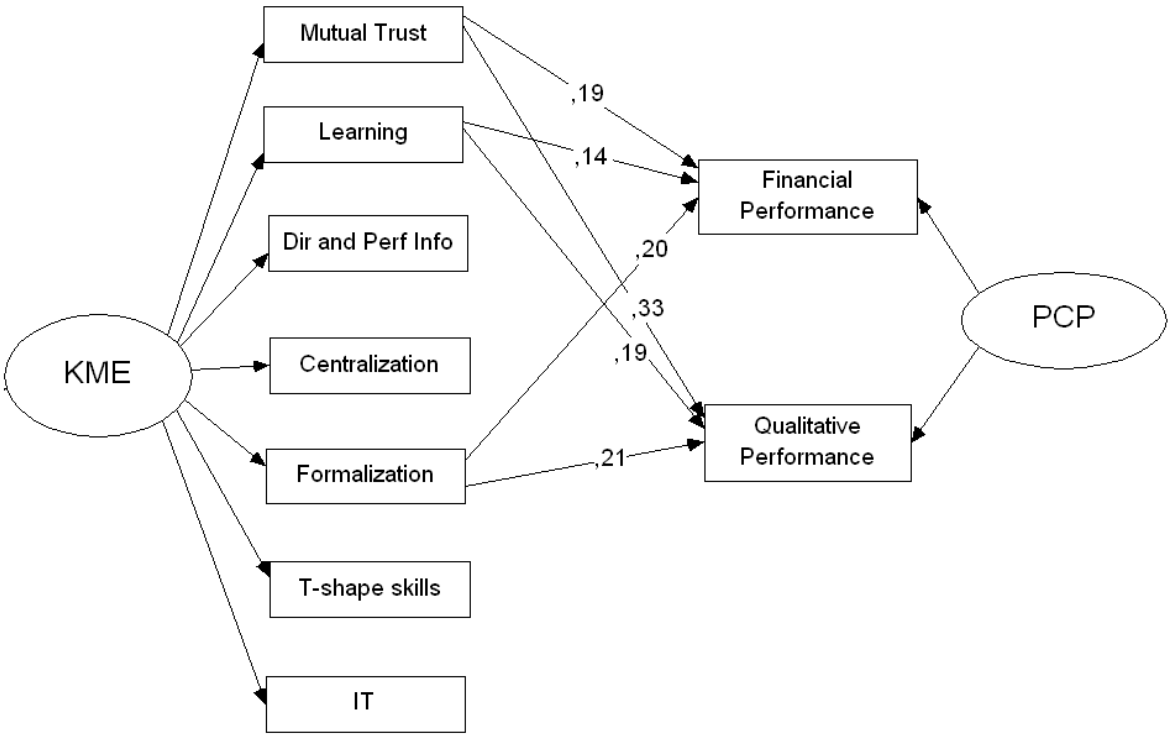


Figure 5.51 - Path Diagram for KM Enablers and Perceived Company Performance

5.5.1.13 Path Analysis for KCP and NPD Capability

It was hypothesized (Hypothesis 10) that KCP would positively affect NPD Capabilities. The results indicate positive relationships between factors of KCP and NPD Capability at 99.99% confidence level. Among four factors, socialization and combination have positive relationships at significant levels which are displayed in the path diagram in Figure 5.52 - Path Diagram for KC Process and NPD Capabilities. Finally, Hypothesis 10 is accepted for a and c.

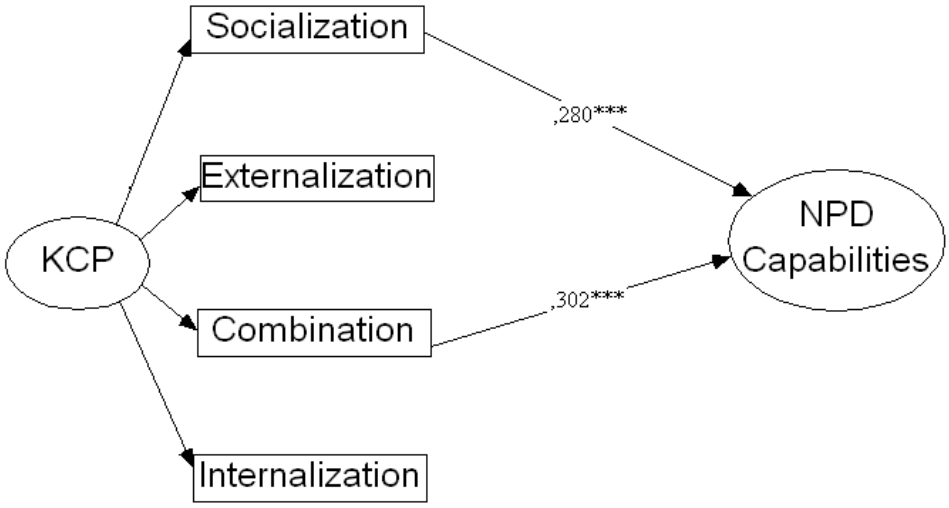


Figure 5.52 - Path Diagram for KC Process and NPD Capabilities

5.5.1.14 Path Analysis for KCP and Perceived Company Performance

The proposed model had no direct relation with KCP and Perceived Company Performance, hence, no hypothesis were developed for the correlation among them. However, path analysis showed that, there is such a relation. Two factors of KCP, to name them, socialization and combination have positive relationships between them and the two factors of Perceived Company Performance at 99.99% confidence level. Despite a standard regression analysis which checks if the proposed relations are valid or not, SEM analysis has the power to indicate new relations among variables. This is also true in this case, so the path diagram for the model is displayed in Figure 5.53.

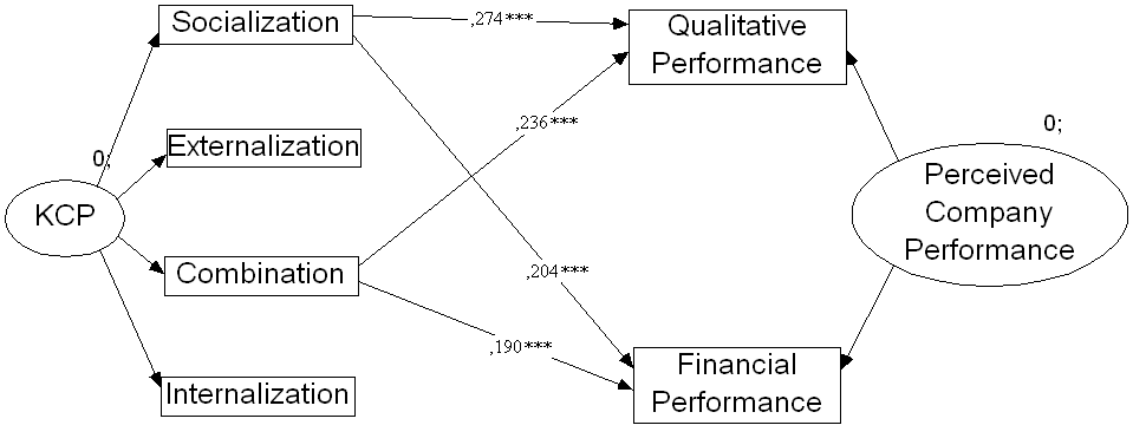


Figure 5.53 - Path Diagram for KC Process and Perceived Company Performance

5.5.1.15 Path Analysis for NPD Capability and Perceived Company Performance

It was hypothesized (Hypothesis 11) that NPD Capabilities would positively affect each component of Perceived Company Performance (Market Performance, Product/Service Performance, Financial Performance).

After factor analysis, the components of Perceived Company Performance were grouped in two factors: Financial Performance and Qualitative Performance. The results indicate positive relationships between NPD Capability and two factors of Perceived Company Performance at 99.99% confidence level. The path diagram for the model is displayed in Figure 5.54. Finally, Hypothesis 11 is accepted.

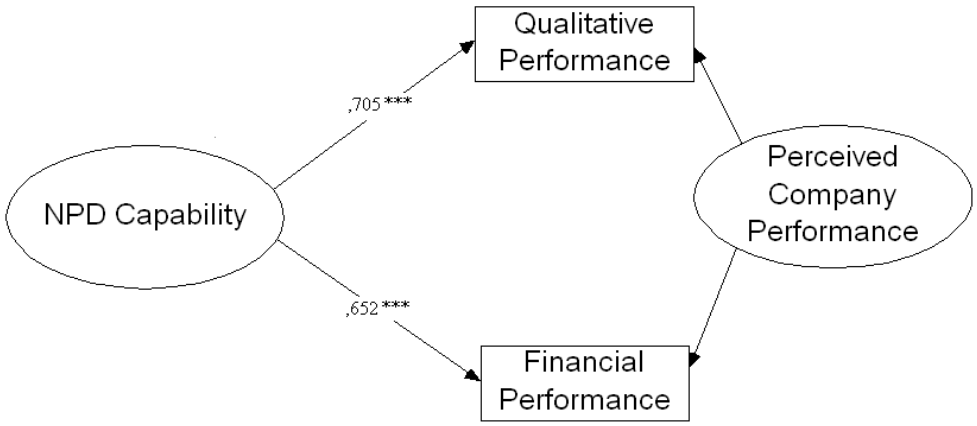


Figure 5.54 - Path Diagram for NPD Capability and Perceived Company Performance

5.6 SEM Models

5.6.1 The Draft Model

Path Analysis for each construct analyses the relationships within themselves. They were combined to form an overall model and this model is depicted in Figure 5.55 - SEM Model 1. The model had 188 variables with 85 of them observed variables and 103 unobserved variables. The number of exogenous variables was 89 and the number of endogenous variables was 99. For the computation of the degrees of freedom, number of distinct sample moments was 3,740 and number of distinct parameters to be estimated was 299, which give degrees of freedom 3,441.

When the model was run in AMOS, it consumed enormous computation power to do all iterations and prepare the output. The result for the default model was "*The model is probably unidentified. In order to achieve identifiability, it will probably be necessary to impose 31 additional constraints*". The model was unidentified, so no statistical *p* value for chi-square and degree of freedom could be calculated.

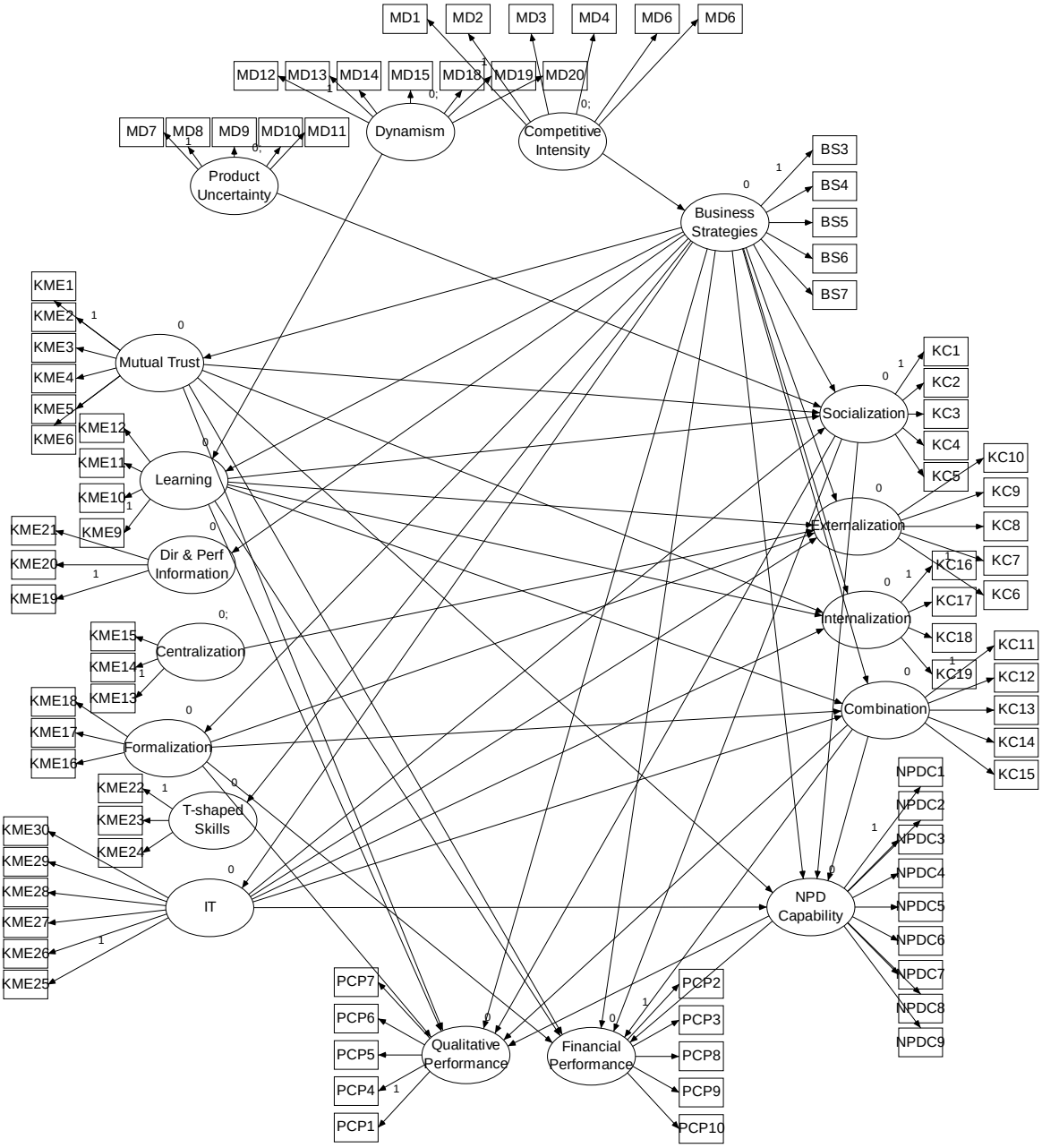


Figure 5.55 - SEM Model 1

5.6.2 Revised Models for SEM

As discussed in the previous chapters, an acceptable number of samples for any model are 10 for each variable. With 188 variables in the model, a minimum of 1880 valid responses for the instrument would be fine to make statistically reliable calculations. The sample size in this research is 294, and thus, either the number of responses should be increased or the model had to be simplified.

Instead of having each item and factors in the model as variables, constructs were taken as variables in the revised model. Then, the path diagram was formed in accordance with the values in Table 5.75 and the detailed model represented in Figure 5.56.

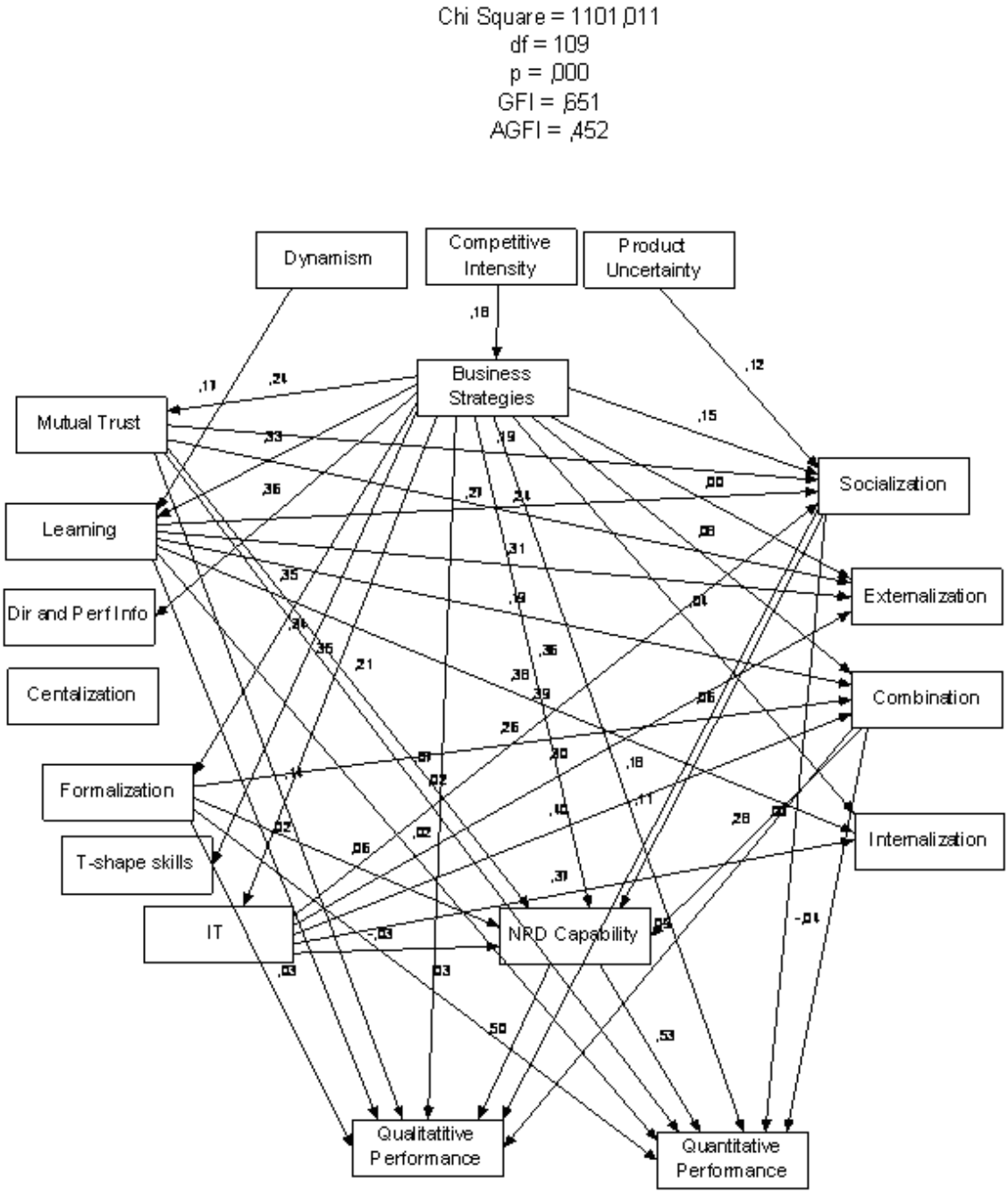


Figure 5.56 - SEM Model 2 – Constructs as Variables

Figure 5.56 depicts a regression model with 18 observed variables. When this model was run in AMOS, a local minimum was achieved with Chi-square value of 1,057.068 with degrees of freedom 100, and probability level 0.000. As *p* level is less than 0.05, the model was rejected to be a SEM model (Hair et al., 1998). This statistic shows that the

differences of the predicted and actual matrices are significant, indicative of non-acceptable fit. So, no need to check for the other goodness of fit indexes. It can be concluded that this model is not valid.

Achieving a minimum in AMOS indicates a statistical model which can be improved; hence, the output file was inspected for possible improvements in the model. The level of significance for regression weight was used as the key to eliminate any connections between two variables. In the regression weights table, all connections with a probability value more than 0.05 were dropped from the model. This p value in the regression weights table indicates the probability of getting a critical ratio as large as the indicated CR (Critical Ratio) value in absolute terms is less than the indicated p value. This can be also stated as; the regression weight for variable_1 in the prediction of variable 2 is significantly different from zero at the indicated *p* level (two-tailed). The simplified model is depicted in Figure 5.57.

Chi Square = 1114,251
df = 124
p = ,000
GFI = ,649
AGFI = ,517

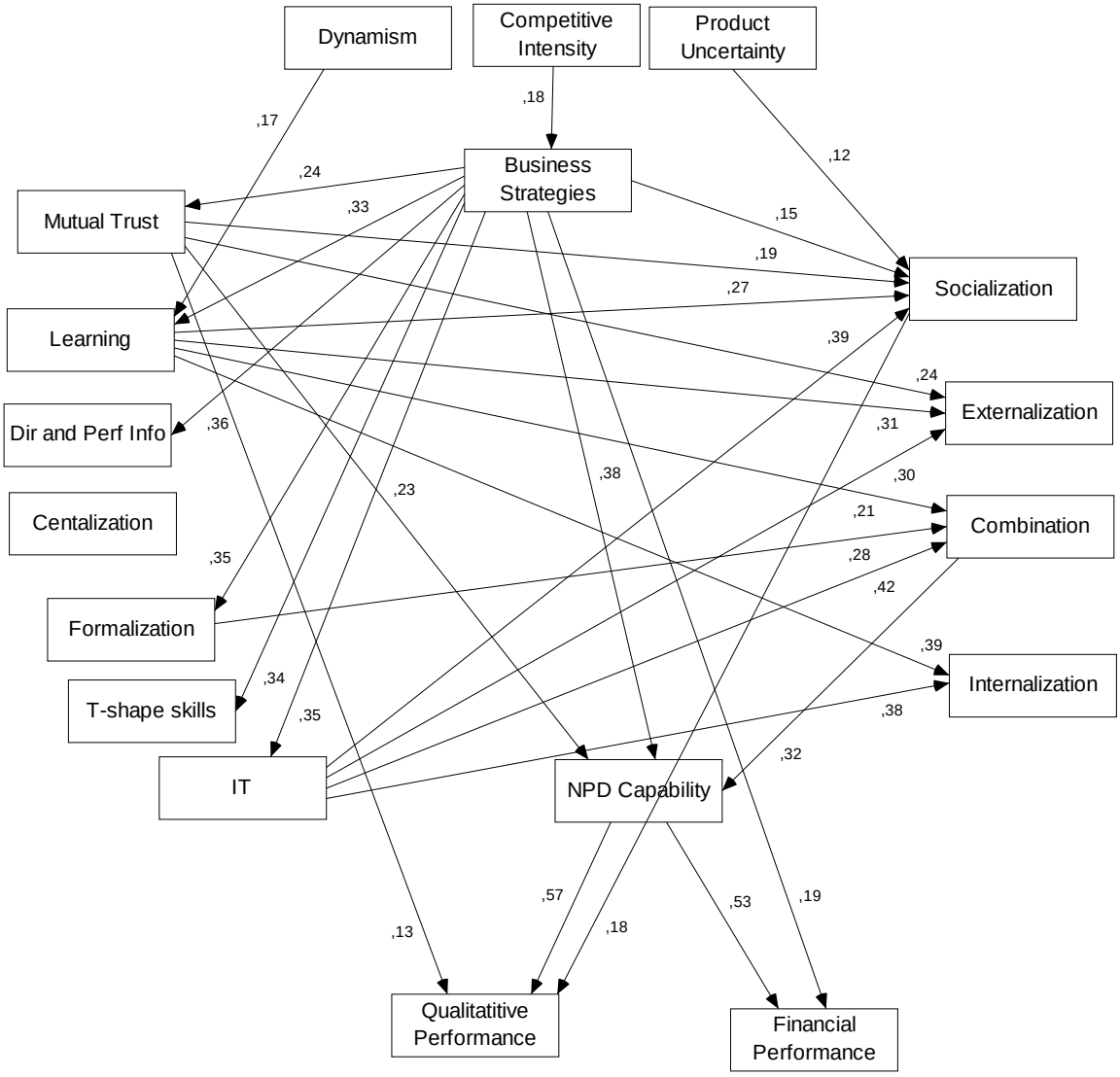


Figure 5.57 - SEM Model 3

When this model was run, minimum was achieved with a chi-square value of 951.623 and degrees of freedom of 85, with probability level = 0.000. As *p* level is not higher than 0.05 the model was rejected to be a SEM model.

5.6.3 The Accepted Model

AMOS has a feature named Modification Indices. The software computes a modification index for each parameter that is fixed at a constant value and for each parameter that is required to equal some other parameter. The modification index for a parameter is an estimate of the amount by which the discrepancy function would decrease if the analysis were repeated with the constraints on that parameter removed. The actual decrease that would occur may be much greater. We can rephrase this as: each time Amos displays a modification index for a parameter, it also displays an estimate of the amount by which the parameter would change from its current, constrained value if the constraints on it were removed.

AMOS computes modification indices not only for parameters that are explicitly constrained, but also for parameters that are implicitly assumed to be zero. For example, a modification index is computed for every covariance that is fixed at zero by default.

It also computes modification indices for paths that do not appear in a model, giving the approximate amount by which the discrepancy function would decrease if such a path were introduced. There are, however, two types of nonexistent paths for which Amos does not compute a modification index. First, Amos does not compute a modification index for a nonexistent path which, if introduced, would convert an exogenous variable into an endogenous variable. Second, Amos does not compute a modification index for a nonexistent path that, if introduced, would create an indirect path from a variable to itself where none already exists. In particular, Amos does not compute a modification index for a nonexistent path that, if introduced, would convert a recursive model to a non-recursive one.

The model was revised many times according to the modification indices results, while inspecting the regression weights table in order to determine any correlation which became obsolescence. The major modification done was to drop ‘Demand’ variable from Market Dynamism which let ‘Sector’ to be the only one that represents it. Thus, the name of this variable was changed to ‘Market Dynamism (Sector)’. In addition to this, the error terms for each group were correlated to each other as indicated in the Modification Indices. This

implies that, the environmental conditions for any variable were affecting the other variables in that group. There were no correlations between error terms of different groups. The revised model is displayed in Figure 5.58 - SEM Model 4 – The Accepted Model.

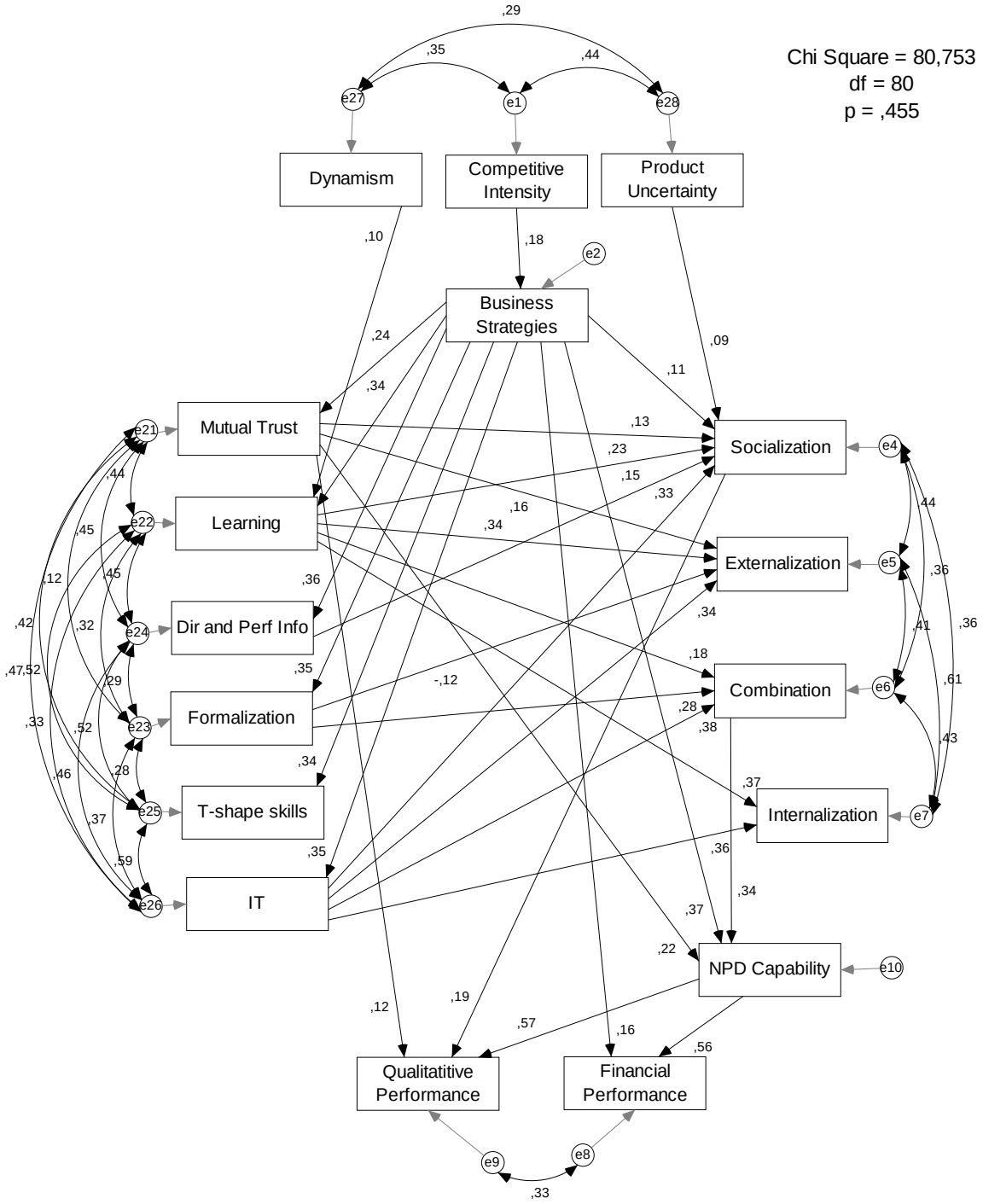


Figure 5.58 - SEM Model 4 – The Accepted Model

The model has a Chi-square value of 80.753 and degrees of freedom = 80, with probability level = 0.455. As *p* level is higher than 0.05, it was failed the reject to model. This statistic supports that the differences of the predicted and actual matrices are non-significant, indicative of acceptable fit.

The goodness of fit (GFI) has a value of 0,977 which is quite high, and adjusted goodness of fit (AGFI) has a value of 0,944 which is also quite high. The root mean square residual (RMSR) indicates that the average residual correlation 0,014, is very good as it is below 0,05.

The next type of goodness-of-fit measure assesses the incremental fit of the model compared to a null model. In this case, the null model is hypothesized as a single factor model with no measurement error. TLI (Tucker Lewis Index) and Normed Fit Index (NFI) are calculated based on the null model chi-square and degrees of freedom. TLI value 0,997 and NFI value 0,978 exceed the recommended level of 0,90, further supporting acceptance of the proposed model. CFI (Comparative Fit Index) is appropriate in a model development strategy or when a smaller sample is available (Rigdon, 1994). The value 0,999 which is very close to a perfect fit of 1.0. Lastly, the normed chi-square (chi-square/df) has a value of 1,055. This falls well within the recommended levels of 1.0 to 2.0.

It can be seen from Table 5.76 - Regression Weights for the Accepted Model that, all the connections between the variables are significant at 0,01 level. In the table, Estimate stands for *estimate of regression weight*. This means that, when Market Dynamism goes up by 1, Business Strategies goes up by 0.183. Column that has label SE stands for *Standard error of regression weight*. The regression weight estimate, 0.183, has a standard error of about 0.059. The next column is C.R. which is *Critical ratio for regression weight*. Dividing the regression weight estimate by the estimate of its standard error gives z = 0.183/0.059 = 3,087. In other words, the regression weight estimate is 3,087 standard errors above zero. The last column is P, which is *the level of significance for regression weight*. The probability of getting a critical ratio as large as 3,087 in absolute value is less than 0,01. In other words, the regression weight for Business Strategies in the prediction of Market Dynamism is significantly different from zero at the 0,01 level (two-tailed).

Table 5.76 - Regression Weights for the Accepted Model

			Standard Regression Weight	S.E.	C.R.	P
Business Strategies	<---	Competitive Intensity	0,177	0,059	3,087	**
Learning	<---	Dynamism	0,104	0,05	2,419	**
Socialization	<---	Uncertainty	0,093	0,034	2,641	**
Mutual Trust	<---	Business Strategies	0,236	0,057	4,165	***
Learning	<---	Business Strategies	0,343	0,063	6,302	***
Direction and Performance information	<---	Business Strategies	0,357	0,081	6,548	***
Formalization	<---	Business Strategies	0,350	0,055	6,401	***
T-shaped_skills	<---	Business Strategies	0,342	0,07	6,221	***
IT	<---	Business Strategies	0,348	0,06	6,352	***
Socialization	<---	Business Strategies	0,106	0,039	2,708	**
NPDC	<---	Business Strategies	0,369	0,041	8,133	***
Financial Performance	<---	Business Strategies	0,162	0,045	3,325	***
Socialization	<---	Mutual Trust	0,129	0,046	2,808	**
Externalization	<---	Mutual Trust	0,165	0,047	3,748	***
NPDC	<---	Mutual Trust	0,220	0,042	4,767	***
Qualitative Performance	<---	Mutual Trust	0,119	0,035	2,694	**
Socialization	<---	Learning	0,226	0,042	4,616	***
Externalization	<---	Learning	0,335	0,049	6,279	***
Combination	<---	Learning	0,184	0,046	3,761	***
Internalization	<---	Learning	0,369	0,051	7,299	***
Socialization	<---	Direction and Performance information	0,151	0,031	3,285	***
Externalization	<---	Formalization	-0,122	0,043	-3,04	**
Combination	<---	Formalization	0,280	0,048	6,35	***
Socialization	<---	IT	0,331	0,045	6,64	***
Externalization	<---	IT	0,339	0,053	6,169	***
Combination	<---	IT	0,378	0,05	7,556	***
Internalization	<---	IT	0,364	0,054	7,2	***
Qualitative Performance	<---	Socialization	0,191	0,036	4,208	***
NPDC	<---	Combination	0,340	0,039	7,254	***
Financial Performance	<---	NPDC	0,557	0,051	10,957	***
Qualitative Performance	<---	NPDC	0,567	0,039	12,643	***

*** p<0,001; ** p<0,01; * p<0,05

5.6.4 Analysis of Results

Model 4 is tested using Structural Equation Modeling as described above. Using SEM, the default model is tested first. As the default model could not pass the goodness of fit tests, the model is modified to reach a valid model. Considering Model 4 as the accepted model which had passed all of the goodness of fit tests, we will examine the hypothesis once more in the light of the relations in this model.

5.6.4.1 Hypothesis 1

It was hypothesized that Market Dynamism has a significant positive impact on Business Strategies. Market Dynamism was found to have three factors and among them competitive intensity has relationship which can be seen from Figure 5.58 . This relationship is also mentioned in Table 5.50 where the relationship has an estimation of regression weight of 0,177. To explain in a different way, one can say that when competitive intensity goes up by 1, Business Strategies goes up by 0,177. Table 5.50 also shows that the relationship between competitive intensity and Business Strategies is significant at 0,01. That means the probability of getting a critical ratio as large as 3,087 in absolute value is less than 0,01. In other words, the regression weight for competitive intensity in the prediction of Business Strategies is significantly different from zero at the 0,01 level (two-tailed). Since Market Dynamism has a positive impact on Business Strategies, ***we accept Hypothesis 1***.

5.6.4.2 Hypothesis 2

It was hypothesized that Market Dynamism has a significant positive impact on NPD Capability. As can be seen from Figure 5.58 which the relationships and their weights are also summarized in Table 5.50, there is no significant relationship between Market Dynamism and NPD Capability. So ***we reject Hypothesis 2.***

5.6.4.3 Hypothesis 3:

It was hypothesized that Market Dynamism has a significant positive impact on Perceived Company Performance. As can be seen from Figure 5.58 there is no significant relationship between Market Dynamism and PCP. So, ***we reject Hypothesis 3***.

5.6.4.4 Hypothesis 4

It was hypothesized that Business Strategies has a significant positive impact on KM Enablers. As can be seen from Figure 5.58, the relationships between Business Strategies and six factors of KM Enablers (mutual trust, learning, direction and performance information, formalization, t-shaped skills, and IT) have estimation of regression weights of 0,236; 0,343; 0,357; 0,350; 0,342; and 0,348 respectively. To explain in a different way, one can say that when Business Strategies goes up by 1, all the mentioned factors of KM Enablers goes up by the indicated values in the previous sentence respectively. Table 5.50 also shows that the relationship between Business Strategies and the six factors of KM Enablers are significant at 0,001. One can conclude that, the regression weights for Business Strategies in the prediction of six factors of KM Enablers are significantly different from zero at the 0,001 level (two-tailed). Since Business Strategies has a positive impact on KM Enablers, ***we accept Hypothesis 4***.

5.6.4.5 Hypothesis 5

It was hypothesized that Business Strategies has a significant positive impact on Knowledge Creation Process (KCP). As can be seen from Figure 5.58, the relationships between Business Strategies and one factor of KCP (socialization) has estimation of regression weight of 0,106. To explain in a different way, one can say that when Business Strategies goes up by 1, socialization goes up by 0,106. One can conclude that, the regression weight for Business Strategies in the prediction of socialization is significantly different from zero at the 0,01 level (two-tailed). Since Business Strategies has a positive impact on two factors of KCP, ***we accept Hypothesis 5***.

5.6.4.6 Hypothesis 6

It was hypothesized that Business Strategies has a significant positive impact on NPD Capability. As can be seen from Figure 5.58, the relationship between Business Strategies and NPD Capability has an estimation of regression weight of 0,369. To explain in a different way, one can say that when Business Strategies goes up by 1, NPD Capability goes up by 0,369. Table 5.50 Model shows that the relationship between Business Strategies and NPD Capability is significant at 0,001. That means the probability of getting a critical ratio as large as 8,133 in absolute value is 0,001. In other words, the regression

weight for Business Strategies in the prediction of NPD Capability is significantly different from zero at the 0,001 level (two-tailed). Since Business Strategies has a positive impact on NPD Capability, ***we accept Hypothesis 6***.

5.6.4.7 Hypothesis 7

It was hypothesized that Business Strategies has a significant positive impact on Perceived Company Performance. As can be seen from Figure 5.58, the relationship between Business Strategies and Financial Performance factor of Perceived Company Performance has an estimation of regression weight of 0,158. To explain in a different way, one can say that when Business Strategies goes up by 1, Financial Performance goes up by 0,162. Table 5.50 also shows that the relationship between Business Strategies and Financial Performance is significant at 0,001. That means the probability of getting a critical ratio as large as 3,325 in absolute value is 0,001. In other words, the regression weight for Business Strategies in the prediction of Financial Performance is significantly different from zero at the 0,01 level (two-tailed). Since Business Strategies has a positive impact on Financial Performance factor of **Perceived Company Performance**, ***we accept Hypothesis 7***.

5.6.4.8 Hypothesis 8

It was hypothesized that KM Enablers has a significant positive impact on Knowledge Creation Process (KCP). As can be seen from Figure 5.58, the relationship between factors of KM Enablers and factors of KCP have the following estimation of regression weights: mutual trust to socialization: 0,129; mutual trust to externalization: 0,165; learning to socialization: 0,226; learning to externalization: 0,335; learning to combination: 0,184; learning to internalization: 0,369; formalization to externalization: -0,122; formalization to combination: 0,280; direction and performance information to socialization: 0,151; IT to socialization: 0,331 IT to externalization: 0,339; IT to combination: 0,378; IT to internalization: 0,364. Table 5.50 also shows that the relationships between factors of KM Enablers and factors of KCP are significant at 0,01. Since factors of KM Enablers have significant impacts on KCP, ***we accept Hypothesis 8*** with a slight modification that, all impacts are positive except formalization to externalization which is negative.

5.6.4.9 Hypothesis 9

It was hypothesized that KM Enablers have significant positive impacts on NPD Capability. As can be seen from Figure 5.58, the relationship between one of the factors of KM Enablers, which is mutual trust and NPD Capability has an estimation of regression weight of 0,220. To explain in a different way, one can say that when collaboration goes up by 1, NPD Capability goes up by 0,220. Table 5.50 also shows that the relationship between mutual trust and NPD Capability is significant at 0,01. That means the probability of getting a critical ratio as large as 4,767 in absolute value is 0,001. In other words, the regression weight for mutual trust in the prediction of NPD Capability is significantly different from zero at the 0,01 level (two-tailed). Since mutual trust -one of the factors of KM Enablers- has a positive impact on NPD Capability, ***we accept Hypothesis 9***.

5.6.4.10 Hypothesis 10

It was hypothesized that KCP has a significant positive impact on NPD Capability. As can be seen from Figure 5.58 the relationship between one of the factors of KCP, which is combination and NPD Capability has an estimation of regression weight of 0,340. To explain in a different way, one can say that when combination goes up by 1, NPD Capability goes up by 0,340. Table 5.50 also shows that the relationship between combination and NPD Capability is significant at 0,001. That means the probability of getting a critical ratio as large as 7,254 in absolute value is less than 0,001. In other words, the regression weight for combination in the prediction of NPD Capability is significantly different from zero at the 0,01 level (two-tailed). Since combination -one of the factors of KCP- has a positive impact on NPD Capability, ***we accept Hypothesis 10***.

5.6.4.11 Hypothesis 11

It was hypothesized that NPD Capability has a significant positive impact on Perceived Company Performance (PCP). As can be seen from Figure 5.58, the relationships between NPD Capability and both factors of PCP (qualitative performance and -financial performance) have estimation of regression weights of 0,367 and 0,557 respectively. To explain in a different way, one can say that when NPD Capability goes up by 1, qualitative performance goes up by 0,567 and Financial Performance goes up by 0,557. Table 5.50 also shows that the relationships between NPD Capability and the two factors of PCP

(qualitative performance and Financial Performance) are significant at 0,001. One can conclude that, the regression weights for NPD Capability in the prediction of qualitative performance and Financial Performance are significantly different from zero at the 0,01 level (two-tailed). Since NPD Capability has positive impact on both factors of PCP, ***we accept Hypothesis 11***.

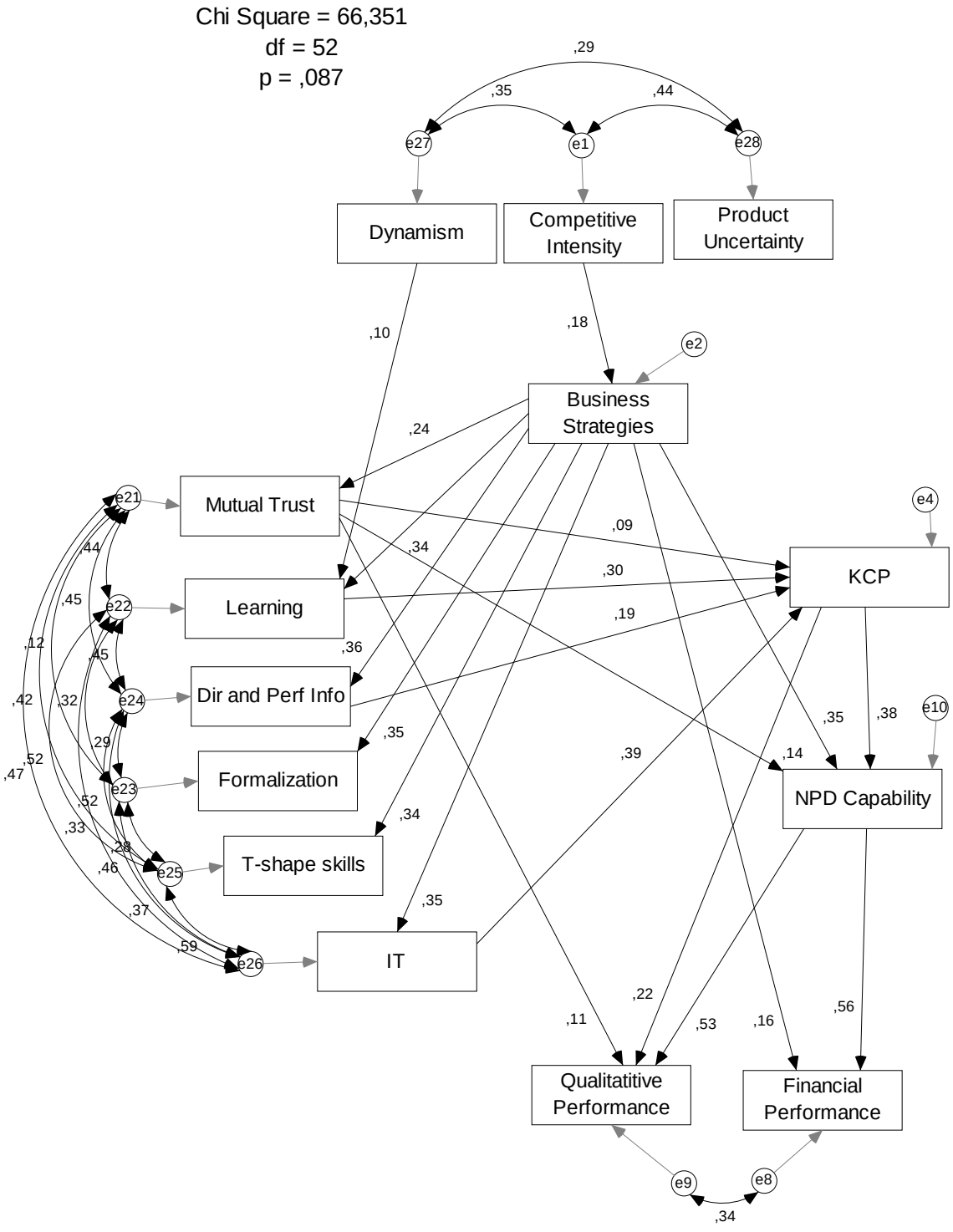
Table 5.77 Summary of results of hypothesis

Hypothesis	Result
1. Market Dynamism has a significant positive impact on Business Strategies	Accepted
2. Market Dynamism has a positive impact on NPD Capability	**Rejected**
3. Market Dynamism has a positive impact on Perceived Company Performance.	**Rejected**
4. Business Strategies have a significant positive impact on KM Enablers	Accepted
5. Business Strategies have a significant positive impact on Knowledge Creation Process	Accepted
6. Business Strategies have a significant positive impact on NPD Capability	Accepted
7. Business Strategies have a significant positive impact on Perceived Company Performance	Accepted
8. Knowledge Management Enablers have a significant positive impact on Knowledge Creation Process for all of its factors	Accepted
9. Knowledge Management Enablers have a significant positive impact on NPD Capability for all of its factors	Accepted
10. Knowledge Creation Process has a significant positive impact on NPD Capability, for each of its factor	Accepted
11. NPD Capability has a significant positive impact on Perceived Company Performance.	Accepted

5.6.5 Further analysis towards a plain model.

A plain model is better than a complicated one especially for managers to apply in the real world. Even though, the final model in Figure 5.58 is analyzed in details in the previous sections, further analysis on the model was done in Amos to reach a possible plain model.

Model 4 is revised by accepting all KCP factors as one variable. Hence, all the value for the new variable is calculated as the average values of the four factors. The new model is depicted in Figure 5.59. This model has a chi-square value of 66,351 with degrees of freedom of 52. As the probability level is 0,087, we can conclude that it is failed to reject the model.



5.59 SEM Model 4b - In search for a plain model

Further simplications are done for each of Market Dynamism, KME, and PCP. The values for them are calculated as the average values of their factors. The model is depicted in Figure 5.60. This model has a chi-square value of 8,845 with a degrees of freedom of 6. As the probability level is 0,183, we can conclude that it is failed to reject the model. Assuming the appropriate distributional assumptions to be met, if the specified model is correct, then the value 0,183 is the approximate probability of getting a chi-square statistic as large as the chi-square statistic obtained from the current set of data (8,845). It can be also phrased as; the departure of the data from the model is insignificant at the 0.05 level. Other statistical indices confirm the fitness.

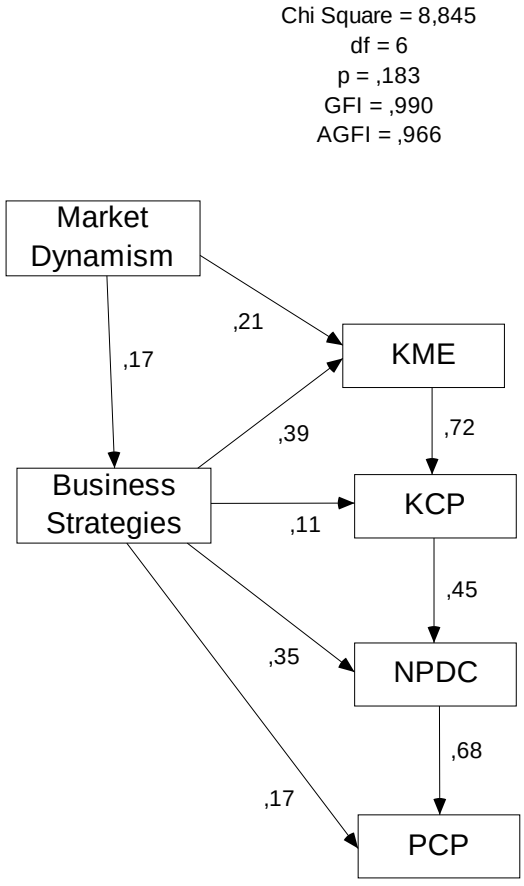


Figure 5.60 - SEM Model 5 – A Plain version of the Accepted Model

The goodness of fit (GFI) has a value of 0,990 which is quite high, and adjusted goodness of fit (AGFI) has a value of 0,966 which is also quite high. The root mean square residual (RMSR) indicates that the average residual correlation 0,040, which is less than 0,05 and indicates a close fit of the model in relation to the degrees of freedom.

The next type of goodness-of-fit measure assesses the incremental fit of the model compared to a null model. In this case, the null model is hypothesized as a single factor model with no measurement error. TLI (Tucker Lewis Index) and Normed Fit Index (NFI) are calculated based on the null model chi-square and degrees of freedom. TLI value 0,991 and NFI value 0,989 exceed the recommended level of 0,90, further supporting acceptance of the simplified model.

CFI (Comparative Fit Index) is appropriate in a model development strategy or when a smaller sample is available (Rigdon, 1994). The value is 0,996 which is very close to a perfect fit of 1.0. Lastly, the normed chi-square (chi-square/df) has a value of 1,474. This falls within the recommended levels of 1.0 to 2.0. It can be seen from Table 5.51 that, all connections between the variables are significant at 0,01 level.

Table 5.78 - Regression Weights for the Plain Model

			Standardized Regression Weights	S.E.	C.R.	P
Business Strategies	<---	Market Dynamism	0,168	0,076	2,922	**
KME	<---	Market Dynamism	0,207	0,057	3,947	***
KME	<---	Business Strategies	0,387	0,043	7,39	***
KCP	<---	Business Strategies	0,109	0,04	2,694	**
NPDC	<---	Business Strategies	0,351	0,043	7,403	***
PCP	<---	Business Strategies	0,175	0,035	4,097	***
KCP	<---	KME	0,724	0,048	17,814	***
NPDC	<---	KCP	0,449	0,044	9,487	***
PCP	<---	NPDC	0,681	0,039	15,985	***

*** p<0,001; ** p<0,01

5.7 Interpretation of Results

The present research is based on Lee and Choi (2003). The similarity between Figure 2.16 (Lee and Choi, 2003) and Figure 5.60 is depicted in Figure 5.61. The regression results between the variables are provided in Appendix 10.

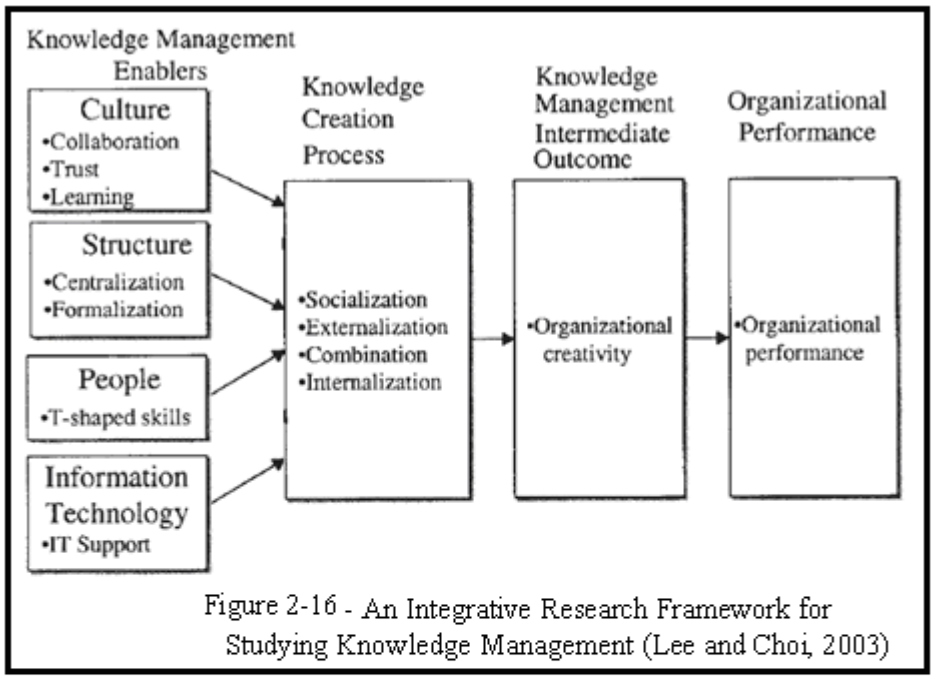
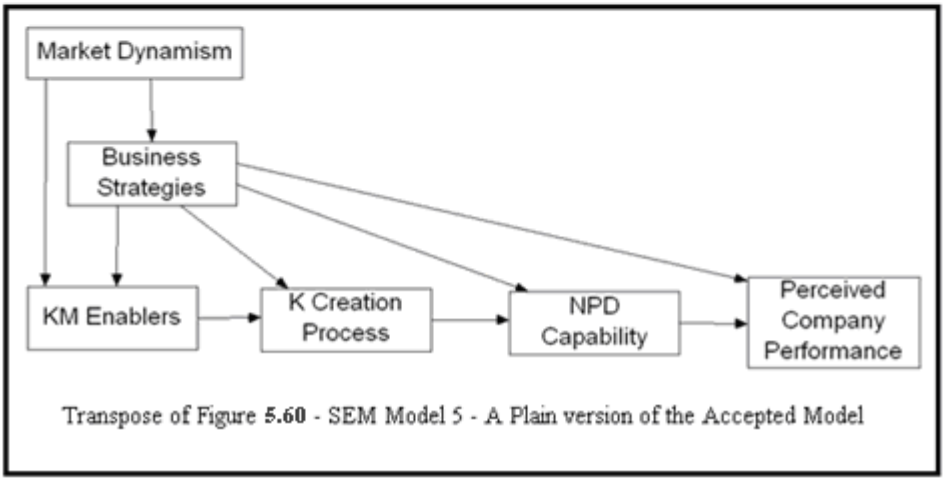


Figure 2-16 - An Integrative Research Framework for Studying Knowledge Management (Lee and Choi, 2003)



Transpose of Figure **5.60** - SEM Model 5 - A Plain version of the Accepted Model

Figure 5.61 - Visual Comparison of Research Models

The relations between the constructs are depicted in the following two figures for visualization purposes, which are also interpreted in details in the following paragraphs.

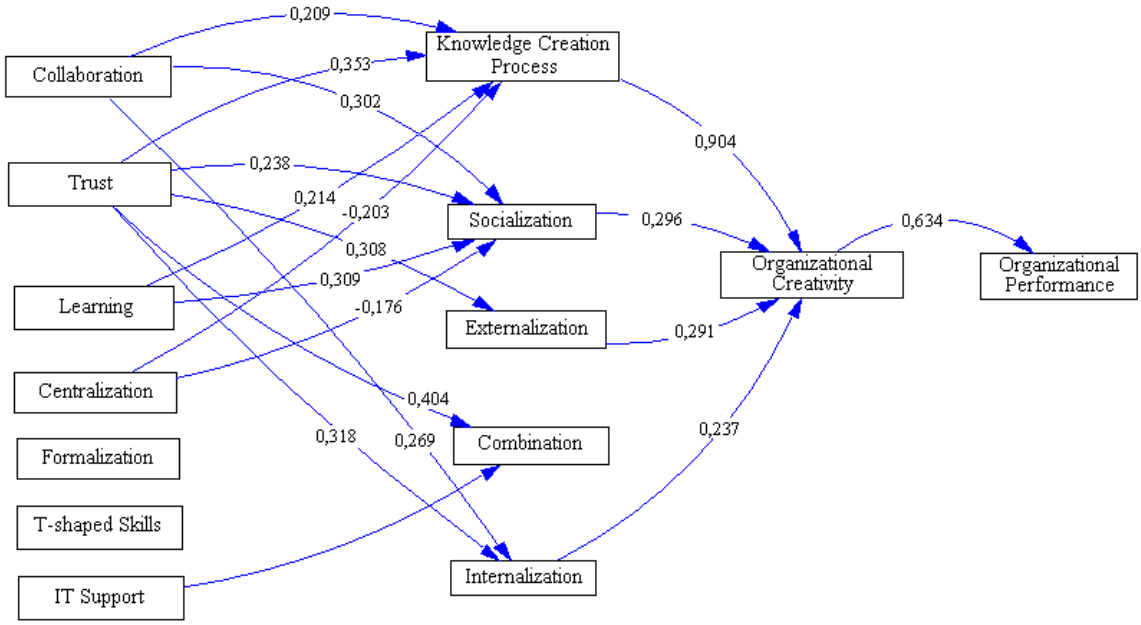


Figure 5.62 - Significance Relationships in Regression Results of Lee and Choi (2003)

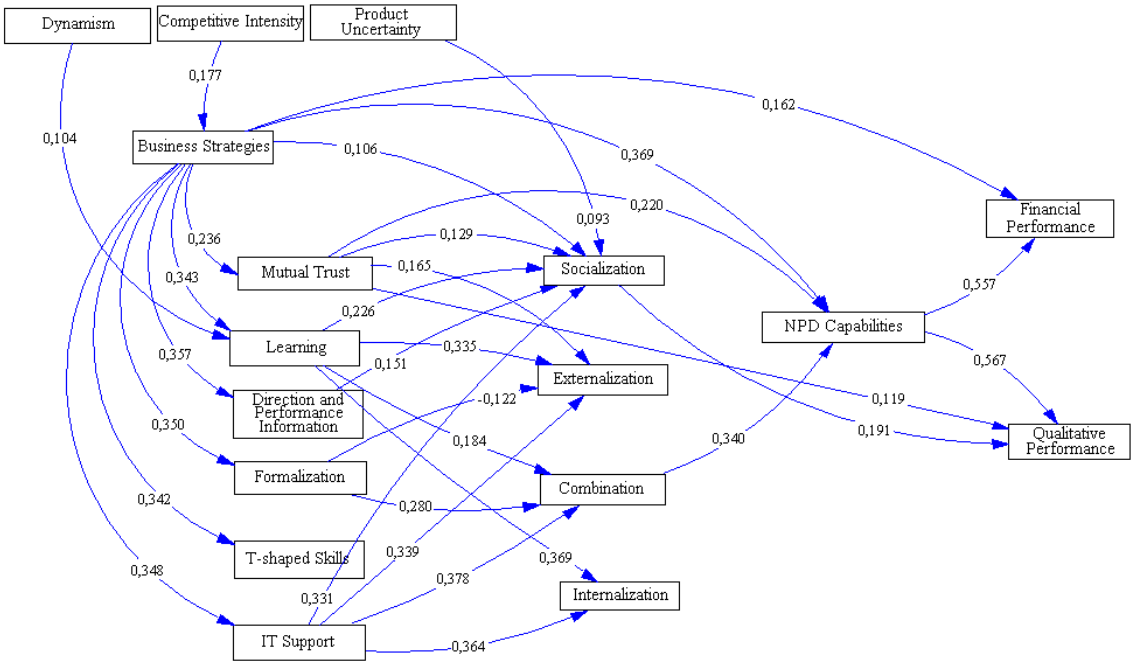


Figure 5.63 - Significance Relationships in Regression Results of the Research Model

In general KM strategies are applied in two dimensions (Hansen et al, 1999). The first one is interpersonal interaction while the second one is the capability to help create, store, share, and use an organization's explicitly documented knowledge. First one is more affected by socialization and the second one is more affected by combination (Choi and Lee, 2002). Managers can take into considerations of the findings of this research to improve KM capabilities of their companies on the basis of enablers highlighted in this research.

It is evident that Market Dynamism is associated with Business Strategies at a moderate impact which is parallel to the assumptions made at the proposed model. One factor of market dynamism which is *competitive intensity* has a relationship with business strategies (0,18). *Dynamism* has relationship with *learning* (0,10) and *product uncertainty* has relationship with *socialization* (0,09) which was not predicted in the proposed model.

The findings confirm that Business Strategies are associated with KM Enablers, such as *mutual trust* (0,24), *learning* (0,34), *direction and performance information* (0,36), *formalization* (0,35), *t-shaped skills* (0,34), and *IT* (0,35). Business Strategies has relationships also with *socialization* (0,11), NPD Capability (0,37) and *financial performance* (0,16). In the plain model (SEM model 5), the relationships are more clear which are 0,39 with KM Enablers; 0,11 with Knowledge Creation Process; 0,35 with NPD Capability; and 0,17 with Perceived Company Performance. The findings of the research confirm that, knowledge creation is associated with cultural factors such as *mutual trust, learning,* and *direction and performance information,* with structural factor *formalization*, and with technological factor *IT*. The regression weights among these variables are given in the following table.

Table 5.79- Regression Weights between KM Enablers and KC Process

	Socialization	**Externalization**	**Combination**	**Internalization**
Mutual Trust	0,13	0,16		0,22
Learning	0,23	0,34	0,18	
Direction and Performance Information	0,15			
Formalization		-0,12	0,28	
IT	0,33	0,34	0,38	0,36

Shaping cultural factors is important for companies to manage their knowledge effectively (Lee and Choi, 2003). Groups are more creative when their members cooperate, and stop holding when they have *mutual trust* (Huemer et al, 1998 cited in Lee and Choi, 2003). *Learning* plays the key role in culture, and focusing on *learning* has impact on all four factors of KC Process. The major impact of *learning* is on *internalization*, and as *internalization* refers to creation of new tacit knowledge from explicit knowledge, covering the term *learning*; this is most expected.

Direction and performance information has relation with only *socialization*. This association has a base in literature where; goals, metrics, plans, and milestones are intended to create shared understanding about standards and targets (Weick, 1995). They focus employees' attention, and motivate higher levels of performance (Locke and Latham, 1990). They can make employees aware of the areas and levels of performance required for market success and may lead to seeking out knowledge and trying new approaches that allow product and process breakthroughs and continual improvement (Mohrman et al, 2003).

Formalization is associated with *externalization* and *combination*. This confirms the literature as Galbraith (1973) indicated that *formalization* may increase the level of certain types of information processing and Daft and Lengel (1986) argued that it also increase information use. *Formalization* is found to be negatively associated with *externalization* (-0,12). This is also in alignment with literature as Jarvenpaa and Staples (2000) discussed that *formalization* using less flexibility and less emphasis on work rules usually restricts new ideas. In NPD projects, this formal situation asphyxiates the communication and interaction necessary to create knowledge. Therefore, a lack of formal structure tends to enable NPD members to communicate and interact with one another to create knowledge.

These results are parallel to the findings of Lee and Choi (2003), although they had done their interpretations based on β values that are not statistically significant. "*According to the ambidextrous model, which is based on the distinction between the initiation and implementation stages of innovation, formalization may inhibit tacit-related activities such as socialization (β = –0.052) and externalization (β = –0.1165), but may encourage explicit-related activities such as combination (β = 0.0018) and internalization (β =*

0.1152).”

The KM literature has focused on IT tools and their potential to support collaboration among people with different knowledge bases; to enable knowledge access and sharing including connections to company experts; and to disseminate generic and codified knowledge, including algorithms and systematic work processes that embody the knowledge of the firm (Mohrman et al, 2003). Defined in terms of these potentialities, high quality IT is expected to foster working in a way that takes an expanded focus and draws in more knowledge which all supports the impact of *IT* on KM Enablers. Also, groupware, intranet, or videoconferencing can help collaborative works (Howells, 2000). It is evident from the regression values in that, *IT* is the most influencing KM Enablers factor on Knowledge Creation Process. Although there was only one relation between *IT* and *combination* in the original research (Lee and Choi, 2003), the difference could be resulted from the sector that this research is done, as it is expected *IT* to have a more important role on the model. Still, similar to the original research, the highest relation is with *combination*. Many knowledge management project in real life, focus on *IT* (Davenport and Prusak, 1998). Still, initiating knowledge management only through *IT* can be a risky proposition, so successful information systems should be supported by cultural factors such as learning (Stein and Zwass, 1995).

Despite of many studies in the literature which suggested that *T-shaped skills* influence knowledge creation positively (Leonard-Barton, 1995; Madhavan, and Grover, 1998; Johannenssen et al, 1999; cited in Lee and Choi, 2003), this research shows no relationship between *T-shaped skills* and knowledge creation. This result is similar to the original research. The reasons for such a result may arise from the T-shaped management systems as well as the focus group that the research was applied. T-shaped management systems are against the traditional corporate hierarchy and encourage employees to share knowledge (Hansen et al, 1999). If there is no appropriate environment provided for *T-shaped skills* to flourish, people with *T-shaped skills* will not attempt to create new knowledge (Lee and Choi, 2003). We can conclude that, *T-shaped skills* are not definite element of successful knowledge management, but systematic management of these skills is crucial.

There is a high association between business strategies and NPD Capabilities which is parallel to what was hypothesized. The literature on knowledge management has demonstrated that the integration of information from past related projects is an important contributor to new product performance (Sherman et al, 2005). In this research, *mutual trust* found to have a moderate (0,22) effect on NPD Capabilities supports this finding as mutual trust is crucial for sharing the knowledge acquired from past experiences.

Previous studies on knowledge management have demonstrated that the effective retrieval of information influences NPD performance (Lynn, Reilly, and Akgun, 2000) which is parallel to the finding that combination has a high relationship with NPD Capabilities.

Table 5.80 - Regression Weights between PCP and Others

	Business Strategies	Mutual Trust	Socialization	NPD Capabilities
Qualitative Performance		0,12	0,19	0,57
Financial Performance	0,158			0,56

Competitiveness in today's global knowledge economy demands that the firm have organizational competencies along multiple dimensions (Galbraith and Lawler, 1998), including cost, quality, productivity, customer focus, speed, innovation, technical excellence and financial performance (Mohrman et al, 2003). The relationships between Perceived Company Performance and other variables are presented in Table 5.80. It is evident that, the highest association is with NPD Capabilities. As Perceived Company Performance is analyzed in two factors, *qualitative performance* and *financial performance,* there are other variables that affect these two factors. *Mutual trust* is the only KM Enabler that has a relationship with this factor. Among KC Process, *socialization* has positive association. The only variable that has an effect on financial performance other than NPD Capabilities is Business Strategies.

The major critics to the original model proposed by Lee and Choi (2003) is that, although knowledge creation processes are accepted as constructs and entered to the model as variables, *Knowledge Creation Process* is added as an additional variable. This hinders to see the exact relationships between constructs of KCP and others.

6 CONCLUSION

The final chapter summarizes the entire study by giving a brief overview of the research according to the chapters, focusing on the essence and the main results of each chapter. The final integrated framework depicting the building blocks of impact of knowledge management on new product development and perceived company performance will be presented.

Additional key findings of the study are presented according to their methodological, theoretical and practical significance. The strengths and limitations of the study are discussed while possible future research is highlighted. Recommendations will be made and finally some concluding thoughts will be shared in closure of this dissertation.

6.1 Brief Overview of Study

This study confirms and improves a relatively new framework which proposes a link between knowledge management enablers (KME) and knowledge creation process (KCP) and their impact on perceived company performance (PCP). The proposed model is an integrative view of knowledge management (KM) and is adopted from a process-oriented perspective of knowledge by using the creation model of Nonaka (1994). The original framework proposed by Lee and Choi (2003) is used as a stepping stone for this empirical research and is improved by applying additional conditions of business strategies (BS) and market dynamism (MD) with and intermediator new product development (NPD) capabilities.

This research contributes to business, as relationships among KME, and KCP provides some clues as to how firms should apply these KM components to achieve better NPD capabilities and higher company performance with the detailed information on which enablers are critical for knowledge creation. It is on firm’s capability to define strategies on managing the appropriate KME and modes of knowledge creation that contributes to them more.

The first chapter was Introduction which contextualized this study for the reader, with the research questions (page 19) as the core of the chapter. The researcher posed research

questions both on practical and theoretical (literature) level. The theoretical research questions yielded the information that formed the core of the conceptual framework, while practical part served to enrich the conceptual framework with appropriate additions.

The second chapter was Literature Review that served to inform the reader on the importance and need of knowledge management on new product development substantiated by different viewpoints in literature. The concept clarification created ultimately a common understanding and definition of knowledge management enablers, knowledge creation process, new product development and perceived company performance.

The third chapter was Research Model Development and operationalized the model in a conceptual way. In spite of the previous studies which had linear relations among consequent variables, the model which represented in Figure 3.7 was build up on a pie diagram which was depicted in Figure 3.5. As pie was not completed circles, the model enabled for further studies for enhancing by completing the missing parts of the pie with new constructs.

The fourth chapter was Research Design and Methodology, reported on the research design and approach, as well as the pilot study in details. Detailed information about Structural Equation Modeling (SEM), sampling, and the software Amos, that was used for SEM was introduced briefly.

The fifth chapter was Research Findings, which contained the empirical findings of this study based on the research questions posed in chapter one. Detailed analysis of the model with SPSS and Amos enabled to do both explanatory and confirmatory analysis. The information that emerged from the data provided the researcher to form a new model regarding the proposed one with more details of interactions within the variables (Figure 5.58).

6.2 Discussion of Results

This research has been investigating the following research and management questions:

RQ1: What is the relationship between the knowledge management capabilities of a firm and its performance?

RQ2: What are the parameters that influence performance of a firm through new product development?

MQ1: Should managers reserve some of their resources for knowledge management?

MQ2: Which factors of knowledge management are affecting the company performance through new product development capabilities?

The first question is explored in literature review first, and then constructs are analyzed in details in research design and methodology. There are five constructs in KM Enablers which are culture (collaboration, trust, learning, participating in boundary spanning structures, direction and performance information), two in structure (centralization, formalization), one in people (t-shaped skills), and two in technology (IT quality, IT support). KM Enablers were assumed to affect New Product Development Capability through Knowledge Creation Process (socialization, externalization, combination, internalization).

The second question is analyzed through an extensive search on literature. The proposed model is conceptualized by referring to the previous studies in literature, mainly on the model developed by Lee and Choi (2003) that seeks the relationship between KM Enablers and Knowledge Creation Process, and their impact on organization performance is applied with improvements. The quantitative research which was done with an instrument aimed a population of 150.000 IT sector employees. A web based questionnaire with 123 items is used as the tool that reached via mail to a wide group that resulted in 1.336 direct responses, where among them 70.5% which makes a total of 942 started on answering the items. There exist 648 responses uncompleted which result a sample group of 294 people

(22%) who completed the survey from 93 different companies.

Third question depends on the findings to the fourth question. The data collected via the instrument are evaluated first in SPSS 16.0 and several statistical tests are applied. In order to check the significance and strength of the relationships, non-parametric measures of association is used with Cramer's V. Factor analysis was applied to reduce raw data. In order to avoid collinearity, determinant value is observed. During factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's Tests were applied. Reliability analysis for each scale of the constructs consisting of remaining items was performed with Cronbach's alpha.

To test the validity, the draft model derived from the path analysis is fed into Amos 16.0, however the result is unidentified. Amos 16.0 is used as a powerful tool to explore the draft model into a fitting one. After revising the model several times, 'accepted model' is achieved which shows a perfect fit in terms of all required goodness of fit tests of structural equation modeling. The analysis is further improved to obtain a simplified model. The plain version of the accepted model fits better to compare the original model proposed by Lee and Choi (2003).

KM Enablers has a strong relationship with Knowledge Creation Process, where in details, there are slight differences between the two researches:

a. Factor analysis resulted in combining collaboration and trust together which then named mutual trust. They were two separate constructs in the original model.
b. Learning has relationship with all constructs of Knowledge Creation Process, rather than having relationship only with socialization.
c. Centralization is found to have no relationship with Knowledge Creation Process, while formalization does have, which are on contrary to the original model.
d. IT has relationship with all four constructs of Knowledge Creation Process, rather than having relationship only with combination.

These differences are most probably to occur on the sample group that the research is based. There are major differences in country, industry and even the life cycle of respondents. The original research was applied to Korean companies in manufacturing,

service and financial business sectors; while this study covers IT companies in Turkey.

The mediator between Knowledge Creation Process and organizational performance is accepted to be NPD instead of organizational creativity. Similar to the original research, this study found a significant and strong relationship between them.

Instead of organizational performance, perceived company performance is used in this research, as all the information gathered about the performance of the firm are subjective evaluations based on the perceptions of the sample group. Another difference from the original model is that, the company performance is found to be measured in two different constructs: qualitative performance and financial performance. The first one focuses on product/service quality, speed, and flexibility; while financial performance focuses on return on assets and sales, and general profitability of the firm. Finally, NPD has a strong relationship with PCP which shows a similar result with the original research.

In addition to these similarities and differences that are highlighted in the findings, there exist additions to the original model. Market Dynamism and Business Strategies are included in the model to have a better understanding of the internal strategies of the firm and the environmental factors. The results depict moderate relationships between dynamism and learning (0,10), uncertainty and socialization (0,09) and competitive intensity and business strategies (0,18). However, the relationships between business strategies and constructs of KM Enablers are very high (page 269). This makes a considerable contribution and improvement to the original model.

This model displays all the relevant relations among constructs, regardless of their groups and thus is more powerful than the original proposed model which has only linear relations. SEM Model 5 shows that business strategies have relationship with all others. SEM Model 4 – the accepted model depicts the relationships of all constructs in details e.g. mutual trust has relationships with NPD Capabilities and qualitative performance in addition to socialization and externalization.

The result to first managerial question is simply, ‘yes managers should reserve some of their resources for KM’. The relationship that has been highlighted among KM Enablers,

knowledge creation and perceived company performance provides enough clues as how firms can adjust Knowledge Creation Process to sustain their performance. This study provides further details on which enablers are critical for knowledge creation that covers full answer to the second management question. Having in mind the limited resources for any company, the managers should seek for sound strategies to manage which knowledge creation modes they should focus on.

6.3 The Significance of the Study

The theoretical significance of this study lies in the fact that the empirical evidence showed a close resemblance to the results of the literature review. The interactions between KM Enablers and Knowledge Creation Process were confirmed in addition to the relation between NPD Capabilities and Perceived Company Performance. The relationships between Market Dynamism, Business Strategies, KM Enablers, Knowledge Creation Process and NPD Capabilities were identified during the empirical research which was supported by the literature review and they all contributed to literature by the results of empirical analysis.

The method used in this research consists of both explanatory and confirmatory analysis which were done by the help of statistical software SPSS 16.0 and Amos 16.0. SEM analysis opened up various research opportunities in addition to the empirical results it yielded. The method ensured that the researcher analyzed the data shared by the participants to explore new relations within constructs other than the ones provided in the proposed method. If only SPSS analysis were run, the initial model proposed in Fig. 3.6 would have been analyzed ignoring the cross relations within constructs. Furthermore, analysis with Amos seems to be an easy tool for SEM that enables to analyze different models with consequently while providing modification indices which helps up to improve the model.

The practical significance of the findings lies in the fact that the conceptual framework depicting the relationship between knowledge management and perceived company performance is practical. The framework was based on literature review and the model was tested on IT professionals. Furthermore, depending on the strength of relations among the

constructs, the model seems to be applicable to other industries in addition to Information Technologies.

6.4 Strengths and Limitations of the Study

The objective of this study is achieved as the research questions are answered. Impact of KM on NPD and company performance are identified and confirmed by SEM analysis. The instrument applied had strong bases which different sections are applied at different researches where consistency is granted for them. The research design and methods chosen ensured alignment between the proposed and confirmed model in addition to the dissemination in the IT professionals as a major portion of them are assumed to be reached via emails even if most of them did not responded to the instrument. Therefore, the method is applied effectively from a business perspective. The researcher believes that both the confirmed model and the simplified model can be referred not only by academicians but also by managers in any kind of organizations for practical consequences.

Although the researcher found so many literatures on the main constructs of the research, quantitative analysis done by SEM were very limited. The extensive research which had been done separately on knowledge management, new product development and company performance, shall be handled again and again as they are all ongoing issues. This cross-sectional study was a picture of a static point in time. So, similar studies in a longitudinal format are required to go deeper in this area of research.

Although it was adequate for this research, it would be better to have higher number of responses for the instrument applied for SEM analysis. This would help any future research to validate the Accepted Model once more.

This study focused only on IT sector, where applications in different industries will investigate the dynamic features of knowledge management and new product development further. Finally, the results are limited to Turkish firms or foreign firms operating in Turkey. It is required to do similar research in different countries to check the consistency of the confirmed model.

6.5 Suggestions for Future Research

Future research will have theoretical, methodological and practical value from an integrated point of view. This research can be improved by applying the same instrument to a broader participant group to validate the results. This might be other sectors in the same country or in other nations which will enable the researcher to evaluate effects of cultural differences or business dynamics on knowledge management enablers. Different factors of enablers or other types of knowledge process can be applied which might yield to interesting implications. More constructs of business strategies can be involved in the research which measures internal strategies as well as external ones. Finally, additional constraints other than business strategies can be involved in the research to have a broader cause and effect perspective of the system.

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8 APPENDIX

Appendix 1 - Pilot Questionnaire in Turkish

I. BÖLÜM – KURUM BİLGİLERİ

K01. Anket no:

K02. Firmanızın tam ünvanı nedir? _____

K03. Firmanızın kuruluş yılı nedir? _____

K04. Firmanızın ana faaliyet alanını öğrenebilir miyiz? *(birden fazla işaretleme yapabilirsiniz)*

☐ Yazılım ☐ Donanım ☐ Danışmanlık ☐ Çözüm ortaklığı ☐ BT Altyapı sağlayıcılığı

☐ Diğer _____

	2005	2006	2007
K05. Firmanızda toplam çalışan sayısı kaçtır?			
K06. Firmanızın cirosu nedir? (*YTL, Euro, $*)			

Firmanızın **kendi algılamanıza** göre pazar büyüklükleri ve paylarını belirtiniz	2005	2006	2007
K07. Ana faaliyet alanının Türkiye'deki Pazar büyüklüğü (*YTL, Euro, $*)			
K08. Firmanızın ana faaliyet alanı için yurt içi pazar payı (%)			
K09. Sektördeki en büyük firmanın ana faaliyet alanınız için yurt içi pazar payı (%)			

K10. Firmanız bir aile şirketi olarak nitelendirilebilir mi? ☐ Evet ☐ Hayır

K11. Firmanızın hukuki statüsü nedir?

X Anonim Şirket c) Komandit Şirket e) Şahıs İşletmesi
b) Limited Şirket d) Kolektif Şirket f) Diğer : _____

K12. Firmanızda yabancı sermaye bulunuyor mu? ☐ Evet ☐ Hayır

Evet ise:

K13. Yabancı sermaye oranı nedir? % _____

K14. Yabancı sermaye ile ortaklığa başlangıç yılı nedir? _____

II. BÖLÜM – PAZAR ÖZELLİKLERİ VE REKABETİN YAPISI

	Lütfen okuduğunuz her ifadenin **kendi algılamanıza göre** sizin kurumunuz için ne kadar geçerli ya da uygun olduğunu işaretleyiniz:	Kesinlikle Katılmıyorum	Katılmıyorum	Kısmen Katılmıyorum	Kısmen Katılıyorum	Katılıyorum	Kesinlikle Katılıyorum
P01	Bu sektör çok hızlı büyümektedir.	1	2	3	4	5	6
P02	Bu sektörde rekabet oldukça yoğundur	1	2	3	4	5	6
P03	Bu sektör yoğun fiyat rekabeti ile tanınır.	1	2	3	4	5	6
P04	Bu sektörde birçok rakip vardır.	1	2	3	4	5	6
P05	Bu sektörde, büyük pazar payına sahip egemen bir rakip vardır	1	2	3	4	5	6
P06	Pazarda, rakiplerin stratejileri ve faaliyetleri sürekli değişir	1	2	3	4	5	6
P07	Bu sektörde potansiyel müşteri sayısı çoktur.	1	2	3	4	5	6
P08	Bu sektörde Pazar için yeni olan ürün arzı çok sık olur.	1	2	3	4	5	6
P09	Rakipler, birbirlerinin yaptığı herhangi bir yeniliği kolaylıkla taklit edip pazara sunabilir	1	2	3	4	5	6
P10	Bu sektörde piyasadaki rakip ürünler birbirlerine çok benzer	1	2	3	4	5	6
P11	Pazarda, ürünler, hızlı bir şekilde eskir (demode olur).	1	2	3	4	5	6
P12	Bu sektörde, iç pazarda ithal rakip ürünlere çok rastlanır.	1	2	3	4	5	6
P13	Rakiplerce çok farklı ve karmaşık ürün kombinasyonları geliştirilmiştir	1	2	3	4	5	6
P14	Bu sektörde müşteri ihtiyaçları çok hızlı değişir.	1	2	3	4	5	6
P15	Müşteri ihtiyaçları son derece karmaşık ve birbirine benzemez niteliktedir	1	2	3	4	5	6
P16	Bu sektörün müşterileri, ihtiyaç ve beklentileri konusunda çok bilinçlidir.	1	2	3	4	5	6
P17	Bu sektörde, mevcut ürünlere sadakati fiyat belirler.	1	2	3	4	5	6
P18	Pazarda, teknolojik değişim oranı çok yüksektir	1	2	3	4	5	6
P19	Uygulanan teknolojiler karmaşık, birbirine benzemez ve anlaşılmaz niteliktedir	1	2	3	4	5	6
P20	Bu sektörde yetenekli işgücü bulmak ve elde tutmak çok zordur	1	2	3	4	5	6

III. BÖLÜM – FİRMA STRATEJİLERİ

FS1. Üst düzey yöneticiler tarafından onaylanan, açık bir biçimde ifade edilmiş olan bir *yazılı stratejik plan* bulunmaktadır.

☐ Evet ☐ Hayır

FS2. **Evet ise** kaç yıllık bir zaman ufkuna sahip? _____

Başlıca rakiplerinize kıyasla benzer ürünlerde aşağıdaki başlıklarda Firmanızın ürünlerini nasıl değerlendiriyorsunuz?

FS3. **Fiyat**	Çok düşük fiyat	1	2	3	4	5	6	Çok yüksek fiyat
FS4. **Kalite**	Çok düşük kalite	1	2	3	4	5	6	Çok yüksek kalite

Başlıca rakiplerinize kıyasla benzer ürünlerde aşağıdaki başlıklarda Firmanızı nasıl değerlendiriyorsunuz?

FS5. **Odaklanma** (Hedef Pazar Büyüklüğü)	Çok dar	1	2	3	4	5	6	Çok geniş
FS6. **Çeşitlendirme** (Ürün Yelpazesinin Genişliği)	Çok dar	1	2	3	4	5	6	Çok geniş

Yatırım kararlarını etkileyen temel etmeni değerlendiriniz:

FS7. Büyük yatırımlarda:	Tamamen Finansal	1	2	3	4	5	6	Tamamen Stratejik
FS8. Küçük yatırımlarda:	Tamamen Finansal	1	2	3	4	5	6	Tamamen Stratejik

	Şirketin son üç yıllık (2005-2006-2007) döneminde aşağıdaki hususlara verdiği önemi belirtiniz	Hiç önemli değil	Pek önemli değil	Kısmen önemsiz	Kısmen öndemli	Oldukça önemli	Son derece önemli
FS9	Mevcut pazarlar için mevcut ürünlerde küçük değişiklikler yapmak.	1	2	3	4	5	6
FS10.	Mevcut pazarlar için yeni ürünler geliştirmek.	1	2	3	4	5	6
FS11	Yeni pazarlara mevcut ürünlerle girmek.	1	2	3	4	5	6
FS12	Yeni pazarlara yeni ürünlerle girmek.	1	2	3	4	5	6

	Son 3 yılda (2005-2006-2007), pazara sunduğunuz yeni ürünlerinizde, aşağıdaki yeni ürün geliştirme stratejilerini uygulamak için ayırdığınız kaynak ağırlığını belirtiniz	Hiç kaynak ayrılmadı	Yeterince kaynak ayrılmadı	Kısmen kaynak ayrılmadı	Kısmen kaynak ayrıldı	Yeterince kaynak ayrıldı	Tüm kaynaklar ayrıldı
FS13	Yeni teknoloji geliştirmek	1	2	3	4	5	6
FS14	Kendi mevcut teknolojisini iyileştirmek	1	2	3	4	5	6
FS15	Başkalarınca geliştirilen teknolojileri iyileştirmek	1	2	3	4	5	6
FS16	Başkalarınca geliştirilen teknolojileri kullanmak	1	2	3	4	5	6

IV. BÖLÜM – BİLGİ YÖNETİMİ KOLAYLAŞTIRICILARI

Çalıştığınız kurumu dikkate aldığınızda aşağıdaki ifadelere ne ölçüde katıldığınızı belirterek değerlendiriniz:	Kesinlikle Katılmıyorum	Katılmıyorum	Kısmen Katılmıyorum	Kısmen Katılıyorum	Katılıyorum	Kesinlikle Katılıyorum
BY01. Kurum içerisindeki işbirliği düzeyi memnuniyet vericidir	1	2	3	4	5	6
BY02. Çalışanlar yaptıkları işlerde birbirlerine yardımcı olur	1	2	3	4	5	6
BY03. Farklı birimlerdeki çalışanlar birbirleriyle işbirliği yapmaya heveslidir	1	2	3	4	5	6
BY04. Çalışanlar birbirlerini destekler	1	2	3	4	5	6
BY05. Genel olarak değerlendirildiğinde çalışanları güvenilirdir	1	2	3	4	5	6
BY06. Niyetleri ya da davranışları konusunda çalışanlar karşılıklı olarak birbirine güven duyar	1	2	3	4	5	6
BY07. Sahip oldukları yetenekler konusunda çalışanlar karşılıklı olarak birbirlerine güven duyar	1	2	3	4	5	6
BY08. Çalışanların kendi aralarındaki ilişkiler karşılıklı güvene dayanır	1	2	3	4	5	6
BY09. Çalışanlar farklı görevlerdeki arkadaşlarına da destek olur	1	2	3	4	5	6
BY10. Çalışanların kendi işlerinden başka işlerde de fikirlerini paylaşmaları desteklenir	1	2	3	4	5	6
BY11. Çalışanların birbirlerinin işlerine katkıda bulunmalarını sağlayacak ortam sağlanmaktadır	1	2	3	4	5	6
BY12. Her çalışan kurumdaki bir başka çalışanın yaptığı iş ile ilgili önerilerde bulunabilir	1	2	3	4	5	6
BY13. Çalışanların kendilerini geliştirmeleri amacıyla farklı görevlerde çalışmaları sağlanır	1	2	3	4	5	6
BY14. Çalışanların seminer, sempozyum gibi aktivitelere katılması teşvik edilir	1	2	3	4	5	6
BY15. Çalışanların bir araya gelmesini amaçlayan sosyal etkinlikler düzenlenir	1	2	3	4	5	6
BY16. Çalışanların işleriyle ilgili kendilerine sağlanan eğitim ve geliştirme imkanları memnuniyet vericidir	1	2	3	4	5	6
BY17. Çalışanlar yöneticilerinin izni olmadan işleriyle ilgili konularda herhangi bir şey yapamazlar	1	2	3	4	5	6
BY18. Çalışanların işleriyle ilgili kararları kendi başlarına vermeleri teşvik edilmez	1	2	3	4	5	6
BY19. Çalışanlar yaptıkları işle ilgili konularda bir başkasından onay alma ihtiyacı duyar	1	2	3	4	5	6

BY20. Çalışanlar işleriyle ilgili bir şey yapmadan önce mutlaka yöneticilerine sorma ihtiyacı hisseder	1	2	3	4	5	6
BY21. Kurumdaki tüm kural ve prosedürler yazılı haldedir	1	2	3	4	5	6
BY22. Çalışanlar kurumun kurallarını gözardı edemez	1	2	3	4	5	6
BY23. Çalışanlar işleriyle ilgili kuralları konuşmuş kuralları uygular	1	2	3	4	5	6
BY24. Başka kurumlarla iş yaparken resmi sözleşmeler yapılır	1	2	3	4	5	6
BY25. Tüm çalışanlar hedeflerini bilir	1	2	3	4	5	6
BY26. Her çalışan için performans bilgisi dönemsel olarak paylaşılır	1	2	3	4	5	6
BY27. Çalışanlar kendi hedeflerinin kurumun hedeflerine olan katkısını bilir	1	2	3	4	5	6
BY28. Hefefler değiştiğinde veya güncellendiğinde, çalışanlar öncelikli olarak bilgilendirilir	1	2	3	4	5	6
BY29. Tüm çalışanlar birbirlerinin yaptıkları işler hakkında fikir sahibidir	1	2	3	4	5	6
BY30. Her çalışan kurumdaki bir başka çalışanın yaptığı iş ile ilgili önerilerde bulunabilir	1	2	3	4	5	6
BY31. Çalışanlar sadece kendi departmanlarındaki kişilerle değil diğer departmanlardaki kişilerle de iyi bir iletişime sahiptir	1	2	3	4	5	6
BY32. Çalışanlar kendi alanlarında uzmanlık sahibidir	1	2	3	4	5	6
BY33. Kurumun BT altyapısı sektörün altında değildir	1	2	3	4	5	6
BY34. Kurumun BT yatırımı sektörün altında değildir	1	2	3	4	5	6
BY35. Kurumdaki BT çözümleri, hedeflenen oran veya daha iyi bir oranda sorunsuz çalışmaktadır	1	2	3	4	5	6
BY36. Kurumun BT çözümleri, kurum içinde tüm işlerin yapılması için yeterlidir.	1	2	3	4	5	6
BY37. BT ekibi ile diğer departmanlar arasında BT'nin taahhüdünü içeren bir Hizmet Seviyesi Anlaşması vardır.	1	2	3	4	5	6
BY38. Çalışanlar BT'den istedikleri desteği BT ile yaptıkları Hizmet Seviyesi Anlaşmasına paralel olarak alabilmektedir	1	2	3	4	5	6
BY39. Kurumun BT çözümleri, zaman ve lokasyondan bağımsız olarak, işbirliği içinde çalışmak için yeterli desteği sağlar	1	2	3	4	5	6
BY40. BT çözümleri için gereken eğitim, kullanım öncesinde, sırasında ve sorun ile karşılaşıldığında düzenli olarak verilmektedir.	1	2	3	4	5	6

V. BÖLÜM – BİLGİ YARATMA

Çalıştığınız kurumu dikkate aldığınızda aşağıdaki ifadelerde belirtilen konulara kurumunuzun ne derece önem verdiğini değerlendiriniz:	Kesinlikle Önem Vermez	Önem Vermez	Kısmen Önem Vermez	Kısmen Önem Verir	Önem Verir	Kesinlikle Önem Verir
B01. Müşterilerin görüşlerini öğrenmek	1	2	3	4	5	6
B02. Rakipleriyle diyalog halinde olmak	1	2	3	4	5	6
B03. Çalışanların yeni fikirler üretebilmeleri için kurum içinde serbestçe hareket etmesi ve birbirleriyle etkileşim içerisinde olması için olanak sağlamak	1	2	3	4	5	6
B04. Çalışanların birbirlerinin uzmanlıklarından faydalanmasını sağlayacak iş ortamı yaratmak	1	2	3	4	5	6
B05. Faaliyet alanı ile ilgili kuruluşlardan ya da internet sitelerinden bilgi toplamak	1	2	3	4	5	6
B06. Çalışanların birikimlerini kuruma kazandırmak için dökümante etmesini teşvik etmek	1	2	3	4	5	6
B07. Düzenli toplantı notları tutulmasını ve ve bu notların yetkililerin paylaşımına açık şekilde saklanmasını sağlamak	1	2	3	4	5	6
B08. Projelerde kaydedilen aşamaların ve sonuçların proje üyelerinin görüşlerini de kapsayacak şekilde kaydedilmesini sağlamak	1	2	3	4	5	6
B09. Stratejileri planlarken akademik makaleler, tahmin teknikleri kullanmak, bilgisayar simulasyonları yapmak gibi yöntemlerden yararlanmak	1	2	3	4	5	6
B10. Ürün ve hizmetlerle ilgili teknik el kitapçıkları oluşturmak	1	2	3	4	5	6
B11. Ürün ve hizmetlerle ilgili veritabanı oluşturmak	1	2	3	4	5	6
B12. Teknik bilgi ve yönetsel rakamları bir araya getirerek materyal oluşturmak	1	2	3	4	5	6
B13. Yeni üretilmiş konseptleri irdelemek	1	2	3	4	5	6
B14. Farklı departmanlardan kişiler içeren fonksiyonel takımlar kullanarak çalışanları birbirleriyle irtibat halinde tutmak	1	2	3	4	5	6
B15. Model olacak takımlar tarafından deneyler yapılmasını sağlamak ve deneylerin sonuçlarını tüm departmanlarla paylaşmak	1	2	3	4	5	6
B16. Yeni değerler ve fikirleri araştırmak ve paylaşmak	1	2	3	4	5	6
B17. İş arkadaşlarıyla kurulan iletişim aracılığıyla yönetimin vizyonunu anlamaya çalışmak ve paylaşmak	1	2	3	4	5	6

VI. BÖLÜM – YENİ ÜRÜN GELİŞTİRME YETKİNLİKLERİ

Lütfen, kurumunuzda yapılan yeni ürün geliştirme etkinliklerini dikkate alarak kurum içinde ve sektöre kıyasla aşağıdaki ifadeleri değerlendiriniz.	Kesinlikle Katılmıyorum	Katılmıyorum	Kısmen Katılmıyorum	Kısmen Katılıyorum	Katılıyorum	Kesinlikle Katılıyorum
YU01. Yeni geliştirilen ürünler için satış hedeflerimizi net olarak belirleriz	1	2	3	4	5	6
YU02. Yeni geliştirilen ürünlerde satış hedeflerimizi yakalarız	1	2	3	4	5	6
YU03. Yeni geliştirilen ürünlerin satış hedeflerinin gerçekleştirilmesi önceliklerimiz arasındadır	1	2	3	4	5	6
YU04. Yeni geliştirilen ürünler için kar hedeflememizi net olarak yaparız	1	2	3	4	5	6
YU05. Yeni geliştirilen ürünlerin karlılıkları planlamalarımız ile örtüşmektedir	1	2	3	4	5	6
YU06. Yeni geliştirilen ürünlerin kar hedeflerinin gerçekleştirilmesi önceliklerimiz arasındadır	1	2	3	4	5	6
YU07 Projelerimiz planlanan zamanda veya daha öncesinde tamamlanır.	1	2	3	4	5	6
YU08 Yeni ürünler pazara planlanan zamanda çıkarılır	1	2	3	4	5	6
YU09 Yeni ürün geliştirmede tasarım değişiklikleri proje süresini uzatmayacak ölçekte kalır.	1	2	3	4	5	6
YU10 Yeni ürün geliştirirken farklı projeler için de öğrenimlerimiz olur	1	2	3	4	5	6
YU11 Yeni ürün geliştirirken yaptığımız hatalar, sonraki projeler için birer kaynaktır.	1	2	3	4	5	6
YU12 Yeni ürün geliştirirken ortaya çıkan alternatif yeni ürünleri mutlaka değerlendiririz	1	2	3	4	5	6
YU13 Yeni ürünlerimizin performansı rakiplerimizin yeni ürünlerinden iyidir	1	2	3	4	5	6
YU14 Yeni ürünlerimizin performansı kurum içinde beklenilen seviyededir.	1	2	3	4	5	6
YU15 Yeni ürünlerimizin performansını beğeniyorum	1	2	3	4	5	6
YU16 Yeni ürünlerimizin kurumumuza finansal etkisi olumludur	1	2	3	4	5	6
YU17 Yeni ürünlerimiz kurumumuzun imajını olumlu yönde etkiler	1	2	3	4	5	6
YU18 Yeni ürünlerimiz kurum içinde oldukça olumlu bir hava yaratırlar.	1	2	3	4	5	6

VII. BÖLÜM – ALGILANAN ŞİRKET PERFORMANSI

Lütfen, şu anki durumu dikkate alarak kurumunuzu sektöre kıyasla aşağıdaki ifadeler açısından değerlendiriniz.		Çok daha başarısız	Daha başarısız	Kısmen daha başarısız	Kısmen daha başarılı	Daha başarılı	Çok daha başarılı
PE01.	Müşteri memnuniyeti	1	2	3	4	5	6
PE02.	Toplam satışlar	1	2	3	4	5	6
PE03.	Pazar payı büyüklüğü	1	2	3	4	5	6
PE04.	Yeni ürünleri rakiplerden önce pazara sunabilme	1	2	3	4	5	6
PE05.	Geliştirilen yeni ürün ve hizmetlerin kalitesi	1	2	3	4	5	6
PE06.	Yeni Ürün Geliştirme Hızı	1	2	3	4	5	6
PE07.	Yeni Ürün Geliştirme Maliyeti	1	2	3	4	5	6
PE08.	Yeni Ürün Geliştirme Esnekliği	1	2	3	4	5	6
PE09.	Yeni Ürün Geliştirme Kalitesi	1	2	3	4	5	6
PE10.	Ciro Karlılığı (Kar/Toplam satışlar)	1	2	3	4	5	6
PE11.	Aktif Karlılığı (Kar/Toplam varlıklar)	1	2	3	4	5	6
PE12.	Firmanın genel karlılık durumu	1	2	3	4	5	6

VIII. BÖLÜM - ANKETE KATILAN KİŞİYE AİT BİLGİLER

KA01. Toplamda kaç yıldır profesyonel olarak çalışıyorsunuz? _____ yıl

KA02. Kaç yıldır bu sektördesiniz? _____ yıl

KA03. Kaç yıldır bu şirkette çalışıyorsunuz? _____ yıl/ay

KA04. Firmanızdaki görevinizi öğrenebilir miyiz? _____

KA05. Ünvanınız nedir? _____

KA06. Firmanızdaki pozisyonunuz nedir?

- ☐ Tepe Yönetici (Genel Müdür, GMY, Genel Müdüre direk bağlı Direktör, Müdür, vb.)
- ☐ Üst Düzey Yönetici (Tepe Yöneticilere raporlama yapan yönetici)
- ☐ Orta Düzey Yönetici (Üst Düzey Yöneticiye raporlama yapan yönetici)
- ☐ Diğer _____

KA07. Yaşınız? _____

KA08. Cinsiyetiniz? ☐ Kadın ☐ Erkek

KA09. En son mezun olduğunuz okul nedir?

- ☐ Doktora ☐ Üniversite ☐ Lise
- ☐ Yüksek lisans ☐ Yüksekokul ☐ İlköğretim

Ankete katıldığınız için çok teşekkür ederiz.

Sonuçların size eposta yoluyla ulaşmasını istiyorsanız lütfen eposta adresinizi yazınız:

_____@_____

Appendix 2 - Pilot Questionnaire in English

PART I – COMPANY INFO

K01. Questionnaire No: _____

K02. What is your firm's full title? _____

K03. When was your company founded? _____

K04. What is your firm's main business area? *(you can choose more than one)*

☐ Software ☐ Hardware ☐ Consultancy ☐ Solution provider ☐ IT Infrastructure provider

☐ Other _____

	2005	2006	2007
K05. What is your firm's employee number?			
K06. What is the total sales volume? (*YTL, Euro, $*)			

Please state your company's market share in volume and ratio **with respect to your perception.**	2005	2006	2007
K07. Market share of the main business area in Turkey (*YTL, Euro, $*)			
K08. Domestic market share of main business area (%)			
K09. Domestic market share of the biggest firm in the industry (%)			

K10. Is your firm a family company? ☐ Yes ☐ No

K11. What is your firm's legal status?

a) Corporation b) Limited Company c) Limited Partnership
d) Open Partnership e) Sole proprietorship f) Other: _____

K12. Does your firm have foreign partnership? ☐ Yes ☐ No

If Yes:

K13. What is foreign partnership percentage? % _____

K14. When was your foreign partnership started? _____

PART II – MARKET DYNAMISM

	Please rate to the following statements related to your company and your business sector **according to your perceptions**	Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree
P01	This sector grows very fast	1	2	3	4	5	6
P02	Competition in this sector is very intensive	1	2	3	4	5	6
P03	This sector is recognized with intensive price competition	1	2	3	4	5	6
P04	There are many rivals in this sector	1	2	3	4	5	6
P05	There is a dominant competitior with big market share in this sector	1	2	3	4	5	6
P06	Competitors strategies and actions changes continuously in the market	1	2	3	4	5	6
P07	There are a lot of potential customers in this sector	1	2	3	4	5	6
P08	New product supply in this market is very high	1	2	3	4	5	6
P09	Competitors can easily copy new products	1	2	3	4	5	6
P10	Competing products are very similar to each other	1	2	3	4	5	6
P11	Products deminish in a fast pace in the market	1	2	3	4	5	6
P12	There are a lot of imported competing products in this sector	1	2	3	4	5	6
P13	Many different and complicated products were developed by competitors	1	2	3	4	5	6
P14	Customer demands change very fast in this sector	1	2	3	4	5	6
P15	Customer needs are very complicated and different than each other	1	2	3	4	5	6
P16	Customers are very conscious about the demands and expectations	1	2	3	4	5	6
P17	Price determines the loyalty to current products in this sector	1	2	3	4	5	6
P18	Technological change rate is very high in the market	1	2	3	4	5	6
P19	Applied technologies are complicated and different than each other	1	2	3	4	5	6
P20	It is hard to find qualified work power and to retain them in this sector	1	2	3	4	5	6

PART III – FIRM STRATEGIES

FS1. We have a written and approved strategic plan that is clearly stated and approved by top management ☐ **Yes** ☐ **No**

FS2. **If yes,** what is the time period for the strategic plan? _____

When compared with your main competitors, for the similar products, how do you rate your firm for the below statements?

FS3. **Price**	Very low price	1	2	3	4	5	6	Very high price
FS4. **Quality**	Very low quality	1	2	3	4	5	6	Very high quality
FS5. **Focusing** (Target Market Share)	Too narrow	1	2	3	4	5	6	Too wide
FS6. **Variation** (Wide Product Fan)	Too narrow	1	2	3	4	5	6	Too wide

Please state the main factor that effects your investment decisions:

FS7. Big investments :	Fully Financial	1	2	3	4	5	6	Fully Strategic
FS8. Small investments :	Fully Financial	1	2	3	4	5	6	Fully Strategic

	Please indicate the importance of the below issues for the last three years (2005-2006-2007) in your company	Absolutely not importanat	Not important	Partly not iportant	Partly important	Important	Absolutely very important
FS9	To make small changes in present products for the present market	1	2	3	4	5	6
FS10.	To develop new products for existing markets	1	2	3	4	5	6
FS11	To enter new markets with present solutions	1	2	3	4	5	6
FS12	To enter new markets with new products	1	2	3	4	5	6

	Please indicate the resource level that your company reserved for the last three years (2005-2006-2007) on applying new product development strategies for new products you had introduced to the market	No resources reserved	Not enough resources reserved	Partially resources not reserved	Partially resources reserved	Enough resources reserved	All resources reserved
FS13	New technology development	1	2	3	4	5	6
FS14	Improve its own technology	1	2	3	4	5	6
FS15	Improve technology developed by others	1	2	3	4	5	6
FS16	Use technology developed by others	1	2	3	4	5	6

PART IV – KNOWLEDGE MANAGEMENT ENABLERS

Please rate the following statements related to your company:		Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree
Collaboration	BY01. Collaboration level in our organization is satisfactory.	1	2	3	4	5	6
	BY02. Our organization members are supportive	1	2	3	4	5	6
	BY03. There is willingness to collaborate across organizational units	1	2	3	4	5	6
	BY04. Our organization members are helpful	1	2	3	4	5	6
Trust	BY05. Our company members are generally trustworthy.	1	2	3	4	5	6
	BY06. Our company members have reciprocal faith in other members' intentions and behaviours	1	2	3	4	5	6
	BY07. Our company members have reciprocal faith in others' ability	1	2	3	4	5	6
	BY08. Our company members have relationships based on reciprocal faith	1	2	3	4	5	6
Participating in boundary spanning structures	BY09. Our company members also support colleagues from different departments	1	2	3	4	5	6
	BY10. Our company members are couraged to share ideas on issues other than their own tasks	1	2	3	4	5	6
	BY11. A work environment that enables participation to other tasks is provided	1	2	3	4	5	6
	BY12. Every employee can propose ideas about others' tasks	1	2	3	4	5	6
Learning	BY13. Our company provides opportunities for informal individual development.	1	2	3	4	5	6
	BY14. Our company encourages people to attend seminars, symposia, and so on.	1	2	3	4	5	6
	BY15. Our company provides social events for gatherings.	1	2	3	4	5	6
	BY16. Our company members are satisfied by the contents of job training or self-development programs	1	2	3	4	5	6
Centralization	BY17. Our company members cannot take action without a supervisor	1	2	3	4	5	6
	BY18. Our company members are not encouraged to make their own decisions	1	2	3	4	5	6
	BY18. Our company members need to get approval before making decisions	1	2	3	4	5	6
	BY20. Our company members need to ask their supervisors before action	1	2	3	4	5	6

Please rate the following statements related to your company:		Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree
Formalization	BY21. In our company rules and procedures are typically written	1	2	3	4	5	6
	BY22. In our company members cannot disregard the rules	1	2	3	4	5	6
	BY23. In our company members obey and apply the rules any time	1	2	3	4	5	6
	BY24. In our company legal agreements are always signed while doing business with other companies	1	2	3	4	5	6
Direction and Performance information	BY25. Every employee knows her/his personal goals and performance	1	2	3	4	5	6
	BY26. Performance measures are discussed with every employee periodically	1	2	3	4	5	6
	BY27. Every employee knows the contribution of personal goals to overall company goals	1	2	3	4	5	6
	BY28. When goals are changed or updated, employees are informed in priority	1	2	3	4	5	6
T-shaped skills	BY29. Our company members can understand not only their own tasks but also others' tasks	1	2	3	4	5	6
	BY30. Our company members can make suggestion about others' task	1	2	3	4	5	6
	BY31. Our company members can communicate well not only with their department members but also with other department members	1	2	3	4	5	6
	BY32. Our company members have expertise at their tasks	1	2	3	4	5	6
IT quality	BY33. Our IT infrastructure is at least at average of the industry	1	2	3	4	5	6
	BY34. Our IT investment is at least at average of the industry	1	2	3	4	5	6
	BY35. Our IT solutions work at least at the designated up-and-running ratio	1	2	3	4	5	6
	BY36. Our IT solutions are sufficient to do all tasks required	1	2	3	4	5	6
IT support	BY37. There are Service Level Agreements (SLAs)between IT and other departments	1	2	3	4	5	6
	BY38. Our IT department can serve in parallel to SLAs.	1	2	3	4	5	6
	BY39. Our IT department provides support for collaborative works regardless of time and place	1	2	3	4	5	6
	BY40. Training required for IT solutions are provided contionuously	1	2	3	4	5	6

PART V – KNOWLEDGE CREATION PROCESS

	Please rate at what level your company cares (stresses) for the following statements	Absolutely Not Cares Mostly Not Cares	Partially not Cares	Partially cares	Mostly Cares	Absolutely Cares
Socialization	B01. Learning thoughts of customers	1	2	3	4	5	6
	B02. Communicating competitors	1	2	3	4	5	6
	B03. Finding new strategies and market opportunities by wandering inside the firm.	1	2	3	4	5	6
	B04. Creating a work environment that allows peers to understand the craftsmanship and expertise.	1	2	3	4	5	6
	B05. Gathering information from companies or web sites.	1	2	3	4	5	6
Externalization	B06. Encouraging members to document their knowledge	1	2	3	4	5	6
	B07. Enabling proper meeting notes and restoring them in an accessible format	1	2	3	4	5	6
	B08. Storing project steps and results including project members' thoughts	1	2	3	4	5	6
Combination	B09. Planning strategies by using published literature, computer simulation and forecasting	1	2	3	4	5	6
	B10. Creating manuals and documents on products and services	1	2	3	4	5	6
	B11. Building databases on products and service.	1	2	3	4	5	6
	B12. Building up materials by gathering management figures and technical information	1	2	3	4	5	6
	B13. Transmitting newly created concepts.	1	2	3	4	5	6
Internalization	B14. Forming project teams for members to be in contact with each other	1	2	3	4	5	6
	B15. Stresses forming teams as a model and conducting experiments, and sharing results with entire departments	1	2	3	4	5	6
	B16. Searching and sharing new values and thoughts	1	2	3	4	5	6
	B17. Sharing and trying to understand management visions through communications with fellows.	1	2	3	4	5	6

PART VI – NEW PRODUCT DEVELOPMENT CAPABILITIES

			Please rate the following statements for your company and the sector considering new product development activities	Strongly Disagree	Disagree	Partly Disagree	Partly Agree	Agree	Strongly Agree
Financial Capability	**Sales Goal Achievement**	YU01.	We set our sales goals clearly for the new developed products	1	2	3	4	5	6
		YU02.	We reach to our sales goals for new developed products	1	2	3	4	5	6
		YU03.	It is in our priority to accomplish the sales goals for new developed products	1	2	3	4	5	6
	Profit Expectation Achievement	YU04.	We set our profit goals clearly for the new developed products	1	2	3	4	5	6
		YU05.	Profits of new developed products fits to our profit plans	1	2	3	4	5	6
		YU06.	It is in our priority to accomplish the profit goals for new developed products	1	2	3	4	5	6
R&D Capability	**Project Time Management**	YU07	Our projects finishes at the planned time or earlier	1	2	3	4	5	6
		YU08	New products are introduced to market at the planned time	1	2	3	4	5	6
		YU09	Design changes for new product development does not change the project time	1	2	3	4	5	6
	Opportunities Created – Lessons	YU10	We acquire knowledge for new projects during new product development	1	2	3	4	5	6
		YU11	Lessons learned during new product development are resources for new projects	1	2	3	4	5	6
		YU12	We appreciate alternative new products that we found during new product development	1	2	3	4	5	6
Overall NPD Capability	**Overall Performance of NP**	YU13	Performance of our new products are better than competitors' new products	1	2	3	4	5	6
		YU14	The performance level of new products are at the expected level in company	1	2	3	4	5	6
		YU15	I approve the performance of our new products	1	2	3	4	5	6
	Effect of NP on company	YU16	The financial effect of new products are positive to our company	1	2	3	4	5	6
		YU17	New products affect our company image positively	1	2	3	4	5	6
		YU18	Our new products create an optimistic atmosphere in our company	1	2	3	4	5	6

PART VII – PERCEIVED COMPANY PERFORMANCE

		Please rate each item according to your company's situation with respect to the sector:	Much more unseccessful	More unsuccessful	Partly unsuccessful	Partly successful	More Successful	Much more successful
Market Performance	PE01.	Customer satisfaction	1	2	3	4	5	6
	PE02.	Total sales	1	2	3	4	5	6
	PE03.	Market share	1	2	3	4	5	6
New Prroduct Development Performance	PE04.	Introducing new products before competitors	1	2	3	4	5	6
	PE05.	The quality of new developed products and services	1	2	3	4	5	6
	PE06.	New product development speed	1	2	3	4	5	6
	PE07.	New product development cost	1	2	3	4	5	6
	PE08.	New product development flexibility	1	2	3	4	5	6
	PE09.	New product development quality	1	2	3	4	5	6
Financial Performance	PE10.	Return on sales (Profit/Total sales)	1	2	3	4	5	6
	PE11.	Return on assets (Profit/Total sales)	1	2	3	4	5	6
	PE12.	General profitability of the firm	1	2	3	4	5	6

PART VIII - PARTICIPANT INFO

KA01. For how many years you have been working as a professional? _____ year(s)

KA02. For how many years you are in this sector? _____ year(s)

KA03. For how many years you are in this company? _____ yıl/ay

KA04. What is your task in your company? _____

KA05. What is your title? _____

KA06. At what position you are in your company?

- ☐ Top Executive Management (CEO, Top Executives, Directors, Managers, reporting to CEO)
- ☐ Top Management (Managers reporting to Top Executives)
- ☐ Medium Management (Reporting to Top Management)
- ☐ Other _____

KA07. What is your age? _____

KA08. What is your gender? ☐ Female ☐ Male

KA09. What is your highest academic degree?

- ☐ PhD
- ☐ University (4 years)
- ☐ High School
- ☐ Master / Graduate
- ☐ Associate (2 years)
- ☐ Primary school

Thank you very much for your participation.

If you like the results to be shared with you, please write your email address.

_____@_____

Appendix 3 - Questionnaire in Turkish

BÖLÜM I – KURUM BİLGİLERİ

F1. Firmanızın tam ünvanı nedir? _____

F2. Firmanızın web adresi nedir? www._____

F3. Firmanızın kuruluş yılı nedir? _____

F4. Firmanızın ana faaliyet alanını öğrenebilir miyiz? *(birden fazla işaretleme yapabilirsiniz)*

☐ Yazılım ☐ Donanım ☐ Danışmanlık ☐ Çözüm ortaklığı ☐ BT Altyapı sağlayıcılığı

☐ Diğer _____

F5. Firmanızda toplam çalışan sayısı kaçtır?

☐ 1-10 ☐ 11 – 50 ☐ 51-100 ☐ 101-250 ☐ 251-1.000 ☐ 1.001 ve üstü

F6. Firmanızın 2007 yılı cirosu nedir? (YTL)

☐ 0-500.000 ☐ 500.001 – 1 milyon ☐ 1-2,5 milyon ☐ 2,5-5 milyon ☐ 5-10 milyon ☐ 10 milyon üstü

F7. Firmanızın hukuki statüsü nedir?

a) Anonim Şirket b) Limited Şirket c) Diğer : _____

F8. Firmanızda yabancı sermaye bulunuyor mu? ☐ Evet ☐ Hayır

Evet ise:

F9. Yabancı sermaye oranı nedir? % _____

F10. Yabancı sermaye ile ortaklığa başlangıç yılı nedir? _____

BÖLÜM II – PAZAR ÖZELLİKLERİ VE REKABETİN YAPISI

	Lütfen okuduğunuz her ifadenin **kendi algılamanıza göre** sizin kurumunuz için ne kadar geçerli ya da uygun olduğunu işaretleyiniz:	Kesinlikle Katılmıyorum	Katılmıyorum	Kısmen Katılmıyorum	Kısmen Katılıyorum	Katılıyorum	Kesinlikle Katılıyorum
MD1	Bu sektör çok hızlı büyümektedir.	1	2	3	4	5	6
MD2	Bu sektörde rekabet oldukça yoğundur	1	2	3	4	5	6
MD3	Bu sektör yoğun fiyat rekabeti ile tanınır.	1	2	3	4	5	6
MD4	Bu sektörde birçok rakip vardır.	1	2	3	4	5	6
MD5	Bu sektörde, büyük pazar payına sahip egemen bir rakip vardır	1	2	3	4	5	6
MD6	Pazarda, rakiplerin stratejileri ve faaliyetleri sürekli değişir	1	2	3	4	5	6
MD7	Bu sektörde potansiyel müşteri sayısı çoktur.	1	2	3	4	5	6
MD8	Bu sektörde Pazar için yeni olan ürün arzı çok sık olur.	1	2	3	4	5	6
MD9	Rakipler, birbirlerinin yaptığı herhangi bir yeniliği kolaylıkla taklit edip pazara sunabilir	1	2	3	4	5	6
MD10	Bu sektörde piyasadaki rakip ürünler birbirlerine çok benzer	1	2	3	4	5	6
MD11	Pazarda, ürünler, hızlı bir şekilde eskir (demode olur).	1	2	3	4	5	6
MD12	Bu sektörde, iç pazarda ithal rakip ürünlere çok rastlanır.	1	2	3	4	5	6
MD13	Rakiplerce çok farklı ve karmaşık ürün kombinasyonları geliştirilmiştir	1	2	3	4	5	6
MD14	Bu sektörde müşteri ihtiyaçları çok hızlı değişir.	1	2	3	4	5	6
MD15	Müşteri ihtiyaçları son derece karmaşık ve birbirine benzemez niteliktedir	1	2	3	4	5	6
MD16	Bu sektörün müşterileri, ihtiyaç ve beklentileri konusunda çok bilinçlidir.	1	2	3	4	5	6
MD17	Bu sektörde, mevcut ürünlere sadakati fiyat belirler.	1	2	3	4	5	6
MD18	Pazarda, teknolojik değişim oranı çok yüksektir	1	2	3	4	5	6
MD19	Uygulanan teknolojiler karmaşık, birbirine benzemez ve anlaşılmaz niteliktedir	1	2	3	4	5	6
MD20	Bu sektörde yetenekli işgücü bulmak ve elde tutmak çok zordur	1	2	3	4	5	6

BÖLÜM III – FİRMA STRATEJİLERİ

BS1. Firmanızda üst düzey yöneticiler tarafından onaylanan, açık bir biçimde ifade edilmiş olan bir *yazılı stratejik plan* bulunmakta mıdır? ☐ Evet ☐ Hayır

BS2. **Evet ise** kaç yıllık bir zaman ufkuna sahip? _____

Başlıca rakiplerinize kıyasla benzer ürünlerde aşağıdaki başlıklarda Firmanızın ürünlerini nasıl değerlendiriyorsunuz?

BS3. **Fiyat**	Çok düşük fiyat	1	2	3	4	5	6	Çok yüksek fiyat
BS4. **Kalite**	Çok düşük kalite	1	2	3	4	5	6	Çok yüksek kalite

Başlıca rakiplerinize kıyasla benzer ürünlerde aşağıdaki başlıklarda Firmanızı nasıl değerlendiriyorsunuz?

BS5. **Odaklanma** (Hedef Pazar Büyüklüğü)	Çok dar	1	2	3	4	5	6	Çok geniş
BS6. **Çeşitlendirme** (Ürün Yelpazesinin Genişliği)	Çok dar	1	2	3	4	5	6	Çok geniş

Firmanızın yatırım kararlarını etkileyen temel etmeni değerlendiriniz:

BS7. Büyük yatırımlarda:	Tamamen Operasyonel	1	2	3	4	5	6 Tamamen Stratejik
BS8. Küçük yatırımlarda:	Tamamen Operasyonel	1	2	3	4	5	6 Tamamen Stratejik

	Şirketin son üç yıllık (2005-2006-2007) döneminde aşağıdaki hususlara verdiği önemi belirtiniz	Son derece önemsiz	Önemsiz	Kısmen önemsiz	Kısmen öndemli	Önemli	Son derece önemli
BS9	Mevcut pazarlar için mevcut ürünlerde küçük değişiklikler yapmak.	1	2	3	4	5	6
BS10.	Mevcut pazarlar için yeni ürünler geliştirmek.	1	2	3	4	5	6
BS11	Yeni pazarlara mevcut ürünlerle girmek.	1	2	3	4	5	6
BS12	Yeni pazarlara yeni ürünlerle girmek.	1	2	3	4	5	6

	Son 3 yılda (2005-2006-2007), pazara sunduğunuz yeni ürünlerinizde, aşağıdaki yeni ürün geliştirme stratejilerini uygulamak için ayırdığınız kaynak ağırlığını belirtiniz	Hiç kaynak ayrılmadı	Yeterince kaynak ayrılmadı	Kısmen kaynak ayrılmadı	Kısmen kaynak ayrıldı	Yeterince kaynak ayrıldı	Tüm kaynaklar ayrıldı
BS13	Yeni teknoloji geliştirmek	1	2	3	4	5	6
BS14	Kendi mevcut teknolojisini iyileştirmek	1	2	3	4	5	6
BS15	Başkalarınca geliştirilen teknolojileri iyileştirmek	1	2	3	4	5	6
BS16	Başkalarınca geliştirilen teknolojileri kullanmak	1	2	3	4	5	6

BÖLÜM IV – BİLGİ YÖNETİMİ KOLAYLAŞTIRICILARI

Çalıştığınız kurumu dikkate aldığınızda aşağıdaki ifadelere ne ölçüde katıldığınızı belirterek değerlendiriniz:	Asla Katılmıyorum	Çoğunluka Katılmıyorum	Kısmen Katılmıyorum	Kısmen Katılıyorum	Çoğunlukla Katılıyorum	Tamamen Katılıyorum
KME1. Kurum içerisindeki işbirliği düzeyi memnuniyet vericidir	1	2	3	4	5	6
KME2. Çalışanlar yaptıkları işlerde birbirlerine yardımcı olur	1	2	3	4	5	6
KME3. Farklı birimlerdeki çalışanlar birbirleriyle işbirliği yapmaya heveslidir	1	2	3	4	5	6
KME4. Niyetleri ya da davranışları konusunda çalışanlar karşılıklı olarak birbirine güven duyar	1	2	3	4	5	6
KME5. Sahip oldukları yetenekler konusunda çalışanlar karşılıklı olarak birbirlerine güven duyar	1	2	3	4	5	6
KME6. Çalışanların kendi aralarındaki ilişkiler karşılıklı güvene dayanır	1	2	3	4	5	6
KME7. Çalışanların kendi işlerinden başka işlerde de fikirlerini paylaşmaları desteklenir	1	2	3	4	5	6
KME8. Çalışanların birbirlerinin işlerine katkıda bulunmalarını sağlayacak ortam sağlanmaktadır	1	2	3	4	5	6
KME9. Her çalışan kurumdaki bir başka çalışanın yaptığı iş ile ilgili önerilerde bulunabilir	1	2	3	4	5	6
KME10. Çalışanların kendilerini geliştirmeleri amacıyla farklı görevlerde çalışmaları sağlanır	1	2	3	4	5	6
KME11. Çalışanların bir araya gelmesini amaçlayan sosyal etkinlikler düzenlenir	1	2	3	4	5	6
KME12. Çalışanların işleriyle ilgili kendilerine sağlanan eğitim ve geliştirme imkanları memnuniyet vericidir	1	2	3	4	5	6
KME13. Çalışanların işleriyle ilgili kararları kendi başlarına almaları teşvik edilmez	1	2	3	4	5	6
KME14. Çalışanlar yaptıkları işle ilgili konularda bir başkasından onay alma ihtiyacı duyar	1	2	3	4	5	6
KME15. Çalışanlar işleriyle ilgili bir şey yapmadan önce mutlaka yöneticilerine sorma ihtiyacı hisseder	1	2	3	4	5	6

Çalıştığınız kurumu dikkate aldığınızda aşağıdaki ifadelere ne ölçüde katıldığınızı belirterek değerlendiriniz:	Asla Katılmıyorum	Çoğunluka Katılmıyorum	Kısmen Katılmıyorum	Kısmen Katılıyorum	Çoğunlukla Katılıyorum	Tamamen Katılıyorum
KME16. Kurumdaki tüm kural ve prosedürler yazılı haldedir	1	2	3	4	5	6
KME17. Çalışanlar kurumun kurallarını had safhada dikkate alırlar	1	2	3	4	5	6
KME18. Başka kurumlarla iş yaparken mutlaka resmi sözleşmeler yapılır	1	2	3	4	5	6
KME19. Kişisel hedefim ve performansım benimle mutlaka paylaşılır	1	2	3	4	5	6
KME20. Çalıştığım bölümün hedefleri ve performansı benimle de paylaşılır	1	2	3	4	5	6
KME21. Şirketin hedefleri, performansı ve beni etkileyen planları benimle de paylaşılır	1	2	3	4	5	6
KME22. Farklı fonksiyonlardan gelen çalışanların oluşturduğu proje ekipleri uygulaması yaygındır	1	2	3	4	5	6
KME23. Problem çözme veya iyileştirme amaçlı proje ekipleri kurulur	1	2	3	4	5	6
KME24. Kurum içinde bilgi paylaşımı ağları (network'ü) yoğundur	1	2	3	4	5	6
KME25. Zaman ve lokasyondan bağımsız olarak, işbirliği içinde çalışmak için BT (Bilgi Teknolojileri) desteği sağlar	1	2	3	4	5	6
KME26. Organizasyondaki üyeler arasında iletişim kurulması için BT desteği sağlar	1	2	3	4	5	6
KME27. Gerekli bilgiyi arama, bulma ve erişim için BT desteği sağlar	1	2	3	4	5	6
KME28. Bilgisayar sistemlerimiz farklı fonksiyonlardan insanlarla beraber etkin şekilde çalışmamıza destek olur	1	2	3	4	5	6
KME29. İşimizi yapabilmemiz için gereken bilgiye bilgisayarlar üzerinden erişimimiz çok basit bir yapıdadır	1	2	3	4	5	6
KME30. En modern bilgi teknolojilerine sahibiz	1	2	3	4	5	6

BÖLÜM V – BİLGİ YARATMA

Çalıştığınız kurumu dikkate aldığınızda aşağıdaki ifadelerde belirtilen konulara kurumunuzun ne derece önem verdiğini değerlendiriniz:	Kesinlikle Önem Vermez	Çoğunlukla Önem Vermez	Kısmen Önem Vermez	Kısmen Önem Verir	Çoğunlukla Önem Verir	Kesinlikle Önem Verir
KC1. Satış ve üretim bölümlerinden bilgi toplamak	1	2	3	4	5	6
KC2. Tecrübelerini tedarikçiler ve müşteriler ile paylaşmak	1	2	3	4	5	6
KC3. Rakiplerle dialog halinde olmak	1	2	3	4	5	6
KC4. Kurum içinde dolaşarak yeni stratejiler ve pazar fırsatları bulmak	1	2	3	4	5	6
KC5. Çalışanların uzmanlıklarını paylaşabilecekleri iş ortamı yaratmak	1	2	3	4	5	6
KC6. Yaratıcı diyalogları desteklemek	1	2	3	4	5	6
KC7. Tümevarım ve tümdengelimci düşünmeyi desteklemek	1	2	3	4	5	6
KC8. Konsept yaratma diyaloglarında metafor kullanımını desteklemek	1	2	3	4	5	6
KC9. Farklı fikir ve diyalogların paylaşımını desteklemek	1	2	3	4	5	6
KC10. Subjektif fikirleri desteklemek	1	2	3	4	5	6
KC11. Stratejileri, literatürdeki yayınlar ve bilgisayar simülasyonları kullanarak yapmak	1	2	3	4	5	6
KC12. Ürün ve hizmetlerle ilgili kullanım kılavuzları ve dökümantasyon hazırlanması	1	2	3	4	5	6
KC13. Ürün ve hizmetler için veritabanları hazırlamak	1	2	3	4	5	6
KC14. Yönetim verileri ve teknik bilgileri kullanarak bilgilendirmeye dönük içerik hazırlamak	1	2	3	4	5	6
KC15. Yeni yaratılan konseptleri paylaşmak	1	2	3	4	5	6
KC16. Farklı fonksiyonlardan gelen çalışanların oluşturduğu geliştirme ekipleri ile fonksiyonel departmanların bağlantılı olmalarını sağlamak	1	2	3	4	5	6
KC17. Model olacak ekipler kurup, deneyler yapmak ve sonuçlarını tüm departmanlar ile paylaşmak	1	2	3	4	5	6
KC18. Yeni değer ve düşünceleri araştırmak ve paylaşmak	1	2	3	4	5	6
KC19. Çalışanlarla iletişim halinde olarak yönetim vizyonlarını paylaşmak ve anlamaya çalışmak	1	2	3	4	5	6

BÖLÜM VI – YENİ ÜRÜN GELİŞTİRME YETKİNLİKLERİ

Lütfen, şu anki durumu dikkate alarak kurumunuzu sektöre kıyasla aşağıdaki ifadeler açısından değerlendiriniz.	Çok daha başarısız	Daha başarısız	Kısmen başarısız	Kısmen başarılı	Daha başarılı	Çok daha başarılı
NPD1. Yeni geliştirilen ürünlerin kalitesi	1	2	3	4	5	6
NPD2. Yeni ürünleri rakiplerden önce pazara sunabilme	1	2	3	4	5	6
NPD3. Yeni ürün geliştirme hızı	1	2	3	4	5	6
NPD4. Yeni ürün geliştirme maliyeti	1	2	3	4	5	6
NPD5. Yeni geliştirilen ürünlerin satışı	1	2	3	4	5	6
NPD6. Yeni geliştirilen ürünlerin karlılığı	1	2	3	4	5	6
NPD7. Yeni ürün geliştirme esnekliği	1	2	3	4	5	6
NPD8. Yeni ürün geliştirme kalitesi	1	2	3	4	5	6
NPD9. Yeni ürün geliştirme sürecinde alınan dersler	1	2	3	4	5	6

BÖLÜM VII – ALGILANAN ŞİRKET PERFORMANSI

Lütfen, şu anki durumu dikkate alarak kurumunuzu sektöre kıyasla aşağıdaki ifadeler açısından değerlendiriniz.	Çok daha başarısız	Daha başarısız	Kısmen başarısız	Kısmen başarılı	Daha başarılı	Çok daha başarılı
PCP1. Müşteri memnuniyeti	1	2	3	4	5	6
PCP2. Toplam satışlar	1	2	3	4	5	6
PCP3. Pazar payı büyüklüğü	1	2	3	4	5	6
PCP4. Ürün/Servis kalitesi	1	2	3	4	5	6
PCP5. Ürün/Servis maliyeti	1	2	3	4	5	6
PCP6. Ürün/Servis esnekliği	1	2	3	4	5	6
PCP7. Ürün/Servis teslim hızı	1	2	3	4	5	6
PCP8. Ciro Karlılığı (Kar/Toplam satışlar)	1	2	3	4	5	6
PCP9. Aktif Karlılığı (Kar/Toplam varlıklar)	1	2	3	4	5	6
PCP10. Firmanın genel karlılık durumu	1	2	3	4	5	6
PCP11. Yatırım dışı nakit akışı	1	2	3	4	5	6

BÖLÜM VIII - ANKETE KATILAN KİŞİYE AİT BİLGİLER

KA01. Toplamda kaç yıldır profesyonel olarak çalışıyorsunuz?

☐ 0–1 ☐ 2–5 ☐ 6–10 ☐ 11 – 15 ☐ 16 – 20 ☐ 20+

KA02. Kaç yıldır bu sektördesiniz?

☐ 0–1 ☐ 2–5 ☐ 6–10 ☐ 11 – 15 ☐ 16 – 20 ☐ 20+

KA03. Kaç yıldır bu şirkette çalışıyorsunuz?

☐ 0–1 ☐ 2–5 ☐ 6–10 ☐ 11 – 15 ☐ 16 – 20 ☐ 20+

KA04. Firmanızdaki pozisyonunuz nedir?

☐ Tepe Yönetici (Genel Müdür, GMY, Genel Müdüre direk bağlı Direktör, Müdür, vb.)

☐ Üst Düzey Yönetici (Tepe Yöneticilere raporlama yapan yönetici)

☐ Orta Düzey Yönetici (Üst Düzey Yöneticiye raporlama yapan yönetici)

☐ Diğer _____

KA05. Çalıştığınız bölüm hangisidir?

☐ ARGE / Ürün Geliştirme (Dizayn, analiz, vb.) ☐ Pazarlama/Satış

☐ Yazılım Geliştirme (Kodlama, test, vb.) ☐ Satış Sonrası Hizmet

☐ Diğer _____

KA06. Yaşınız? _____

KA07. Cinsiyetiniz? ☐ Kadın ☐ Erkek

KA08. En son mezun olduğunuz okul nedir?

☐ Doktora ☐ Üniversite ☐ Lise

☐ Yüksek lisans ☐ Yüksekokul ☐ İlköğretim

Ankete katıldığınız için çok teşekkür ederiz.

Sonuçların size eposta yoluyla ulaşmasını istiyorsanız lütfen eposta adresinizi yazınız:

_____@_____

Appendix 4 - Questionnaire in English

PART I – COMPANY INFO

F1 What is your firm's full title? _____

F2 What is your firm's web address? www._____

F3 When was your company founded? _____

F4 What is your firm's main business? *(you can choose more than one)*

☐ Software ☐ Hardware ☐ Consultancy ☐ Solution provider

☐ IT Infrastructure provider ☐ Other _____

F5 What is the total number of employees in your company?

☐ 1-10 ☐ 11 – 50 ☐ 51 – 100

☐ 101- 250 ☐ 251 – 1.000 ☐ above 1.000

F6 What is the total sales volume? (YTL)

☐ 0-500.000 ☐ 500.001 – 1 million ☐ 1-2,5 million

☐ 2,5-5 million ☐ 5-10 million ☐ above 10 million

F7 What is your firm's legal status?

a) Corporation b) Limited Company c) Other: _____

F8 Does your firm have foreign shareholder/partner? ☐ Yes ☐ No

If Yes:

F9 What is foreign shareholder percentage? % _____

F10 When was your foreign partnership started? _____

PART II – MARKET DYNAMISM

	Please rate to the following statements related to your company and your business sector **according to your perceptions**	Strongly Disagree	Disagree	Partially Disagree	Partially Agree	Agree	Strongly Agree
MD1	This sector grows very fast	1	2	3	4	5	6
MD2	Competition in this sector is very intensive	1	2	3	4	5	6
MD3	This sector is recognized with intensive price competition	1	2	3	4	5	6
MD4	There are many rivals in this sector	1	2	3	4	5	6
MD5	There is a dominant competitor with big market share in this sector	1	2	3	4	5	6
MD6	Competitors strategies and actions changes continuously in the market	1	2	3	4	5	6
MD7	There are a lot of potential customers in this sector	1	2	3	4	5	6
MD8	New product supply in this market is very high	1	2	3	4	5	6
MD9	Competitors can easily copy new products	1	2	3	4	5	6
MD10	Competing products are very similar to each other	1	2	3	4	5	6
MD11	Products diminish in a fast pace in the market	1	2	3	4	5	6
MD12	There are a lot of imported competing products in this sector	1	2	3	4	5	6
MD13	Many different and complicated products were developed by competitors	1	2	3	4	5	6
MD14	Customer demands change very fast in this sector	1	2	3	4	5	6
MD15	Customer needs are very complicated and different than each other	1	2	3	4	5	6
MD16	Customers are very conscious about the demands and expectations	1	2	3	4	5	6
MD17	Price determines the loyalty to current products in this sector	1	2	3	4	5	6
MD18	Technological change rate is very high in the market	1	2	3	4	5	6
MD19	Applied technologies are complicated and different than each other	1	2	3	4	5	6
MD20	It is hard to find qualified work power and to retain them in this sector	1	2	3	4	5	6

PART III – BUSINESS STRATEGIES

BS1. Does your company have a written and approved strategic plan which is clearly stated, and approved by top management? ☐ Yes ☐ No

BS2. **If yes,** what is the time period for the strategic plan? _____

When compared with your main competitors, for the similar products, how do you rate your firm for the statements below?

BS3. **Price**	Very low price	1	2	3	4	5	6	Very high price
BS4. **Quality**	Very low quality	1	2	3	4	5	6	Very high quality
BS5. **Focusing** (Target Market Share)	Too narrow	1	2	3	4	5	6	Too wide
BS6. **Variation** (Product Range)	Too narrow	1	2	3	4	5	6	Too wide

Please state the main factor that effects your investment decisions:

BS7. Big investments : Fully Operational 1 2 3 4 5 6 Fully Strategic

BS8. Small investments : Fully Operational 1 2 3 4 5 6 Fully Strategic

	Please indicate the importance of the below issues for the last three years (2005-2006-2007) in your company	Absolutely not important	Not important	Partially not important	Partially important	Important	Absolutely very important
BS9	To make small changes in present products for the present market	1	2	3	4	5	6
BS10.	To develop new products for existing markets	1	2	3	4	5	6
BS11	To enter new markets with present solutions	1	2	3	4	5	6
BS12	To enter new markets with new products	1	2	3	4	5	6

	Please indicate the resource level that your company reserved for the last three years (2005-2006-2007) on applying new product development strategies for new products you had introduced to the market	No resources reserved	Not enough resources reserved	Partially resources not reserved	Partially resources reserved	Enough resources reserved	All resources reserved
BS13	New technology development	1	2	3	4	5	6
BS14	Improve its own technology	1	2	3	4	5	6
BS15	Improve technology developed by others	1	2	3	4	5	6
BS16	Use technology developed by others	1	2	3	4	5	6

PART IV – KNOWLEDGE MANAGEMENT ENABLERS

Please rate the following statements related to your company:		Strongly Disagree	Disagree	Partially Disagree	Partially Agree	Agree	Strongly Agree
Collaboration	KME1. Collaboration level in our organization is satisfying	1	2	3	4	5	6
	KME2. Our organization members are supportive	1	2	3	4	5	6
	KME3. There is willingness to collaborate across organizational units	1	2	3	4	5	6
Trust	KME4. Our company members have reciprocal faith in other members' intentions and behaviours	1	2	3	4	5	6
	KME5. Our company members have reciprocal faith in others' ability	1	2	3	4	5	6
	KME6. Our company members have relationships based on reciprocal faith	1	2	3	4	5	6
Participating in boundary spanning structures	KME7. There are cross functional project or program teams	1	2	3	4	5	6
	KME8. There are problem-solving and improvement teams	1	2	3	4	5	6
	KME9. Knowledge-sharing networks are intensive	1	2	3	4	5	6
Learning	KME10. Our company provides job rotation for employees to develop themselves	1	2	3	4	5	6
	KME11. Our company provides opportunities for informal individual development	1	2	3	4	5	6
	KME12. Our company members are satisfied by the contents of job training or self-development programs	1	2	3	4	5	6
Centralization	KME13. Our company members are not encouraged to make their own decisions	1	2	3	4	5	6
	KME14. Our company members need to get approval before making decisions	1	2	3	4	5	6
	KME15. Our company members need to ask their supervisors before action	1	2	3	4	5	6

Formalization	KME16. In our company rules and procedures are typically written	1	2	3	4	5	6
	KME17. In our company members obey and apply the rules any time	1	2	3	4	5	6
	KME18. In our company legal agreements are always signed while doing business with other companies	1	2	3	4	5	6
Direction and Performance information	KME19. I am always informed on my personal goals and performance	1	2	3	4	5	6
	KME20. I am always informed on my departments goals and performance	1	2	3	4	5	6
	KME21. I am always informed on company goals, performance and plans that affect me	1	2	3	4	5	6
T-shaped skills	KME22. Our company members can understand not only their own tasks but also others' tasks	1	2	3	4	5	6
	KME23. Our company members can make suggestion about others' task	1	2	3	4	5	6
	KME24. Our company members can communicate well not only with their department members but also with other department members	1	2	3	4	5	6
IT quality	KME25. Our company provides IT support for collaborative works regardless of time and place	1	2	3	4	5	6
	KME26. Our company provides IT support for communication among organization members	1	2	3	4	5	6
	KME27. Our company provides IT support for searching and accessing necessary information	1	2	3	4	5	6
IT support	KME28. Our computer tools help people from multiple functions to work together effectively	1	2	3	4	5	6
	KME29. We have easy computer access to the information we need to do our jobs	1	2	3	4	5	6
	KME30. We have state of the art computer tools	1	2	3	4	5	6

PART V – KNOWLEDGE CREATION PROCESS

Please rate at what level your company cares (stresses) for the following statements		Absolutely Not Cares	Mostly Not Cares	Partially not Cares	Partially cares	Mostly Cares	Absolutely Cares
Socialization	KC1: gathering information from sales and production sites.	1	2	3	4	5	6
	KC2: sharing experience with suppliers and customers.	1	2	3	4	5	6
	KC3: engaging in dialogue with competitors.	1	2	3	4	5	6
	KC4: finding new strategies and market opportunities by wandering inside the firm.	1	2	3	4	5	6
	KC5: creating a work environment that allows peers to understand the craftsmanship and expertise.	1	2	3	4	5	6
Externalization	KC6: creative and essential dialogues.	1	2	3	4	5	6
	KC7: the use of deductive and inductive thinking.	1	2	3	4	5	6
	KC8: the use of metaphors in dialogue for concept creation.	1	2	3	4	5	6
	KC9: exchanging various ideas and dialogues.	1	2	3	4	5	6
	KC10: subjective opinions.	1	2	3	4	5	6
Combination	KC11: planning strategies by using published literature, computer simulation and forecasting.	1	2	3	4	5	6
	KC12: creating manuals and documents on products and services.	1	2	3	4	5	6
	KC13: building databases on products and service.	1	2	3	4	5	6
	KC14: building up materials by gathering management figures and technical information.	1	2	3	4	5	6
	KC15: transmitting newly created concepts.	1	2	3	4	5	6
Internalization	KC16: enactive liaisoning activities with functional departments by cross-functional development teams.	1	2	3	4	5	6
	KC17: forming teams as a model and conducting experiments, and sharing results with entire departments.	1	2	3	4	5	6
	KC18: searching and sharing new values and thoughts.	1	2	3	4	5	6
	KC19: sharing and trying to understand management visions through communications with fellows.	1	2	3	4	5	6

PART VI – NEW PRODUCT DEVELOPMENT CAPABILITIES

Please rate each item according to your company's situation with respect to the sector:		Much more unsuccessful	Mostly unsuccessful	Partially unsuccessful	Partially successful	Mostly Successful	Much more successful
NPD1.	The quality of new developed products and services	1	2	3	4	5	6
NPD2.	Introducing new products before competitors	1	2	3	4	5	6
NPD3.	New product development speed	1	2	3	4	5	6
NPD4.	New product development cost	1	2	3	4	5	6
NPD5.	New product development sales	1	2	3	4	5	6
NPD6.	Profits from new developed products	1	2	3	4	5	6
NPD7.	New product development flexibility	1	2	3	4	5	6
NPD8.	New product development quality	1	2	3	4	5	6
NPD9.	Lessons learned during new product development	1	2	3	4	5	6

PART VII – PERCEIVED COMPANY PERFORMANCE

		Please rate each item according to your company's situation with respect to the sector:	Much more unsuccessful	Mostly unsuccessful	Partially unsuccessful	Partially successful	Mostly Successful	Much more successful
Market Performance	PCP1	Customer satisfaction	1	2	3	4	5	6
	PCP2	Total sales	1	2	3	4	5	6
	PCP3	Market share	1	2	3	4	5	6
New Prroduct Development Performance	PCP4	Product/Service quality	1	2	3	4	5	6
	PCP5	Product/Service cost	1	2	3	4	5	6
	PCP6	Product/Service flexibility	1	2	3	4	5	6
	PCP7	Product/Service delivery speed	1	2	3	4	5	6
Financial Performance	PCP8	Profit with respect to Total Sales (Profit/Total Sales)	1	2	3	4	5	6
	PCP9	Profit with respect to Total Assets (Profit/Total Assets)	1	2	3	4	5	6
	PCP10	General profitability of the firm	1	2	3	4	5	6
	PCP11	Cash flow (other than investments)	1	2	3	4	5	6

PART VIII – PARTICIPANT INFO

KA01. For how many years you have been working as a professional?

☐ 0–1 ☐ 2–5 ☐ 6–10 ☐ 11 – 15 ☐ 16 – 20 ☐ 20+

KA02. For how many years you are in this sector?

☐ 0–1 ☐ 2–5 ☐ 6–10 ☐ 11 – 15 ☐ 16 – 20 ☐ 20+

KA03. For how many years you are in this company?

☐ 0–1 ☐ 2–5 ☐ 6–10 ☐ 11 – 15 ☐ 16 – 20 ☐ 20+

KA04. What is your position in your company?

☐ Top Management (CEO, or; EVP, Directors, Managers, etc. reporting to CEO)

☐ Managers reporting to Top Management

☐ Employees reporting to Managers

☐ Employees, other

KA05. In which business area are you working in your company?

☐ R&D / Product Development (Design, analysis, etc.) ☐ Marketing/Sales

☐ Software Development (Coding, testing, etc.) ☐ After Sales Service

☐ Other _____

KA06. What is your age? _____

KA07. What is your genre? ☐ Female ☐ Male

KA08. Your academic degree?

☐ PhD ☐ University (4 years) ☐ High School

☐ Master / Graduate ☐ Associate (2 year) ☐ Primary school

Thank you very much for your participation.

If you like the results to be shared with you, please write your email address.

_____@_____

Appendix 5 - Variables in SPSS

Width	Decimals	Label	Values	Missing	Coloumns	Align	Measure
1	0	Group Number for T Test wrt Company	{1, Intertech}...	None	8	Right	Scale
6	0	Response ID	None	None	8	Right	Scale
50	0	Company Name	None	None	36	Left	Nominal
30	0	Company Web Address	None	None	15	Left	Nominal
4	0	Foundation Year	None	None	8	Right	Scale
1	0	Business Area	1, Software 2, Hardware 3, Consultancy 4, Solution Provider 5, IT Infrastructure 6, Other	None	8	Right	Ordinal
30	0	Business Area Other Details	None	None	8	Left	Nominal
1	0	Number of Employees	1, 0-10 2, 11-50 3, 51-100 4, 101-250 5, 251-1000 6, +1001	None	8	Right	Ordinal
1	0	Sales volume	1, 0-500.000 2, 500.001 – 1million 3, 1 – 2,5 million 4, 2,5 – 5 million 5, 5 – 10 million 6, + 10 million	None	8	Right	Ordinal
1	0	Legal Status	1, Corporate 2, Limited 3, Other	None	6	Left	Nominal
1	0	Foreign Partner	1, Yes 2, No	None	6	Left	Nominal
2	0	Foreign shareholder percentage	1, Strongly Disagree	None	8	Right	Ordinal
2	0	When your foreign partnership started		None	8	Right	Ordinal

1	0	MD1 Growth of Sector	2, Mostly Disagree	None	6	Left	Ordinal
1	0	MD2 Competition	3, Partially Disagree	None	6	Left	Ordinal
1	0	MD3 price competition	4, Partially Agree	None	6	Left	Ordinal
1	0	MD4 many rivals	5, Mostly Agree	None	6	Left	Ordinal
1	0	MD5 dominant competitior	6, Strongly Agree	None	6	Left	Ordinal
1	0	MD6 Change in Strategies&actions		None	6	Left	Ordinal
1	0	MD7 Many Potential Customers		None	6	Left	Ordinal
1	0	MD8 High New Product Supply		None	6	Left	Ordinal
1	0	MD9 Easily Copying New Products		None	6	Left	Ordinal
1	0	MD10 Competing Product are very Similar		None	6	Left	Ordinal
1	0	MD11 Products Diminish Fast		None	6	Left	Ordinal
1	0	MD12 Many İmported Competing Products		None	6	Left	Ordinal
1	0	MD13 Many Different and Complicated Products		None	6	Left	Ordinal
1	0	MD14 Customer demands		None	6	Left	Ordinal
1	0	MD15 Customer needs		None	6	Left	Ordinal
1	0	MD16 Customer conscious ness		None	6	Left	Ordinal
1	0	MD17 Current Product Loyalty		None	6	Left	Ordinal
1	0	MD18 Technological change		None	6	Left	Ordinal
1	0	MD19 Applied Technologies		None	6	Left	Ordinal
1	0	MD20 Find Qualified Work Power		None	6	Left	Ordinal
1	0	BS1 Strategic Plan	1, Yes 2, No	None	6	Left	Nominal
1	0	BS2 time period for the strategic plan	None	None	7	Left	Scale
1	0	BS3 Price	1, Very Low 2, Low 3, Below Average 4, Above Average 5, High 6, Very High	None	8	Left	Ordinal
1	0	BS4 Quality		None	8	Left	Ordinal

Width	Decimals	Label	Values	Missing	Coloumns	Align	Measure
1	0	BS5 Focusing	1, Very Focused 2, 3, 4, 5, 6, Very Wide	None	8	Left	Ordinal
1	0	BS6 Variation	1, Completely Operational 2, 3, 4, 5, 6, Completely Strategic	None	8	Left	Ordinal
1	0	BS7 Big investments	1, Absolutely Not Important 2, 3, 4, 5, 6, Strongly Important	None	8	Left	Ordinal
1	0	BS8 Small investments	1, No Resources Reserved 2, 3, 4, 5, 6, All Resources Reserved	None	8	Left	Ordinal
1	0	BS9 Small changes in present products		None	8	Left	Ordinal
1	0	BS10 NP for Existing Markets		None	8	Left	Ordinal
1	0	BS11 New markets with present solutions		None	8	Left	Ordinal
1	0	BS12 New markets with new products		None	8	Left	Ordinal
1	0	BS13 New technology development		None	8	Left	Ordinal
1	0	BS14 Improve its own technology		None	8	Left	Ordinal
1	0	BS15 Improve technology developed by others		None	8	Left	Ordinal
1	0	BS16 Use technology developed by others		None	8	Left	Ordinal

Width	Decimals	Label	Values	Missing	Coloumns	Align	Measure
1	0	KME1 C1 Collaboration level		None	8	Left	Ordinal
1	0	KME2 C1 supportive Members		None	8	Left	Ordinal
1	0	KME3 C1 collaborate across organizational units		None	8	Left	Ordinal
1	0	KME4 C2 other members' intentions and behaviours		None	8	Left	Ordinal
1	0	KME5 C2 others' ability		None	8	Left	Ordinal
1	0	KME6 C2 relationships on reciprocal faith		None	8	Left	Ordinal
1	0	KME7 C3 cross functional teams		None	8	Left	Ordinal
1	0	KME8 C3 problem-solving teams		None	8	Left	Ordinal
1	0	KME9 C3 Knowledge-sharing networks		None	8	Left	Ordinal
1	0	KME10 C4 job rotation		None	8	Left	Ordinal
1	0	KME11 C4 informal individual development	1, Strongly Disagree	None	8	Left	Ordinal
1	0	KME12 C4 job training		None	8	Left	Ordinal
1	0	KME13 S5 not encouraged to make their own decisions	2, Mostly Disagree	None	8	Left	Ordinal
1	0	KME14 S5 get approval before making decisions		None	8	Left	Ordinal
1	0	KME15 S5 ask their supervisors before action	3, Partially Disagree	None	8	Left	Ordinal
1	0	KME16 S6 Written rules and procedures		None	8	Left	Ordinal
1	0	KME17 S6 obey and apply the rules	4, Partially Agree	None	8	Left	Ordinal
1	0	KME18 S6 Signed legal agreements		None	8	Left	Ordinal
1	0	KME19 S7 informed on personal goals and performance	5, Mostly Agree	None	8	Left	Ordinal
1	0	KME20 S7 informed on departments goals and performance		None	8	Left	Ordinal
1	0	KME21 S7 informed on company goals and performance	6, Strongly Agree	None	8	Left	Ordinal
1	0	KME22 S8 understand other task		None	8	Left	Ordinal
1	0	KME23 S8 make suggestion about others' task		None	8	Left	Ordinal
1	0	KME24 S8 communicate well with other department members		None	8	Left	Ordinal
1	0	KME25 P9 IT support for collaborative works		None	8	Left	Ordinal
1	0	KME26 P9 IT support for communication		None	8	Left	Ordinal
1	0	KME27 P9 IT support for searching information		None	8	Left	Ordinal
1	0	KME28 T10 computer tools help people to work together		None	8	Left	Ordinal
1	0	KME29 T10 easy computer access to information		None	8	Left	Ordinal
1	0	KME30 T10 state of the art computer tools		None	4	Left	Ordinal

Width	Decimals	Label	Values	Missing	Coloumns	Align	Measure
1	0	KC1 S Gathering Information from sales and production sites		None	5	Left	Ordinal
1	0	KC2 S Sharing experience with suppliers and customers		None	4	Left	Ordinal
1	0	KC3 S Engaging in dialogue with competitors		None	3	Left	Ordinal
1	0	KC4 S Finding new strategies by wandering inside firm		None	3	Left	Ordinal
1	0	KC5 S Enabling understanding of craftsmanship and expertise	1, Absolutely Not Cares	None	4	Left	Ordinal
1	0	KC6 E Creative and essential dialogue		None	3	Left	Ordinal
1	0	KC7 E Using deductive and inductive thinking	2, Mostly Not Cares	None	3	Left	Ordinal
1	0	KC8 E Using metaphors for concept creation		None	3	Left	Ordinal
1	0	KC9 E Exchanging various ideas and dialogues	3, Partially Not Cares	None	4	Left	Ordinal
1	0	KC10 E Subjective opinions		None	3	Left	Ordinal
1	0	KC11 C Using literature and simulation during planning strategies	4, Partially Cares	None	4	Left	Ordinal
1	0	KC12 C Creating manuels and documents on products		None	3	Left	Ordinal
1	0	KC13 C Building databases on products	5, Mostly Cares	None	8	Right	Ordinal
1	0	KC14 C Building materials by gathering management figures		None	8	Right	Ordinal
1	0	KC15 C Transmitting newly created concepts	6, Strongly Cares	None	8	Right	Ordinal
1	0	KC16 I Enactive liasoning activities by cross-functional teams		None	8	Right	Ordinal
1	0	KC17 I Forming teams as a model		None	8	Right	Ordinal
1	0	KC18 I Sharing new values and thougts		None	8	Right	Ordinal
1	0	KC19 I Sharing management visions through communications		None	8	Right	Ordinal
1	0	NPDC1 The quality of new developed products and services		None	5	Left	Ordinal
1	0	NPDC2 Introducing new products before competitors	1, Much More Unsuccessful	None	6	Left	Ordinal
1	0	NPDC3 New product development speed	2, Unsuccessfull	None	5	Left	Ordinal
1	0	NPDC4 New product development cost		None	8	Left	Ordinal
1	0	NPDC5 New product development sales	3, Partially Unsuccessfull	None	8	Left	Ordinal
1	0	NPDC6 Profits from new developed products		None	8	Left	Ordinal
1	0	NPDC7 New product development flexibility	4, Partially Successful	None	8	Left	Ordinal
1	0	NPDC8 New product development quality		None	8	Left	Ordinal
1	0	NPDC9 Lessons learned during new product development	5, Successful	None	8	Left	Ordinal
			6, Much More Successfull				

Width	Decimals	Label	Values	Missing	Coloumns	Align	Measure
1	0	PCP1 MP Customer satisfaction		None	8	Left	Ordinal
1	0	PCP2 MP Total sales	1, Much More Unsuccessful	None	8	Left	Ordinal
1	0	PCP3 MP Market share	2, Unsuccessfull	None	8	Left	Ordinal
1	0	PCP4 PSP Product/Service quality		None	8	Right	Ordinal
1	0	PCP5 PSP Product/Service cost	3, Partially Unsuccessfull	None	8	Right	Ordinal
1	0	PCP6 PSP Product/Service flexibility	4, Partially Successful	None	8	Right	Ordinal
1	0	PCP7 FP Product/Service delivery speed		None	8	Right	Ordinal
1	0	PCP8 FP Return on sales (Profit/Total sales)	5, Successful	None	8	Left	Ordinal
1	0	PCP9 FP Return on assets (Profit/Total Assets)	6, Much More Successfull	None	8	Left	Ordinal
1	0	PCP10 FP General profitability of the firm		None	8	Left	Ordinal
1	0	SI1 Years as a professional		None	6	Left	Ordinal
1	0	SI2 Years in this sector	1, 0-1 2, 2-5 3, 6-10 4, 11-15	None	6	Left	Ordinal
1	0	SI3 Years in this company	5, 16-20 6, +20	None	6	Left	Ordinal
1	0	SI4 Position in Company	1, Top Management 2, Senior Management 3, Middle Management 4, Other	None	8	Left	Ordinal
20	0	SI4_Detail Position in Company Other in Detail	None	None	8	Left	Nominal
1	0	SI5 Business Line	1, Marketing/Sales 2, After Sales Service 3, R&D, Product Development 4, Software Development 5, Other	None	8	Right	Ordinal
20	0	SI5_Detail Business Line Other in Detail	None	None	8	Left	Nominal
1	0	SI6 Age	None	None	8	Right	Scale
1	0	SI7 Sex	1, Female 2, Male	None	8	Right	Nominal
1	0	SI8 Academic Degree	1, PhD 2, Graduate, 3, Undergraduate 4, Associate 5, High School 6, Primary School	None	8	Right	Ordinal
30	0	SI9 Email Address	None	None	8	Left	Nominal

Appendix 6 - Descriptive Statistics

Descriptive Statistics											
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Foundation Year	274	73	1935	2008	1993,38	12,825	164,477	-2,851	,147	8,911	,293
Business Area Software	230	0	1	1	1,00	,000	,000	.	.	.	.
Business Area Hardware	61	0	1	1	1,00	,000	,000	.	.	.	.
Business Area Consultancy	119	0	1	1	1,00	,000	,000	.	.	.	.
Business Area Solution Provider	172	0	1	1	1,00	,000	,000	.	.	.	.
Business Area IT Infrastructure	98	0	1	1	1,00	,000	,000	.	.	.	.
Business Area Other	42	0	1	1	1,00	,000	,000	.	.	.	.
Number of Employees	292	5	1	6	3,49	1,393	1,941	,389	,143	-,469	,284
Sales volume	233	5	1	6	4,88	1,259	1,586	-1,478	,159	2,117	,318
Legal Status	293	2	1	3	1,31	,540	,291	1,507	,142	1,349	,284
Foreign Partner	294	2	0	2	1,62	,514	,264	-,795	,142	-,697	,283
Foreign shareholder percentage	89	98	2	100	89,56	23,960	574,090	-2,276	,255	4,222	,506
When your foreign partnership started	85	34	1973	2007	2001,42	7,402	54,795	-1,626	,261	1,961	,517
MD1 Growth of Sector	294	5	1	6	4,98	1,122	1,259	-1,615	,142	3,138	,283
MD2 Competition	294	5	1	6	5,03	1,089	1,187	-1,489	,142	2,546	,283
MD3 price competition	293	5	1	6	4,50	1,238	1,532	-,711	,142	,030	,284
MD4 many rivals	293	5	1	6	4,45	1,189	1,413	-,917	,142	,636	,284
MD5 dominant competitior	294	5	1	6	3,85	1,369	1,875	-,217	,142	-,831	,283
MD6 Change in Strategies&actions	294	5	1	6	4,09	1,164	1,355	-,533	,142	-,508	,283

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
MD7 Many Potential Customers	294	5	1	6	4,60	1,173	1,375	-,998	,142	,723	,283
MD8 High New Product Supply	293	5	1	6	4,26	1,262	1,592	-,589	,142	-,377	,284
MD9 Easily Copying New Products	294	5	1	6	4,44	1,212	1,469	-,753	,142	-,060	,283
MD10 Competing Product are very Similar	293	5	1	6	4,24	1,137	1,292	-,663	,142	,222	,284
MD11 Products Diminish Fast	293	5	1	6	3,98	1,329	1,767	-,279	,142	-,698	,284
MD12 Many İmported Competing Products	293	5	1	6	4,03	1,461	2,136	-,424	,142	-,888	,284
MD13 Many Different and Complicated Products	294	5	1	6	3,62	1,303	1,697	-,077	,142	-,809	,283
MD14 Customer demands	294	5	1	6	4,38	1,266	1,603	-,561	,142	-,541	,283
MD15 Customer needs	293	5	1	6	3,84	1,355	1,836	-,099	,142	-,963	,284
MD16 Customer conscious ness	293	5	1	6	3,54	1,294	1,674	-,056	,142	-,901	,284
MD17 Current Product Loyalty	294	5	1	6	3,49	1,233	1,520	,024	,142	-,769	,283
MD18 Technological change	294	5	1	6	4,56	1,204	1,448	-,724	,142	-,051	,283
MD19 Applied Technologies	294	5	1	6	3,17	1,228	1,509	,444	,142	-,552	,283
MD20 Find Qualified Work Power	294	5	1	6	4,59	1,170	1,369	-,749	,142	,024	,283
BS1 Strategic Plan	286	1	1	2	1,40	,490	,241	,416	,144	-1,840	,287
BS2 time period for the strategic plan	149	49	1	50	4,66	4,579	20,970	6,755	,199	64,901	,395
BS3 Price	283	5	1	6	3,81	1,030	1,061	-,422	,145	,655	,289
BS4 Quality	288	5	1	6	4,93	,958	,918	-,978	,144	1,144	,286
BS5 Focusing	285	5	1	6	4,38	1,244	1,547	-,558	,144	-,325	,288
BS6 Variation	291	5	1	6	4,42	1,266	1,603	-,541	,143	-,408	,285
BS7 Big investments	284	5	1	6	4,36	1,360	1,848	-,844	,145	,147	,288
BS8 Small investments	282	5	1	6	3,31	1,368	1,872	-,017	,145	-,816	,289

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
BS9 Small changes in present products	289	5	1	6	4,22	1,214	1,474	-,556	,143	-,070	,286
BS10 NP for Existing Markets	290	5	1	6	5,06	1,070	1,146	-1,423	,143	2,116	,285
BS11 New markets with present solutions	287	5	1	6	4,76	1,160	1,346	-1,164	,144	1,226	,287
BS12 New markets with new products	289	5	1	6	4,74	1,295	1,677	-1,146	,143	,751	,286
BS13 New technology development	288	5	1	6	4,27	1,318	1,738	-,639	,144	-,113	,286
BS14 Improve its own technology	289	5	1	6	4,44	1,144	1,310	-,697	,143	,156	,286
BS15 Improve technology developed by others	288	5	1	6	3,22	1,532	2,346	,061	,144	-1,150	,286
BS16 Use technology developed by others	288	5	1	6	3,59	1,460	2,131	-,251	,144	-,826	,286
KME1 C1 Collaboration level	274	5	1	6	4,77	1,063	1,130	-1,225	,147	1,967	,293
KME2 C1 supportive Members	274	5	1	6	4,94	,998	,996	-1,501	,147	3,255	,293
KME3 C1 collaborate across organizational units	274	5	1	6	4,50	1,110	1,233	-,818	,147	,741	,293
KME4 C2 other members' intentions and behaviours	274	5	1	6	4,78	1,054	1,111	-,905	,147	1,023	,293
KME5 C2 others' ability	273	5	1	6	4,73	,971	,943	-,882	,147	1,195	,294
KME6 C2 relationships on reciprocal faith	274	5	1	6	4,78	,991	,983	-,875	,147	1,087	,293
KME7 C3 cross functional teams	273	5	1	6	4,62	1,128	1,273	-,863	,147	,777	,294
KME8 C3 problem-solving teams	272	5	1	6	4,53	1,139	1,298	-,872	,148	,778	,294
KME9 C3 Knowledge-sharing networks	272	5	1	6	4,42	1,169	1,366	-,731	,148	,380	,294
KME10 C4 job rotation	272	5	1	6	3,81	1,322	1,747	-,307	,148	-,483	,294
KME11 C4 informal individual development	272	5	1	6	4,40	1,336	1,784	-,772	,148	,046	,294
KME12 C4 job training	272	5	1	6	4,03	1,429	2,043	-,487	,148	-,554	,294
KME13 S5 not encouraged to make their own decisions	272	5	1	6	3,27	1,388	1,926	,262	,148	-,841	,294
KME14 S5 get approval before making decisions	272	5	1	6	4,02	1,173	1,376	-,229	,148	-,556	,294

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
KME15 S5 ask their supervisors before action	272	5	1	6	3,84	1,297	1,683	-,142	,148	-,805	,294
KME16 S6 Written rules and procedures	270	5	1	6	4,13	1,367	1,868	-,553	,148	-,441	,295
KME17 S6 obey and apply the rules	272	5	1	6	4,22	1,091	1,191	-,482	,148	-,082	,294
KME18 S6 Signed legal agreements	272	5	1	6	5,33	,930	,866	-1,683	,148	3,151	,294
KME19 S7 informed on personal goals and performance	269	5	1	6	4,39	1,441	2,075	-,782	,149	-,198	,296
KME20 S7 informed on departments goals and performance	268	5	1	6	4,60	1,284	1,650	-,986	,149	,573	,297
KME21 S7 informed on company goals and performance	267	5	1	6	4,48	1,341	1,799	-,861	,149	,196	,297
KME22 S8 understand other task	265	5	1	6	4,24	1,382	1,909	-,651	,150	-,258	,298
KME23 S8 make suggestion about others' task	269	5	1	6	4,26	1,357	1,841	-,700	,149	-,128	,296
KME24 S8 communicate well with other department members	269	5	1	6	4,53	1,265	1,601	-,926	,149	,491	,296
KME25 P9 IT support for collaborative works	269	5	1	6	4,74	1,185	1,404	-,981	,149	,695	,296
KME26 P9 IT support for communication	269	5	1	6	4,77	1,141	1,303	-,972	,149	,693	,296
KME27 P9 IT support for searching information	268	5	1	6	4,80	1,140	1,300	-1,293	,149	1,960	,297
KME28 T10 computer tools help people to work together	268	5	1	6	4,82	1,078	1,161	-1,150	,149	1,743	,297
KME29 T10 easy computer access to information	267	5	1	6	4,81	1,181	1,396	-1,154	,149	1,181	,297
KME30 T10 state of the art computer tools	269	5	1	6	4,69	1,148	1,319	-,998	,149	1,027	,296
KC1 S Gathering Information from sales and production sites	263	5	1	6	4,63	1,118	1,249	-,986	,150	1,039	,299
KC2 S Sharing experience with suppliers and customers	262	5	1	6	4,58	,982	,964	-,799	,150	,970	,300
KC3 S Engaging in dialogue with competitors	263	5	1	6	4,03	1,160	1,347	-,643	,150	,108	,299
KC4 S Finding new strategies by wandering inside firm	261	5	1	6	4,35	1,041	1,083	-,664	,151	,631	,300
KC5 S Enabling understanding of craftsmanship and expertise	262	5	1	6	4,41	1,130	1,277	-,822	,150	,624	,300
KC6 E Creative and essential dialogue	263	5	1	6	4,52	1,091	1,190	-,978	,150	1,352	,299

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Erro	Statistic	Std. Error
KC7 E Using deductive and inductive thinking	262	5	1	6	4,40	1,136	1,292	-,733	,150	,576	,300
KC8 E Using metaphors for concept creation	256	5	1	6	4,16	1,141	1,301	-,550	,152	,376	,303
KC9 E Exchanging various ideas and dialogues	262	5	1	6	4,48	1,106	1,224	-,823	,150	,861	,300
KC10 E Subjective opinions	262	5	1	6	4,07	1,144	1,309	-,607	,150	,024	,300
KC11 C Using literature and simulation during planning strategies	258	5	1	6	4,04	1,293	1,672	-,671	,152	-,037	,302
KC12 C Creating manuels and documents on products	262	5	1	6	4,64	1,149	1,320	-,799	,150	,195	,300
KC13 C Building databases on products	262	5	1	6	4,74	1,063	1,130	-1,001	,150	1,037	,300
KC14 C Building materials by gathering management figures	264	5	1	6	4,62	1,083	1,172	-,786	,150	,384	,299
KC15 C Transmitting newly created concepts	264	5	1	6	4,58	1,086	1,180	-,950	,150	,924	,299
KC16 I Enactive liasoning activities by cross-functional teams	261	5	1	6	4,36	1,164	1,354	-,720	,151	,392	,300
KC17 I Forming teams as a model	264	5	1	6	3,94	1,335	1,783	-,593	,150	-,395	,299
KC18 I Sharing new values and thougts	263	5	1	6	4,40	1,127	1,271	-,696	,150	,413	,299
KC19 I Sharing management visions through communications	264	5	1	6	4,42	1,212	1,468	-,844	,150	,478	,299
NPDC1 The quality of new developed products and services	261	5	1	6	4,92	,840	,705	-1,183	,151	3,234	,300
NPDC2 Introducing new products before competitors	260	5	1	6	4,62	1,114	1,241	-,979	,151	1,126	,301
NPDC3 New product development speed	260	5	1	6	4,58	1,061	1,125	-,927	,151	1,207	,301
NPDC4 New product development cost	259	5	1	6	4,40	1,038	1,078	-,697	,151	,830	,302
NPDC5 New product development sales	261	5	1	6	4,58	1,026	1,052	-1,107	,151	1,926	,300
NPDC6 Profits from new developed products	259	5	1	6	4,44	,980	,961	-,862	,151	1,780	,302
NPDC7 New product development flexibility	260	5	1	6	4,67	1,086	1,178	-,872	,151	,754	,301
NPDC8 New product development quality	260	5	1	6	4,92	,882	,777	-1,238	,151	3,510	,301

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Erro	Statistic	Std. Error
NPDC9 Lessons learned during new product development	260	5	1	6	4,62	1,131	1,280	-1,168	,151	1,714	,301
PCP1 MP Customer satisfaction	256	5	1	6	5,01	,787	,620	-1,327	,152	3,816	,303
PCP2 MP Total sales	256	5	1	6	4,74	,861	,741	-1,037	,152	2,087	,303
PCP3 MP Market share	255	5	1	6	4,75	1,035	1,071	-,921	,153	,798	,304
PCP4 PSP Product/Service quality	255	4	2	6	4,95	,782	,611	-1,000	,153	2,218	,304
PCP5 PSP Product/Service cost	255	5	1	6	4,59	,886	,786	-,573	,153	,593	,304
PCP6 PSP Product/Service flexibility	256	5	1	6	4,82	,908	,825	-,831	,152	1,144	,303
PCP7 FP Product/Service delivery speed	255	5	1	6	4,78	,896	,802	-,746	,153	,962	,304
PCP8 FP Return on sales (Profit/Total sales)	250	5	1	6	4,60	,957	,916	-,649	,154	,605	,307
PCP9 FP Return on assets (Profit/Total Assets)	246	5	1	6	4,61	,970	,942	-,707	,155	,661	,309
PCP10 FP General profitability of the firm	244	5	1	6	4,61	1,002	1,004	-,864	,156	,991	,310
SI1 Years as a professional	234	5	1	6	3,25	1,333	1,777	,197	,159	-,556	,317
SI2 Years in this sector	230	5	1	6	2,93	1,286	1,655	,392	,160	-,325	,320
SI3 Years in this company	226	4	1	5	2,22	1,021	1,042	,440	,162	-,500	,322
SI4 Position in Company	241	5	1	6	3,04	1,106	1,223	-,697	,157	-,628	,312
SI5 Business Line	234	4	1	5	3,62	1,379	1,903	-,826	,159	-,553	,317
SI6 Age	228	44	20	64	32,41	6,967	48,543	1,221	,161	2,381	,321
SI7 Sex	235	1	1	2	1,72	,448	,201	-1,005	,159	-,998	,316
SI8 Academic Degree	237	4	1	5	2,79	,745	,555	,603	,158	1,530	,315
Valid N (listwise)	0										

Appendix 7 - Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Competitive Intensity	1,00																
2	Dynamism	0,35	1,00															
3	Product Uncertainty	0,44	0,29	1,00														
4	Business Strategies				1,00													
5	Mutual Trust					1,00												
6	Learning				0,34	0,48	1,00											
7	Formalization				0,36		0,41	1,00										
8	Centralization					-0,22			1,00									
9	Dir and Perf Info				0,34	0,49	0,52	0,38	-0,25	1,00								
10	T-shape skills				0,33	0,46	0,58	0,36		0,58	1,00							
11	IT Support				0,34	0,51	0,41	0,45		0,53	0,64	1,00						
12	Socialization			0,21	0,43	0,53	0,55	0,36	-0,23	0,60	0,59	0,61	1,00					
13	Extenalization				0,33	0,54	0,55	0,30	-0,28	0,53	0,53	0,56	0,76	1,00				
14	Combination				0,38	0,35	0,46	0,52		0,48	0,52	0,58	0,65	0,66	1,00			
15	Internalization				0,37	0,46	0,56	0,39		0,51	0,55	0,58	0,72	0,79	0,70	1,00		
16	NPD Capability				0,53	0,42	0,42	0,38		0,37	0,43	0,43	0,56	0,51	0,58	0,55	1,00	
17	Financial Performance				0,50	0,29	0,31	0,29		0,23	0,27	0,31	0,37	0,32	0,37	0,35	0,68	1,00
18	Qualitative Performance				0,46	0,46	0,44	0,35		0,37	0,39	0,42	0,56	0,53	0,55	0,55	0,74	0,65

All correlations are significant at the 0.05 level (2-tailed) with Bonferroni correction 0,05/153=0,00033

Appendix 8 - Companies with Number of Participants

Company Name	Number of Participants
Intertech Bilgi İşlem ve Pazarlama Ticaret A.Ş.	40
Vrp Veri Raporlama Programlama A.Ş.	33
Bizitek Bilgisayar Yazılım ve İnternet Teknolojileri A.Ş	30
Global Bilgi A.Ş.	15
Done İletişim ve Bilgi Sistemleri	12
Banksoft Bilişim Bilgisayar Hizmetleri Ltd. Şti.	11
Ericsson Telekomünikasyon A.Ş.	6
Fujitsu Siemens Computers	6
Avez Elektronik A.Ş.	5
Deksar Multimedya ve Telekomunikasyon A.S.	5
Oracle Bilgisayar Sistemleri A.Ş.	5
Yaz Bilgi Sistemleri A.Ş.	5
Data Market Bilgi Hizmetleri Ltd. Şti.	4
İnnova Bilişim Çözümleri A.Ş.	4
Probil Bilgi İşlem Destek ve Danışmanlık A.Ş.	4
Avea İletişim Hizmetleri Tic.A.Ş.	3
Garanti Teknoloji	3
Ibm Turk Ltd. Sti.	3
Eastern Networks	2
Element Eğitim Teknolojileri A.Ş.	2
Enocta	2
Hp Türkiye	2
Makrokod Bilişim Yazılım Danışmanlık	2
Netron Teknoloji	2
Yapi ve Kredi Bank A.Ş.	2
Akhan ET	1
Aplimax Bilişim Danışmanlık Ltd Şti	1
Avivasa Emeklilik ve Hayat A.Ş.	1
Aydın Yazılım ve Elektronik Sanayii A.Ş.	1
Bilgi Birikim Sistemleri Ltd. Şti.	1
Bilgi ve Görüntü Teknolojileri	1
Boyut Bilgisayar Hizmetleri San ve Tic Ltd Sti	1
Bull Türkiye	1
Bulut Mutfak Mobilya A.Ş.	1
Burakyol Ltd.Şti	1
C Bilişim	1
Çözüm Bilgisayar ve Yazılım Tic. Ltd. Şti.	1
Creon Tasarim ve Yazilim Hizmetleri	1
Cybersoft Enformasyon Teknolojileri	1
Dalga Yazılım Bilgisayar ve İletişim Sistemleri San. ve Tic.A.Ş.	1
Demedya Dijital Elektronik Medya Sistemleri A.Ş.	1
Dijitalis	1
Egeform Bilgisayar Ltd.Şti	1
Eti Maden İşletmeleri Genel Müdürlüğü	1
Feza Gazetecilik Aş	1
Figes Fizik ve Geometride Bilgisayar Simülasyonu Hiz. Tic. A.Ş.	1
Foreks Bilgi İletişim Hizmetleri A.Ş.	1
Forte Teknoloji	1

Globalnet Internet Teknolojileri Ltd.Şti.	1
Hidrolik ve Mekanik Makina İmalat San. ve Tic. Ltd. Şti	1
Icinnova Consultancy	1
Innoem Eğitim Danışmanlık Ltd.	1
İnşaat ve İmalat Şirketi	1
İnterpromedya Yayıncılık Etkinlik Yönetimi ve Pazarlama Hizmetleri A.Ş.	1
Jforce Bilişim Teknolojileri	1
Karash Yazılım ve Güvenlik Teknolojileri	1
Karsan Otomotiv Sanayi ve Ticaret A.Ş.	1
Kcc Boya San.Vetic.Ltd.Şti.	1
Kkb Kredi Kayit Bürosu A.Ş.	1
Koçsistem Bilgi ve İletişim Hizmetleri A.Ş.	1
Komtas Bilgi Yönetimi ve Danışmanlık A.Ş.	1
Lexmark International - Türkiye	1
Maestro Yazılım ve Danışmanlık	1
Martı Bilgisayar Yazılım ve Danışmanlık Ltd.Şti.	1
Medya Medya Reklam Danişmanliği Ltd.Şti.	1
Mental Teknoloji	1
Obss Bilişim Bilgisayar Hizm. Dan. San. Tic. Ltd. Şti.	1
Od Yazılım	1
Odel Bilişim Hizmetleri ve Pazarlama Şirketi	1
Oyak Genel Müdürlüğü	1
Özgenç Medikal	1
Pl4c Teknoloji Çözümleri	1
Pro Associates	1
Provus Bilişim Hizmetleri A.Ş.	1
Roketsan	1
Sade Teknoloji Araştirma Geliştirme Elektronik San. ve Tic. Ltd. Şti	1
Saudi Cable Company	1
Sdt Space And Defence Technologies Inc.	1
Serhat Eğitim A.Ş.	1
S-N Müzik Yapım ve Organizasyon A.Ş.	1
Sönmezler Tarim Makinalari Tic.ve San.Ltd.Şti.	1
Tgb A.Ş.	1
Ties Ltd. Şti	1
Triodor Software Bv	1
Trouw Nutrition Tr	1
Turkcell İletişim Hizmetleri A.Ş.	1
Tusaş-Türk Havacılık ve Uzay San. A.Ş.	1
Vestek	1
Vizyon Bilgi Teknolojileri	1
Wellpro	1
Yaz Bilgi Sistemleri A.Ş.	1

Appendix 9 - Web Groups That Were Sent Invitation Mail

	Group Name	Number of Members	Mailing Accepted	Members reached
1	Metu-odtu	1.964	YES	1.964
2	AquariusHY	121	YES	121
3	Bilgiyonetimi	1.950	YES	1.950
4	bilisimetkinlikleri	292	YES	292
5	ceceydeniz_destek	524	YES	524
6	CMMI_Turkiye	728	YES	728
7	Database_tr	207	YES	207
8	em_mezunlari	1.337	YES	1.337
9	Endustri_muhendisligi	1.163	YES	1.163
10	Endustriengineering	447	YES	447
11	EndustriMuh	3.515	YES	3.515
12	E-O-Psikoloji	284	YES	284
13	hightechHR	765	YES	765
14	imtes-tr	44	YES	44
15	Kolej89	218	YES	218
16	Metu-ie-alumni	1.200	YES	1.200
17	ODTU_Mezunlari	1.462	YES	1.462
18	RecruitmentTurkey	19.782	YES	19.782
19	Robbotix	831	YES	831
20	TechStrateji	553	YES	553
21	Teknoloji_yonetimi	122	YES	122
22	Teknoloji-yonetimi	407	YES	407
23	Tisag	416	YES	416
24	Turkelektronikmuhendisleri	592	YES	592
25	Turk-ie	5.256	YES	5.256
26	TurkishBankers	2.939	YES	2.939
27	Turkiyebilgitoplumu	207	YES	207
28	Turkiyeendustri	810	YES	810
29	Turkmuhendisleri	504	YES	504
30	YazilimMuhendisligiTurkiye	1.723	YES	1.723
31	YeditepePhd	124	YES	124
32	YonetimGelisim	2.064	YES	2.064
33	YontekMusavirlik	844	YES	844

Appendix 9 continous

	Group Name	Number of Members	Mailing Accepted	Members reached
34	Akademikmerkez	967	NO	0
35	AkademIT	4.157	NO	0
36	Bankacıyız.biz	7.871	NO	0
37	Bilgi_kultur	15.718	NO	0
38	bilgisayarmuhendisleri	1.505	NO	0
39	Bilisimkariyer	841	NO	0
40	Bilisimpazaryeri	496	NO	0
41	Everythink_free	21.987	NO	0
42	Is_yonetimi	4.510	NO	0
43	Isarayanmuhendisler	4.564	NO	0
44	Java_tr	2.036	NO	0
45	Mekanikmuhendisleri	918	NO	0
46	MSProjectTurk	925	NO	0
47	Muhendis	1.176	NO	0
48	Middle_east_technical_university	1.422	NO	0
TOTAL		**122.488**		**53.395**

Appendix 10 Summary of Regression Results (Lee and Choi, 2003)

			Regression Weight	T	P
Socialization	⇐	Collaboration	0,3017	3,1036	***
KC Process	⇐	Collaboration	0,2085	2,4901	**
Externalization	⇐	Collaboration	0,2477	1,9941	*
Internalization	⇐	Collaboration	0,2692	2,0947	**
Socialization	⇐	Learning	0,3096	2,8054	***
Internalization	⇐	Learning	0,1895	1,9985	*
KC Process	⇐	Learning	0,2138	2,2498	**
KC Process	⇐	Centralization	-0,2030	-2,6745	**
Socialization	⇐	Centralization	-0,1755	-2,0142	**
Externalization	⇐	Centralization	-0,2144	-1,9039	*
Internalization	⇐	Centralization	-0,2025	-1,7381	*
KC Process	⇐	Trust	0,3525	3,5907	***
Socialization	⇐	Trust	0,2379	2,0873	**
Externalization	⇐	Trust	0,3079	2,114	**
Combination	⇐	Trust	0,4041	2,4515	**
Internalization	⇐	Trust	0,3182	2,1118	**
KC Process	⇐	Organizational Creativity	0,9035	15,7786	***
Socialization	⇐	Organizational Creativity	0,2957	2,0883	**
Externalization	⇐	Organizational Creativity	0,2906	2,2281	**
Combination	⇐	Organizational Creativity	0,1778	1,8835	*
Internalization	⇐	Organizational Creativity	0,2371	2,601	**
Organizational Creativity	⇐	Organizational Peformance	0,6338	6,1313	***

*** p<0,01; ** p<0,05; * p<0,1