EFFECTS OF BUSINESS EXCELLENCE DRIVERS ON FIRM PERFORMANCE IN MANUFACTURING INDUSTRY

by

Gizem Kömürcü

Submitted to the Graduate School of Engineering and Natural Sciences
in partial fulfillment of
the requirements for the degree of Master of Science
in

SABANCI UNIVERSITY

Spring 2008

EFFECTS OF BUSINESS EXCELLENCE DRIVERS ON FIRM PERFORMANCE IN MANUFACTURING INDUSTRY

APPROVED BY:

Prof. Gündüz Ulusoy (Thesis Adivisor)	……..
Assoc. Prof. Lütfihak Alpkan	……..
Assist. Prof. Kemal Kılıç	……..
Assist. Prof. M. Atilla Öner	……..
Assist. Prof. Murat Kaya	……..

DATE OF APPROVAL: ……

EFFECTS OF BUSINESS EXCELLENCE DRIVERS ON FIRM PERFORMANCE IN MANUFACTURING INDUSTRY

Gizem KÖMÜRCÜ

Industrial Engineering, M.Sc Thesis, 2008

Thesis Advisor: Prof. Dr. Gündüz ULUSOY

Keywords: Business Excellence, Firm performance, Statistical analysis, Manufacturing industry

Abstract

Improvement of firm performance has been an effective tool for firms to increase their competitiveness. Acceleration of technological developments, difficulty of customer satisfaction and very intense global competition have resulted in a hostile environment necessitating a dynamic change process. This process is indeed difficult to manage and Business Excellence has become one of the critical instruments for managers to secure survival.

Defining Business Excellence, discovering its determinants, analyzing the status and characteristics of Business Excellence in Turkish manufacturing industry and measuring its effects on firm performance constitute the major objectives of this thesis. After an extensive literature review, technology and innovation tendency, human resources, process management and continuous improvement (CI), manufacturing structure and operations, planning, manufacturing strategy, customer focus, supplier relations and leadership are identified as Business Excellence determinants. The questionnaire is prepared by considering Business Excellence determinants and the questionnaires employed in previous studies. Our final sample size has reached 140 manufacturing firms.

In the following step, employing the data gathered, analyses about relationship between Business Excellence determinants and general firm performance and financial indicators are performed. Factor analysis, reliability analysis, correlation analysis, T-tests and structural equation modeling are selected as the appropriate methods for the analysis. Commercial software packages MS Excel, SPSS v13 and AMOS v4 are used.

İMALAT SANAYİİNDE İŞ MÜKEMMELLİĞİNİN FİRMA PERFORMANSINA ETKİLERİNİN ARAŞTIRILMASI

Gizem KÖMÜRCÜ

Endüstri Mühendisliği, Yüksek Lisans Tezi, 2008

Tez Danışmanı: Prof. Dr. Gündüz ULUSOY

Anahtar Kelimeler: İş Mükemmelliği, Firma performansı, İstatistiksel analiz, İmalat sanayii

Özet

Performans iyileştirme, firmaların rekabetçiliklerini arttırabilmeleri için etkili bir yol haline gelmiştir. Teknolojik gelişmelerin hızlanması, müşteri memnuniyetinin sağlanmasının giderek zorlaşması ve rekabetin yoğunlaşması ile ortaya çıkan çetin piyasa koşulları dinamik bir değişim sürecini gerekli kılmıştır. Bu zoru süreçte, ayakta kalmaya çalışan firma yöneticileri için İş Mükemmelliği kavramı kritik metotlardan biri haline gelmiştir. .

Bu çalışmada İş Mükemmelliği kavramını tanımlamak, İş Mükemmelliği belirleyicilerini ortaya çıkarmak, Türkiye imalat sanayisinde faaliyet gösteren firmalarda İş Mükemmelliğini analiz etmek ve firma performansı üzerine etkilerini ölçmek hedeflenmiştir. Yapılan literatür araştırması sonucu firmalarda İş Mükemmelliğini ortaya çıkaran faktörler teknoloji ve yenilik eğilimi, insan kaynakları, süreç yönetimi ve sürekli iyileştirme, imalat yapısı ve faaliyetleri, planlama, imalat performans hedefleri, müşteri odaklılık, tedarikçi ilişkileri ve liderlik olarak belirlenmiştir. Tespit edilen iş mükemmelliği belirleyicileri ve geçmiş çalışmalardaki anket formları göz önüne alınarak yeni bir anket formu hazırlanmıştır. Araştırmaya imalat sektöründen toplam 140 adet firmanın katılımı gerçekleşmiştir.

Bir sonraki aşamada, İş Mükemmelliğini ortaya çıkaran faktörler ile firmanın genel performansı ve finansal göstergeleri arasındaki ilişkinin analizine geçilmiştir. Faktör analizi, güvenilirlik analizi, korelasyon analizi, t-test ve yapısal denklem modellemesi istatistikî analiz yöntemlerinin kullanılması uygun bulunmuş; MS Excel, SPSS v13 ve AMOS v4 ticari yazılımları kullanılmıştır.

To my love Gürhan
&
Sevgili Anneme

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my thesis adviser *Gündüz Ulusoy*, for his valuable guidance, comments, suggestions and especially patience against my all awkwardness through my thesis process. It was a great chance for me to conduct this thesis under his supervision and to utilize his deep knowledge and experience.

I would like to also thank to each member of my thesis committee *Kemal Kılıç*, *M. Atilla Öner* and *Lütfihak Alpkan* for their precious help and guidance.

My sincere thanks go to *Murat Kaya* because of his invaluable and friendly support, advices and help during my thesis study and especially during my courses. I feel extremely lucky for taking two courses of him during my graduate study.

I am also grateful to TÜBİTAK-BİDEB for their financial support. This scholarship was a very important driver for me to start and complete my graduate study.

I also thank to all my professors in Industrial Engineering Department for their help and support and I am grateful to my friends and colleagues for sharing their friendship and for their help during two years period of my graduate study.

I want to give my deepest thanks to my family, especially to my mum *Hülya Kömürcü* for her endless love, support throughout my life and encouragement to apply and complete this program, to my grandparents *Fatma* and *Selahattin Kaymak* for their precious prayers, to my aunt *Rüya Sungur* for her unforgettable altruisms during my undergraduate and graduate study and finally to my brother *Giray Kömürcü* because he provided me to be aware of Sabancı University's great opportunities.

Finally, I really believe that meeting with my love *Gürhan Günday* at Sabancı University was the greatest chance for me. It is obvious that without his strong friendship, emotional and academic support, motivation, encouragement, and entertainment graduate study in Sabancı University would be very difficult for me even I wouldn't have finished this work without his great help. I need to express my special gratitude for coming into my life in the right time and for everything he has been doing for me.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

The main objective of this thesis is to discover the effects of Business Excellence on the competitiveness and performance of manufacturing firms.

After an extensive literature review mainly two fundamental research questions are singled out as stated below:

- What are the determinants of Business Excellence at firm?
- What are the benefits of Business Excellence applications to firms, especially in terms of competitiveness and performance?

The study conducted in order to achieve these aims consists of the following tasks outlined as below:

- Defining Business Excellence at firm level.
- Determining and evaluating Business Excellence capability of firms in manufacturing industry.
- Uncovering new organizational, managerial and technical capabilities related to Business Excellence in manufacturing industry.
- Proposing managerial insights about the evolution of Business Excellence at firm level.

Shortly, this thesis aims to reach conclusions on the conceptual and theoretical aspects of Business Excellence in manufacturing firms in Turkey by employing empirical research methodology. Finally, the study of searching the effect of Business Excellence upon the competitiveness of manufacturing firms is expected to be a valuable contribution to the literature.

In order to collect the required data, we utilized an empirical survey consisting of 12 main sections covered by 153 questions. The questionnaire is prepared by considering both the recent questionnaires used in previous studies, and both the determinants and the measures met in the up-to-date academic literature. The survey methodology is very helpful especially for analyzing the collected data by statistical methods. It is also a less expensive and less troublesome methodology. But, on the other hand, a disadvantage of this method is that the respondent does not have much assistance for questions s/he does not understand while answering and hence, s/he responds to it according to his/her own perception.

We have acquired most of the participants' contact information from Turkish Quality Association (KalDer). VIP, a public relations company, designed a website, where firms could attend our survey through a user name and password. The questionnaires were asked to be filled in by the upper managers. The upper managers were targeted and were asked to provide information not only as an individual but also as a team since the questionnaire covered topics from firm strategy to functional details. After firms were asked to fill the questionnaire, those firms not doing so were reminded every 3-4 weeks by mail and telephone calls.

By the first two months of this study (October and November 2007), a sample containing 90 firms had been obtained and we applied pilot statistical analyses and obtained some inspiring results. Our data collection process was terminated on April 18, 2008, when the final sample size had reached 140 firms.

After the data is collected, it is analyzed using statistical methods, tools, and commercial software packages. Finally, results of the analyses are gathered and conclusions are drawn.

The thesis consists of ten chapters. The introduction chapter includes the thesis scope, research questions, purposes, and the research methodology. In the second chapter, definitions of Business Excellence, Business Excellence and competitiveness relations, short history of quality awards are discussed and Business Excellence literature is reviewed. The third chapter is about survey design and clarification of the questionnaire form. In the following chapter, data collection process is explained and the sample is presented. The fifth chapter covers the statistical analyses between Business Excellence determinants and performance indicators. In the next chapter, statistical analysis of effects of performance indicators on financial performance is performed. In the seventh chapter, a structural equation modelling approach is used and path analyses are conducted. The eighth chapter includes some results about the differences of sectors. In the next chapter, we summarized main managerial insights resulting from our analyses. Finally, a conclusion chapter is provided.

2 BUSINESS EXCELLENCE

Since the beginning of the industrialization era, efforts for improving the performance of companies in manufacturing operations have been very crucial for the survival of these companies. All companies strive to have higher performance because a high performance level means greater competitiveness, which finally generates more revenue (Gruenberg, 2007). Two of the first well-known and well-documented practitioners in this area were Taylor and Ford. Their successful accomplishments have been an example for many to follow their footsteps and go further behind.

For the last nearly 30 years, organizations have encountered a period of great change in the markets and operations. International competition caused many companies to meet turbulent, complex, and hostile working conditions. Technological developments have been accelerated, customer satisfaction has become harder and competition has become more complicated. In order to respond to these forces, many organizations attempted to apply different performance improvement approaches including ISO 9000, TQM, Business Process Reengineering (BPR), Business Excellence and Six Sigma, lean manufacturing, Just in time (JIT) system.

2.1 Quality Awards

Since 1950s companies have funded and supported more systematic approaches to secure quality of their products and services in the belief of creating a sustainable competitive advantage, as well as reducing the costs. This promoted the Total Quality Management (TQM) boom in the 1980s and subsequently the growth in “Business Excellence” Quality Awards around the world. The TQM movement has encouraged three continental competitions in the world. Countries have introduced Business Excellence frameworks: The Deming Prize in Asia, the Malcolm Baldrige National Quality Award in the United States and the European Quality Award by European Foundation for Quality Management (EFQM) in Europe. These frameworks are various but they support a common philosophy that companies with strong leadership and clear direction that invest in their employee to meet the requirements of their customers through the processes they operate will reach superior levels of performance (ECforBE, 2008).

The competitive advantage of using quality based approaches in the global market is recognized by the Japanese in the early 1950s. Quality of their products and their customer-focused strategy has provided Japanese consumer goods, from automobiles to electronic equipment and cameras, to become a reference point for comparison on global scale. In Japan, since 1951 the organizations that have exerted an immeasurable influence directly or indirectly on the development of quality control or quality management have been awarded by Deming Prize. The prize covers several business functions (such as policy, organization, management, education, profit management, cost control, quality assurance, future planning), which means success is not limited to profitability or product quality (Deming Institute, 2008).

In 1980s the US Government realized that their product and process quality are challenged strongly by foreign competition, their efficiency has not increased as much as their competitors over the last two decades. Since the companies were loosing their market share quickly against the Japanese firms, the pressure of Japanese products became the key factor for important renovations. These developments increased the Western countries' interest for the sources of Japanese success. Two main factors were determined behind this success: taking into account human factor besides the economic ones and values which create a guiding vision for the company.

In order to respond the Japanese competition, the US Government business advisors suggested usage of quality management tools. As a part of this strategy The American Malcolm Baldrige National Quality Award was initiated in 1988. The award criteria framework evaluates firms by seven categories: leadership, information and analysis, quality planning, human resources development and management, management of the process quality, operational results, customer focus and satisfaction (Laszlo, 1996). The American National Institute of Standards and Technology (NIST) coordinates this award and NIST distributed over 450,000 copies of the application forms in the first three years of its existence. This was a clear evidence of the growth of interest in Business Excellence among the organizations (Porter and Tanner, 2003).

According to the report based on the Baldrige award applicants over the years 1988 and 1989 and the Japanese Deming Prize Winners between 1961 and 1980, the common features appearing in these high-scoring organizations were customer focus, management leadership in quality values, employee involvement, an open corporate culture, fact-based decision making and partnerships with suppliers (Tanner, 2005).

On the other hand, by the recognition of the importance of quality as a competitive advantage, fourteen of the western European companies established EFQM in 1988. The EFQM Excellence Award is Europe's most prestigious award for organizational excellence and has been given to Europe's best performing companies and not-for-profit organizations since 1992. Excellence is generally associated with the EFQM Model (EFQM, 2008)

In Turkey, The Scientific and Technological Research Council of Turkey (TÜBİTAK), The Technology Development Foundation of Turkey (TTGV), Turkish Industrialists' and Businessmen's Association (TÜSİAD) came together to establish a Technology Award. This Award is given since 1998 to companies that develop creative, innovative, technologically excellent and competitive products. The objective of this Award is to support innovative product development efforts, to inform business community about the necessity of these efforts and to attract public's attention on the importance of the subject.

On the other hand, since 1993 National Quality Award is given by Quality Association in Turkey (KalDer) and TÜSİAD in Turkey in order to increase the awareness of quality issues and processes in companies and public, to deploy TQM techniques in companies/institutions around the country and to promote the organizations that use these techniques successfully (KALDER, 2008)

Additionally, Hendricks and Singhal (1996) investigated that the stock market responds to winning quality award announcement positively. The reaction was especially strong in the case of small firms, and awards introduced by independent organizations.

2.2 Definitions of Excellence

Along with the quality award process there have been many attempts in the literature to define excellence. Excellence is often described as a journey to quality, both for enablers and outcomes. According to Peters and Waterman (1982) excellent companies present the strengths of innovation, ability to change and a leadership that excel through both their values and their actions. They introduced eight attributes that an excellent firm takes into consideration.

- A bias for action: Organizations use analytical approaches for decision making. However, Peters and Waterman highlight the importance of making experiments. They

believe that too many detailed analyses may block problem solving process. Therefore, their approach to solve problem is usually experimental and external partners such as suppliers or customers can be involved in this process directly or in a relatively short time.

- Customer focus: Successful organizations really try to understand the customer and use customer voice as an incoming for continuous improvement (CI), new product and service development.
- Autonomy and entrepreneurship: All people in the company, not only R&D employees, are expected to be innovative and creative in their jobs.
- Productivity through people: People are expected to come up with suggestions for waste reductions and productivity.
- Hands-on value driven management: Organization's philosophy, values and vision are the major guideline and they are more important than technological or economic resources.
- Stick to the knitting: Excellent organizations stay close to the business they know. They focus on their core competencies.
- Simple form: The fundamental structural forms and systems in the excellent companies are elegantly simple.
- Centralization and decentralization: Excellent companies are both centralized and decentralized. They push autonomy down to the shop floor or product development teams. On the other hand, they are fanatic centralists around the few core values they hold (Dahlgaard-Park and Dahlgaard, 2007).

In 1996, Peters added two new attributes to this list; innovation and dynamics.

Tom Peters and Nancy Austin introduced a simple excellence model in their book in 1985 that is presented in ***Figure 1.1***

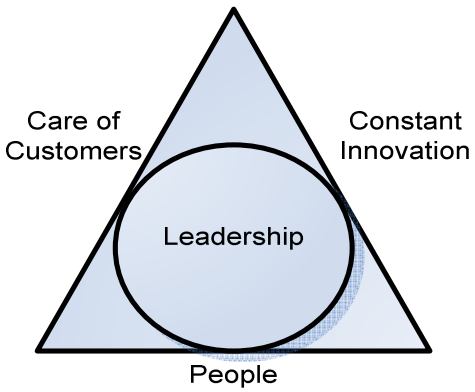

Figure 1.1: Simple excellence model (Peters and Austin, 1985)

In the model, excellence is explained as the result of the following four critical success factors: people, care of customers, constant innovation, and leadership which bind together the first three factors.

Also The British Quality Foundation (1998) has presented a list about Business Excellence criteria for companies. This list includes top management support, an emphasis on people through empowerment and training, effective strategic planning, measurement, management and improvement of process, employee participation through effective communication, involvement in the company's objectives, and adaptation of a culture which focuses on serving customers' requirements (Dahlgaard-Park and Dahlgaard, 2007).

Savolainen (2000) explained that excellence is a status to be achieved using total quality approaches but this status has no permanence. It is also defined as working to produce high-quality products that meet the customer's price, delivery and specification expectations at the lowest possible cost, using the most efficient business processes, and making the maximum profit (Cincom, 2008). Business excellence is mostly about identifying business objectives and then assessing state of excellence against these objectives (Excellence in Business Network, 2008).

Tanner (2005) defines Business Excellence as a management technique that emerged to improve company's performance. According to his research, organizations that rated high in their Business Excellence scale also have high levels of performance. A company's ability to respond to its changing environment, which is called strategic agility, was found to have a positive correlation with performance. Business Excellence positively correlates with strategic agility. Hence, Business Excellence makes a significant difference on performance level.

2.3 The EFQM Excellence Model

In the late 1980s, the economy of Europe was under threat from the expansion of the Far Eastern exports. The CEOs of 14 leading European firms decided to work for maintaining Europe's competitiveness and they attempted to establish a member-based independent foundation that would "develop awareness, management education and motivational activities" and "recognize successes". The EFQM was founded in 1989

and was supported by European Commission. In 1991 the EFQM model was introduced and in 1992 the first quality award was presented (EFQM, 2000).

Excellence models and quality are strongly related to each other. Firms use these models to guide their operations towards becoming “excellent” organizations (Hermel and Pujol, 2003). The EFQM model was largely established on the principles of TQM. In 1999, the EFQM revised the model and made an important change in language from TQM to excellence (Ad banjo, 2001). Nabitz (1999) noted that the word quality does not appear in either the sub-criteria or the areas addressed in the revised model. EFQM (2000) pointed out that they regularly review and update the model in order to reflect the best management thinking and practice. The new model which concentrates on excellence includes all aspects of organizational management. It helps organizations to identify their goals, gives guidelines about how to achieve them, and encourages companies for CI. It is also flexible model that can be applied for all types and sizes of organization from small to large or public to private.

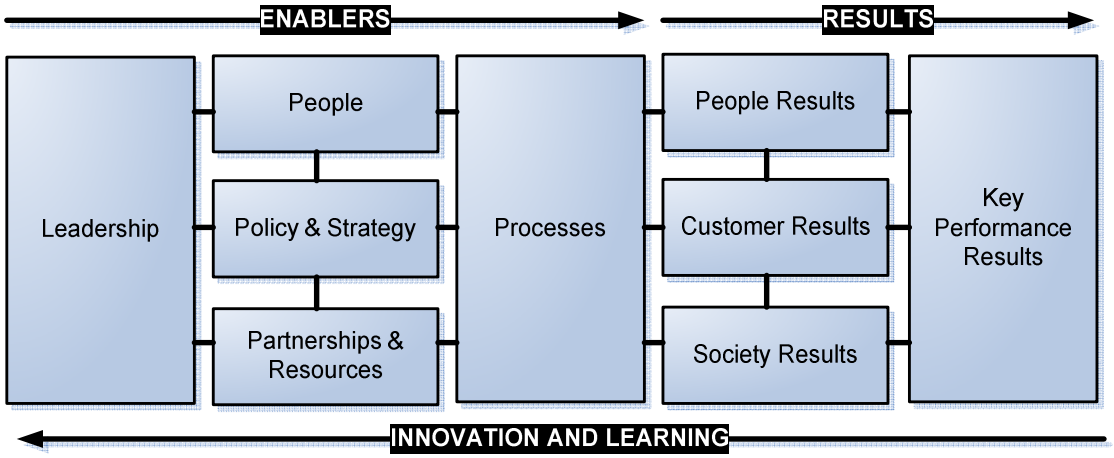

Figure 1.2 The EFQM excellence model

This model is based on the statement that excellent outcomes with respect to performance, customers, people and society are achieved through leadership, driving policy and strategy that is delivered through people, partnerships, resources, and processes. The arrows present the dynamic nature of model (EFQM, 2005).

The EFQM model includes nine criteria which are shown in ***Figure 1.2***; five of them represent “Enablers” and four of them represent “Results”. The Enablers include what an organization does and the results include what an organization achieves.

In EFQM excellence model, one of the enabler criteria is *leadership*. Excellent leaders enable company to achieve its mission. They determine, keep and develop values and systems that are needed for sustainable success and apply these via their

activities or behaviors. They communicate with customers, partners, society, etc. and they drive a culture of excellence with the organization's people. Also, leaders realize and appreciate employees' efforts. They can change the direction of the organization and convince people to follow it when it is necessary.

The second criterion of the model includes *policy and strategy* which is based on the present and future requirements and expectations of stakeholders. Excellent firms apply their mission and vision by following a stakeholder focused strategy that considers the market and sector in which it operates. The policies, plans, goals, and processes are created and applied to deliver its strategy. The policies and strategies of the organization are improved and updated in a regular manner.

People is the third important criterion in the model because excellent organizations manage, develop and release the full potential for their employee at an individual team and organizational level. Employees are cared, involved in, empowered, recognized, and motivated to use their skills and knowledge for the benefit of the company.

Partnerships and resources are the forth criterion of enablers in the model. They include management of external partnerships like suppliers or internal resources like finances, buildings, materials, equipment, technology, information, and knowledge. In order to support policy and strategy, excellent companies plan and manage their internal and external sources effectively.

World of today becomes more and more demanding. Excellent organizations realize that success may be related to the partnerships that they develop. Building sustainable relations based on trust, respect and openness, reaching mutual goals and supporting each other with proficiency, resources and knowledge are the main objectives of excellent companies while they are working together with partners. These partnerships can be developed with suppliers, society, customers or competitors and they provide companies to deliver great value to their stakeholders by enhancing main competencies.

The last element of enablers is *process.* EFQM defines process as a sequence of activities which add value by producing required outputs from a variety of incomings. Excellent organizations design, manage and improve processes for satisfying customers and other stakeholders. Key processes for the success of the company are identified and planned clearly. These facilitate the implementation of the organization's policies,

strategies, aims, and plans. Also the effective use of technology, innovation and creativity enable improvement of the processes

Results are the second part of the model. There exits a symbiotic relation between enablers and results. The results criterion includes organization's outcomes and achievements. Enablers are improved by getting feedback from results.

The first element of results is *customer results*. Excellent organizations extensively measure and achieve excellent outcomes about their customers. They design and manage processes and systems that provide them to understand, monitor and assess their customers' requirements, and ideas. Excellent organizations know that customer faithfulness, retention, and market share is maximized through a high attention on customer requirements and expectations. For excellent companies collecting and analyzing customer results is one of the most important parts of the operations.

The second result in the model is *people*. Excellent organizations obtain and measure outstanding results with respect to their people. People who are not satisfied with their jobs can't serve the customers in the best way. They will not pay enough attention to work without errors. Therefore, it is very critical for organization to measure what people think or feel. People results are very important source for understanding where and how to improve your people management.

According to the *society results* of the model, excellent organizations achieve in satisfying the requirements and the expectations of the local, national, and international community. Excellent organizations pay high attention and actively support social responsibility and ecological sustainability. They adopt an ethical approach by being transparent and responsible to their stakeholders. They realize the organization's effect on both the current and future community and take care of minimizing its harmful effects. Also, they search and encourage opportunities to work on mutually useful projects with society motivating and keeping high levels of confidence with stakeholders.

The last type of the results of EFQM model is *key performance results*. Best results about the key elements of policy and strategy are achieved and measured by excellent organizations. Some organizations produce hundreds of statistics and obtain a very large amount of data on results. This may be a big threat because the volume of the data may hide few but very important results. Therefore, EFQM does not suggest spending time and energy over collecting data to obtain results that may not contribute a lot to company's performance or stakeholders' satisfaction. Analyzing the most

significant areas that may affect business strategy, plans or customer experience may facilitate managing the data.

2.4 Business Excellence Determinants

In this thesis, survey methodology has been followed in order to generate a database about tendencies of the companies in Turkish manufacturing industry over Business Excellence. In a similar study in the literature, leadership, role of quality department, training, product or service design, supplier quality management, process management, quality data and reporting, employee relations are selected as the critical factors of quality measurement (Sarap et al., 1989). Also, Ahire et al. (1996) generated TQM implementation constructs from literature as supplier quality management, supplier performance, customer focus, benchmarking, employee involvement, employee training, employee empowerment, product quality, top management commitment, design quality management, internal quality information usage and statistical process control. In our survey, we analyzed companies' Business Excellence practices under nine main titles: technology and innovation tendency, human resources, process management and CI, manufacturing structure and operations, planning, manufacturing strategy, customer focus, supplier relations and leadership. In this section, we will examine the relationship between our determinants generated from literature and Business Excellence.

Nowadays, technology has become a major key actor component of economical progress for companies (Ulusoy, 2000). Brown and Eisenhardt (1998) noted that developing new technologies significantly modify the ways companies do things. Companies, which develop new technologies, improve the productivity of their own processes with higher productivity. The knowledge driven economies of today indicated that successful organizations of future will be the ones who are able to develop new capabilities by creating organizational knowledge and implementing new technologies and practices, rather than the ones that compete on their existing capabilities (Nonaka and Takeuchi, 1995; Teece, 1998).

On the other hand, innovation is explained as the application of a new or considerably improved product or process, a new marketing method or a new organizational way in business practices, workplace organization or external relations. The impact of innovation on company performance changes in a broad range from

productivity and efficiency to market share, sales, and profitability. Companies, which develop innovations more rapidly, have also more qualified employees, provide more convincing future plans for their workers and pay higher salaries (OECD, 2005).

Global competition is now between technological developments and innovation capabilities of the companies. Technological improvements and innovations are necessary ways to grow continuously, to gain competitive advantage in the market and to have better performance results at firm level and growth of countries. Improving production quality, reducing costs, increasing the market share, extending the service range, entering new markets, developing environmental products, aligning the firm's technology to other firms' are main objectives of excellent companies for introducing new technologies and innovations. Consequently, we have identified a close relation between Business Excellence and technological development and innovativeness. We have researched companies' *technology and innovation tendencies* in our survey.

Success is achieved through the organization's operations and through the development of its intangible assets, such as its intellectual property (Tanner, 2005). Development of new technologies causes human resources to become more critical for the firm because new technologies can be copied easily but it is difficult to copy human assets. For attaining word class-performance, effective management of human resources is very important (Luthans and Stajkovic, 1999)

Kristensen and Juhl (2001) pointed out that desired results are assumed to be a function of both the effective use of the system and the intellectual capital in the company. Through the system the results of the firm are affected directly and indirectly by the quality of the employees. In the journey to excellence the efforts should be long term based and they should include people-related subjects like training, performance evaluation, employee participation, recognition, improving the quality of business life etc (Vouzas, 2007). Therefore, in our survey there is a human resources part including questions over companies' *human resource* strategies.

Nowadays, surviving in an increasingly competitive environment requires well managed processes. Process management is the activity of managing the resources and processes that produce products and services. If the processes are not measured, any amount of improvement can not be approved (Loch et al., 2003). In excellent companies processes are systematically managed and measured. Both types of measurement, qualitative and quantitative enable managers to observe firm's performance and its drivers.

Slack (2005) defines improvement as an activity of closing the gap between the target and the current performance of an operation or process. It is generally the eventual result of all operations and process management activity. Nearly all popular approaches in recent years, such as TQM, lean operations, business process reengineering, and Six Sigma have focused on performance improvement. Therefore, we have included in our survey a *process management and CI* section.

Changes in the competitive environment are explained by increasing globalization of the markets. This enhancement has caused a high level of complexity and dynamism in the business word. One of the most important factors that form the competitiveness of companies is their ability or willingness to deploy innovative technologies. New technologies open the way for innovative products and production processes. In many sectors, growth and return objectives has become tightly related to product innovations. Firms need to understand the importance of this capability. Also, application of established technologies to new areas is another way of technological progress (Eversheim et al., 1997)

On the other hand, concentrating on the core business of the company is an important strategy for improving competitiveness. It is necessary to follow manufacturing strategies and plans that focus on development of the core competencies of the company. In order to be successful, manufacturing firms must predict changes in markets and technologies, and act accordingly. Hence, we have designed a part in our questionnaire form that enables us to analyze tendencies of the companies' *manufacturing structure and operations.*

Planning is a fundamental stepping stone to success in business word. Without proper planning and preparation, failure is almost guaranteed. Planning process helps companies to guarantee changes happen in the way they want, to keep them manageable and to keep costs under control. Excellent companies develop business plans that embody the needs of customers, suppliers and other stakeholders. These plans should focus on the achievement of best practices in order to reach high performance level.

The planning process should be based on evaluation of both internal data (operational performance, quality indicators etc.) and external data (customer feedback, market intelligence, industry trends etc.) (Porter and Tanner, 2003). It should support this mission by identifying both short and long term goals that are well defined in measurable terms (Ulusoy, 2000). The first step of the planning process is the development of a mission that defines the purpose of the company. Additionally,

companies that seem to be especially competitively successful have a clear and often inventive operations strategy. This strategy should be approved by top management and it should cover company's all production processes. That's why we have designed a part of questions about *planning* processes in the companies.

Performance is the umbrella term of excellence and comprises profitability, productivity and also other non-monetary factors such as quality, speed, delivery and flexibility. Günday (2007) stated that companies gain additional competitive advantage and achieve increased business performance according to the degree of importance that they give to manufacturing strategies prevailing in the market such as price, quality, flexibility, and on-time delivery. These are critical factors for companies to build a reputation in the market and hence, to increase their market share.

Today's manufacturing environment is increasingly competitive hence, manufacturers have to concentrate on developing new ways to design, produce, sell and deliver products. Manufacturing quality is conformance of the products to engineering's drawings and specifications. This provides a quantitative sense for evaluations known as quality levels of conformance. Manufacturer's specific, clear, and restricted quality objectives (as specified by engineering's drawings) affect operations of the machines, the class of people hired, raw materials purchased, workmanship standards agreed upon between engineering and manufacturing, teamwork, and cooperative attitudes (Barringer and Associates, 1995). For this reason, in our survey we have designed a section in order to analyze companies' practices about *manufacturing quality*.

Cost and quality are influential features of success in the products or services of many companies, especially customers increasingly expect higher quality at a lower cost (Tiwari et al., 2006). One of the vital factors in the profitability of a new or existing product is its manufacturing cost. Cost is manufacturer's strategic counterpart to price like a weapon of competitiveness in the market. It is a measure of the manufacturing function's efficiency, and traditionally it has been connected to high volume production (Nemetz, 1998). Generally products possess a cost structure that is not as low as it might be. The challenge is to maintain a products reliability and market acceptance while producing it at the lowest possible cost (Kobayashi, 2003). Consequently, our survey includes a part of questions about companies' *manufacturing cost* structure.

During the last decades, manufacturing flexibility has become a very prominent factor on the competitive arena where production oriented companies work. The flexibility characteristic deals with how a company reacts to changed demands and

needs of both customers and the line of business. Flexibility provides its greatest advantage in being able to adapt well to most changes in production (Cardinali, 1995). Many researchers, e.g. Fine and Hax (1985), Hill (1995), and Hayes and Upton (1998) rank manufacturing flexibility as a competitive priority together with cost and quality. Therefore, in our survey there is a part of questions about companies' *manufacturing flexibility* practices.

High quality, low cost, high speed in carrying the products from design to market, fast and reliable delivery of products and services are essential characteristics of every business organization and it is clear that they contribute to success. Many observations show that response time has become an important strategic weapon in global competition. Leading companies search for lower cost, great variety and responsiveness in the market (Li and Lee, 1994). According to Stalk's (1988) and Hout's (1990) empirical studies, customers agree that reliability and responsiveness are two of the most important characteristics of service in many industries. Rapid and reliable delivery of goods and services provide greater market share, increased price premium, lower cost and happier customers.

Waste is explained as the activity that has no positive effect on the final products, e.g. non-value-adding operations. Most of the operations improvement programs concentrate on the elimination of all forms of waste in delivery system. There is an additional factor which is complementary to the elimination of waste is the elimination of uncertainty and unreliability in the system. Causes of this uncertainty and unreliability include unreliable delivery by suppliers, variability in processing times and high defect rates. If the identification and elimination of uncertainty and unreliability from the system is provided, then it should be possible to lower manufacturing costs, customer returns and time of delivery and improve delivery reliability (Mapes et al., 1997). Delivery on time is one of the most important performance indicators in measuring performance of delivery. It is explained as the percentage of time a company delivers the orders at the right quantities and at the right time to its customers (Ulusoy, 2000). Hence, *delivery reliability and speed* is one of the important parts of our survey.

Nowadays, customers are more demanding and competition is more sophisticated. Global competition force today's manufacturing companies to be more and more customer focused. The ultimate judge of the product and service quality is customer so; customer focus becomes an essential part of the effective application of best practices. Customer focus refers to organizational commitment to determine and satisfy customer

demands about the quality and punctuality of their orders as well as meet their demands in new products (Pine et al., 1993). Since customers' expectations and demands are dynamic, it is vital that companies pay close attention to monitor customers' requirements in products and services and improve their skills in meeting those needs fast. For example, by keeping track of customer complaints and reasons of their discontent an organization can proactively prevent the causes of customer discontent (Bhatt and Troutt, 2005). Successful companies are defined by being flexible, adaptive, innovative and responsive.

Customer faithfulness and retention are best achieved by understanding the current and future requirements of actual and potential customers. Excellent companies ensure the transformation of customer feedback into actionable information. They use a wide variety of listening posts such as focus groups, surveys, feedbacks etc. in order to identify both actual and future customer needs, which are then used as incomings in the planning processes, strategic business and improvement plans. Customer voice is considered as the most important base for developing new products and services. Excellent companies collect, analyze customer expectations, and utilize them in product development departments. Therefore, our survey contains a *customer focus* part that researches companies' relations with their customers.

Supply chain management has been more and more recognized as a main driver of overall operational and financial performance (Hammer, 2001). Liker and Choi (2004) stated that effective partnerships are very important for successful supply chain management. An organization works more effectively when it has mutually useful relations built on faithfulness, sharing of knowledge, and integration with its partners (EFQM, 2000). The literature states that the adaptation and application of successful supply chain management practices can give power to the development of innovative mechanisms, which may enable improved productivity (Edwards et al., 2004). Successful management of supplier relations can increase the productivity of the trading partners through the deployment of knowledge and mutual assistance, with the execution of good practices (Giannakis, 2008).

Sharing of knowledge is significant for building trust between manufacturers and suppliers. A number of researchers have emphasized the significance of collaboration (including supply chain coordination, cooperation, and information-sharing) among supply chain partners to achieve the benefits of supply chain integration. Collaborative planning activities and information-sharing have been found to make a positive

difference on supply chain performance, but the quality of information shared (intensively but in a selective manner) and also the trust level among the firms must be considered (Field, 2008).

On the other hand, Watts and Hahn (1993) defined supplier development program as long-term cooperative attempts between a buying firm and its suppliers to improve suppliers' technical, quality, delivery, and cost skills to promote existing improvements. The development of suppliers proved to be a prosperous strategy for many companies in Japan, over the last 50 years. As it mentioned above, relation with suppliers is a very critical subject for manufacturing companies in their journey to excellence hence, we have designed a part about *supplier relations* in our survey.

The specific leadership manners of setting a clear direction and values for the company, producing customer focus, and empowering the company and its employee in the pursuit of excellence are key features for all excellence approaches (Tanner and Porter, 2003). Business Excellence, as a philosophy, requires leaders to set a clear vision and to be actively involved in driving the organization to meet its objectives. Kristensen and Juhl, (2001) point out that quality of management is the overall cause of Business Excellence. Effective people management is increasingly becoming a primarily concern for organizations for business success. Loch et. al. (2003) indicated that the tree of excellence takes root at the top. Furthermore, in the literature many authors have stated that leadership is so important.

In achieving world-class performance, leaders have a role of developing a number of critical competencies related to helping to focus individual attention on organizational mind-sets, facilitating strategy implementation and building change capability (Higgs and Rowland 2000). Leadership has a major role in inspiring change throughout the organization and ensuring that change to be implemented. Consequently, our survey includes a part about companies' *leadership* features.

3 SURVEY DESIGN

The excellence literature review mentioned in the previous chapter constructed a base for our questionnaire form. Collecting correct and necessary data for analysis was the main objective of our questions. The questionnaire is composed of twelve modules, which are: General Firm Characteristics, Technology and Innovation Tendency, Human Resources, Process Management and CI, Manufacturing Structure and Operations, Planning, Manufacturing strategy, Customer Focus, Supplier Relations, Leadership, Performance, and Quantitative Data. The 1-5 Likert scale questions are used in the survey in order to easily gather qualitative information. In order to collect financial performance data few numerical questions are also asked in the survey.

3.1 General Firm Characteristics

In the *general firm characteristics* module, firm establishment date, ownership and legal status, foreign capital existence and managerial experience are questioned. This information is important in order to describe the sample, to classify participant firms and to discover the relationship between firm performance and general firm characteristics. We applied analysis in order to discover effects of firm size, of firm age, of ownership status or foreign capital existence on firm performance

3.2 Technology and Innovation Tendency

To adapt rapidly changing and complex environment has become very important ability of competitiveness. In order to gain competitive advantage, it is vital to understand both the specific technologies and the ways in which organizations can manage technology in the best way. The affect of technology as a competitive advantage source for manufacturing industries is widely accepted by practitioners, governments and academics. There is strong evidence that the usage of technology can enable companies to produce high quality, cost effective products and services (Zineldin, 2000). Therefore, organizations are increasingly trying to combine the technology and quality management systems to assess and satisfy customers' requests (Cook, 2002). However, for producing these products and services technology must be very

appropriate to the needs of the company (Erffmeyer and Johnson, 2001). In order to be the leading company it is very important for firms to understand the significance of identifying and using the most appropriate technology in the most effective way for their manufacturing activities. In our survey, firms' practices about their core manufacturing technology and their competitiveness are analyzed in questions *TY1* and *TY2*.

Before investing into new systems, companies usually don't have clear understanding of what will happen after adaptation. Rethinking over their own strategies deeply before buying the new machines is a very essential step of new technology adaptation process. Sometimes, although companies get new technology, they continue to use it in the old way, they don't change their strategy and this causes losses on the potential benefits of the new technology. Additionally, users don't learn using new technology adequately; they continue working in the same way as they did before the new system was and this leads to low utilization of the new system. In question *TY3* we have analyzed firm's usage of its manufacturing technology potential.

As indicated by the experience of the world-class manufacturers, the key point of their achievement is company's successfully developed manufacturing capabilities. This development critically depends on combining organizational skills with technological ability to produce products better than competitors' products (Ho, 1996). In order to manufacture attractive products at attractive prices, companies need besides plant and equipment also a well established R&D department, which includes highly qualified employees from diversified disciplines that can enable an organization to make the right manufacturing technology decisions to support its business objectives strongly.

Usage of technology is a complex set of activities including the operation and organization of existing technologies for expected results and also the integration of new technology into current systems. Firm performance depends on performing effective usage of the adopted technology by reconfiguring the production system to conform to the new system. Companies choose technologies which enable them to achieve their competitive preferences (Sonntag, 2003). However, choosing necessary technologies requires the knowledge and the practices of a team whose job is clearly defined as focusing on monitoring the new technologies and developing the existing ones. In the survey, companies' practices over developing and monitoring technological advances are analyzed in questions *TY4*, *TY5* and *TY6*.

Monitoring and adopting new technologies are very important activities in order to survive in a competitive environment. However, many of the companies can access to these technologies without much difficulty. Therefore, just buying a new machine or system without learning to use that equipment in a certain application is not enough to sustain competitiveness on the long term base. Companies have to adapt their way of working, way of organizing, and their daily activities to the new equipment. Companies that change what they did before establishing the new system and orient themselves in the totally new way can make progress by adopting new technology. However, usually changing people's working habits is much more difficult than buying a new machine. Usually, it takes long time to fully reorganize production, learning new practices and developing the necessary capabilities. We have analyzed companies' practices after integrating the new technology to the existing one in question *TY7*.

Innovativeness is one of the main components of firms' business strategies for entering new markets, expanding the current market share and obtaining a competitive priority for the company. Elçi (2006) defined innovation as a change of processes, services and products of the firms that are under pressure of strong competition conditions in order to obtain competitive priority and to enhance the efficiency of work. Cumming (1998) described innovation as a unit of technological change and a fundamental tool that enables entrepreneurs to introduce different services and products. Nonaka and Takeuchi (1995) defined innovation as a strong tool of enterprise and a key factor for firm prosperity. Innovation is the operations of finding new ideas effectively and profitably through to satisfied customers (DTI, 1996). It is a significant and largely used approach for increasing market share and improving firm's performance. Improvements can be in technical specifications, modules of the product, software, user ease or other functional characteristics.

In today's global markets, companies must manage to adapt their operational and managerial processes in order to meet the strong competition that they face. Firms from various industries should regularly be in search for finding new ideas and innovative ways to add more value to the services and/or products offered because they operate in different countries and regions of the world in an attempt to try to capture a higher share of the international and local markets.

Competition among the firms is the fundamental factor that creates market conditions and identifies competitive advantages like low price, high quality and speed of the processes, products and services. Since companies want to be pioneer in the

competition race, they should try not to be similar with others, to be favored by customers and to find best methods for extending their profitability and efficiency. As it mentioned before there is a strong relation between innovativeness and Business Excellence therefore, the importance that companies give to developing new ideas and innovative methods are analyzed in questions *TY8* and *TY10* in the survey.

On the other hand, Günday (2007) mentioned that for innovation activities to the relationship and communication between the departments of the company especially marketing, R&D, and production constitute necessary conditions. Capabilities, necessary skills, knowledge and resources for innovativeness are developed as a result of the coordination between these departments and other departments in the firm. Consequently, the conduciveness of the atmosphere inside the company is an important factor for motivating innovation activities. In the survey the appropriateness of the environment in the company for innovativeness is analyzed in question *TY9.*

Service innovation is the crucial factor for success. New methods and technologies offer opportunities for developing new and/or improved services. New service development is necessary for increasing profitability or viability of existing services through cost reduction, increased sales, new customers and devotion between existing customers (Smith et al., 2007). On the other hand, product innovation can be defined as the development of a tangible product or service that is entirely new or improved with respect to the stated needs of customers (Fritz, 1989). In many sectors the occurrence of growth and return objectives has become tightly related to product innovations. Shortly, it is vital for company to determine customer requirements which have not met yet, to develop new products and services for satisfying these requirements and to be the first company that introduces these products or services into the market. The importance that companies give to developing new service and products is analyzed in questions *TY11*

Additionally, companies may face major obstacles while introducing innovations such as lack of appropriate sources of finance and high innovation costs. Innovation cost is the most important factor that prevents firms from introducing new technologies. According to the studies in the literature, R&D expenditure per employee is an important indicator of innovation. Peeters (2003) mentioned that there is a positive relation between R&D investments and innovation competencies. Therefore, we have researched companies' R&D expenditures in question *TY12.*

Patents play a marginal role on the innovativeness of the company. They are accepted as a very important source of information (Sirilli and Evangelista, 1998).

Beside patents internet resources, scientific publications, expositions, and data bases create valuable source for observing the latest technology and innovations in the sector and these can be very useful for promoting company's innovation studies. In the survey, question coded *TY14* evaluates companies' practice for making use of open innovative sources.

Collaboration is a process of participation through which people, groups and organizations work together to obtain expected results (NNCO, 1998). Collaboration emerges as enterprises meet cases where working and operating alone is not enough to solve common problems and to achieve the desired objectives (Matopoulos, 2007).

According to Günday's (2007) statistical analyses, several collaboration strategies have major effect on firms in order to achieve higher innovativeness and better performance. His findings show that R&D collaboration with universities or research centers provide a significant difference for each innovation and performance scale. Firms that perform this collaboration are more innovative and have better performance. It is also reported that R&D collaboration with competitors provides an important difference at process innovations. Additionally, it is mentioned that collaboration with other firms makes a significant difference for innovativeness, process innovations, organizational innovations and financial performance. Peças et al., (2006) stated that collaboration culture between medium-sized enterprises (SME) and academic world for solving real problems supports entrepreneurial growth, innovation processes and CI in SME companies. Consequently, collaboration activities play an important role in Business Excellence journey and in the survey, companies' practices over collaboration with universities, research centers, competitors and other firms are analyzed in questions *TY13* and *TY15*.

3.3 Human Resources

During the last few decades, career planning has become one of the fastest developing areas in the field of human resource management. A career is a process of development of the employee along a path of experience and jobs in the company (Baruch and Rosenstein, 1992). It is well accepted by quality experts, researchers, academics and practitioners alike that human resource issues are at the base of the quality philosophy and that employee involvement and commitment are necessary for the successful introduction and implementation of quality initiatives, programs,

practices, and techniques (Blackburn and Rosen, 1993; Hart and Schlesinger, 1991; Soltani et al., 2004; Soltani, 2003).

Organizational career management usually covers several policies and practices determined by organizations to improve the career effectiveness of their employees. The content of such programs can vary such as identifying what employees want from their careers, providing right career opportunities for employees, identifying which employees deserve these opportunities and then providing and evaluating the results of career management programs (Morgan et. al, 1979; Williams, 1979). Companies that encourage the development efforts of their employees, not surprisingly, have more successful employees. Therefore, companies' practices over career planning of the employees are asked in question *Hr1*.

Smith and Rupp (2002) stated that communication is an essential tool for creating trust and loyalty in employees, which helps to develop them into a major resource for securing sustainable competitive advantage. Price (1997) defined organizational communication as the transmission of information about work by an organization to its members and among the members of an organization. Effective communication of ideas from top management throughout the company provides an open culture and helps employees to possess all the necessary information for making their own decisions (Loch et al., 2003). It is a fundamental tool for achieving company's objectives.

It is emphasized that poor organizational communication leads to lowers organizational commitment and Kanter (1988) mentioned that communication between the levels of the organization is crucial for creating an enthusiastic, widespread involvement among the employees in the achievement of organizational objectives and the creation of a suitable environment for innovation. Consequently, question *Hr2* is asked to find out about the communication inside the organization.

Previous studies have claimed that employees are the greatest asset of a company and employee satisfaction affects organizational performance by improving productivity, decreasing staff turnover and increasing creativity and commitment. Therefore, employee satisfaction should not be ignored (Ulmer et al., 1999). One of the methods for measuring employee satisfaction is conducting a survey. The purpose of employee satisfaction surveys is not only to discover employee satisfaction levels, but also to identify potential leads for essential improvements by designing the survey as well as by investigating the results accordingly. Steers (1977) point out that those employees whose needs are satisfied by an organization would be more faithful to it and therefore,

measuring and providing employee satisfaction regularly is very important for the company. Hence, question *Hr3 deals with the* companies' employee satisfaction measurement practices.

A safety function is defined as a technical, organizational or combined function that can decrease the possibility and/or negative outcomes of accidents and other undesirable events in a workplace. It is generally recognized that a company that creates and keeps a strong safety culture becomes more successful at preventing individual and larger scale accidents (Baram and Schoebel, 2007).

Workplace fatalities and injuries cause great losses to both individuals and societies. Petersen (1982) has mentioned that people are the primary reason behind accidents and prevention of accidents is the responsibility of management. Every workplace must have a set of rules and guidelines which employers must be sure that they are followed. By obeying these rules, employers must be sure that it is a safe workplace, the work itself is safe, staff has required training and supervision and there is safety equipment where essential (CYH, 2008).

According to data of TSI (2008), in the last 12 months %2.9 percent of workers encountered an accident during their work and %3.7 percent of them suffered from a health problem related to their works in Turkey. In the survey, companies' workplace security and health practices are questioned in question *Hr4*

Since employees are the resource that differentiates the organization from its competitors, motivated and satisfied people are necessary for achieving success. New ideas, creativity, innovation, vision and motivation are the drivers that keep the organization alive and they are provided by people. People bring the skills and competencies essential to the company and their most vital contribution is the provision of the products and services the company offers to the market. People who don't have any job satisfaction, motivation, enthusiasm or commitment, can't be efficient. They can't use all their potential, and they may not be innovative and resourceful. In order to satisfy people with their job and to motivate them to do their best, they need to be persuaded that the company acts in their best interest and helps them to do their job easily with the plans, tools, techniques, work designs and work analysis that it provides (EFQM, 2000). Consequently, we have included question *Hr5* in the questionnaire in order to analyze companies' practices to secure job satisfaction for their employees.

Employers usually worry about whether employees devote sufficient effort to work and employees are concerned about whether employers compensate them

appropriately (Fisher et al., 2005). Performance measurement is used for several kinds of workplace practices that analyze the collection of employee performance data. Attewell (1987) mentioned that the use of performance monitoring is as old as industry itself. However, technological developments strengthened organizations' ability to collect performance data and renewed interests in attributes and results of performance monitoring. It plays a great role in the effectiveness of the organization management, optimal structure of the organization, and excellent teamwork. The presence or absence of performance measurement and the way in which measurement is managed affects the amount of effort employees put into their work (Stanton, J., 2000). Additionally, in some studies it is concluded that monitoring is in a close relation with job satisfaction too. In our survey performance measurement is analyzed in question *Hr6.*

Employing the right employee at the right position is one of the critical initial steps of obtaining successful results. Personnel-job fit is explained as the compatibility between a person's characteristics and those of the job or the tasks required. Traditional research on employee selection has concentrated on personnel-job fit or the match between individual knowledge, skills and abilities and the requirements of the job as the main criterion. However, everyone has different work preferences and research results show that people excel doing what they enjoy most. Some people prefer working with numbers on the desk, others love working in the field. To improve the success level of selection and staffing decisions, work preferences need to be taken into consideration (Skeguchi, 2007). Excellent organizations determine the abilities that company will need in the future for implementing its policies, strategies, aims and plans; then they carefully examine what type of employees can meet them. Hence, in the survey, we have analyzed companies' practices over employee selection process in question *Hr7.*

Training is defined as a planned interference that is designed to improve the indicators of individual job performance (Chiaburu and Tekleab, 2005). Training is in close relation to the skills believed essential by the management of an organization that must be gained by the members of that organization in order to increase the probability of achievement of its objectives. Training may help employees to reduce their worry or disappointment caused by work requirements that they are unfamiliar (Chen et al., 2004).

The gap between the skills required and those owned by the employees leads to lack of job satisfaction of the employees. According to Swart et al. (2005), an improvement can be provided with a qualified training program. He claims that

knowledge, skills and attitudes of the employee will change by the application of the training program. If the employee believes that his/her knowledge and skills improve, there will be a significant improvement in the person's individual performance. Through the training a person's competencies will be strengthened and this will provide him/her to perform the tasks assigned more effectively and efficiently. Consequently, in excellent organizations personal development is supported and appreciated; employees are prepared to meet and adjust to the changes. Training is a necessary way for individual development of the employee through the journey to excellence (EFQM, 2000). In question *Hr8* of the questionnaire the participants are asked to evaluate their companies' practices for training.

In a highly changing, uncertain and complex environment, both management and employees are aware of their limited capacity to cope with future demands made on them. In Tai (2006), it is mentioned that researchers' one of the most vital suggestions for companies is to increase their training budgets in order to remain competitive and to keep an adaptable and flexible workforce. Motvani (1994) also stated that workers constantly need to update their skills or learn new skills and techniques so that companies can stay competitive in the market.

On the other hand, as mentioned earlier, innovation is one of the most important factors for creating and maintaining competitive advantage and Günday (2007) reported that intellectual capital is the most important determinant of innovativeness. Therefore, continuous development of the employees' core competencies and abilities for producing more competitive products has became vital in order to survive in the market. In the survey, we have inquired in question *Hr9* about the companies' plans for improving the fundamental capabilities of their human resources for developing more competitive products.

Some of the richest sources of wellbeing are social activities such as a celebratory lunch or some other social activity that enables one to feel more close to others in his/her community and to promote his/her sense of being a valuable member of his/her community. However, if the work environment doesn't support an individual's social, physical and psychological welfare, then his/her subconscious will eventually reveal its dissatisfaction through psychosomatic illnesses and this may affect his/her performance in a negative way (The Times, 2005). Therefore, social activities inside the organization play an important role on the performance of the employees. Question *Hr10* of the

survey inquires about companies' practices over supporting and promoting social activities analyzed in.

3.4 Process Management and Continuous Improvement

The term "internal customer" appeared during the mid 1980s while many companies were trying to enhance quality and reduce costs (Davis, 1991). The concept of "internal customer" implies the existence of an "internal service provider". An internal service provider can be anyone in the organization such as a co-worker, another department, or a distributor who is responsible to provide products or services to an internal customer (Earl, 2007). The fundamental principle of the internal customer assumes that every entity in the company exists to serve some other entity, whether that is an external customer or another entity within the organization. The organization contains interdependent individuals and functional units, each of them take incomings from one another and forward them to external customer service. If everybody strives to provide their internal customer better service, then it is expected that the final customer will get a higher quality service. Individual units or departments need to think of themselves as both customers and suppliers. They receive incoming from their supplier, add value on top of it, and send the resulting output to the next customer. Processes can be improved, and thus quality is improved, if each unit considers the entities who receive the output of their work as a customer (Farner et al., 2001). Hence, it is very important for all employees of the company to understand and apply the "internal customer" notion. This notion is treated in the questionnaire in question *Pro1*.

Before the introduction of the Total Quality concept quality was considered to be the responsibility of only quality departments in most of the companies. Today, it is a well-accepted practice that quality is the responsibility of everyone in the company. The commitment of employees to the goal of quality became fundamentally important for sustainability (Zairi, 2002). If a company is serious about quality and wants to change its philosophy and adopt CI techniques, changes have to be made in the entire organization and everyone needs to be included (Motvani et al., 1994). Therefore, in the survey we investigate this subject through question *Pro2.*

As it is mentioned several times earlier, the final judge of quality is the customer, which means that a system of quality measurement should cover the whole manufacturing and service processes from supplier to the end customer. In the process

of establishing an effective quality measurement system, identifying the check and control points, using charts in order to analyze and distinguish between specific and common causes of variation and having standard quality measures for the whole firm carries great importance (Dahlgaard et al., 1998). If the quality of the products and services are not measured systematically, defective products can be passed over to the customer increasing external quality cost. Therefore, in question *Pro3* we try to discover whether companies have a well established quality measurement method.

Present manufacturing activities are much more complicated than those of the past. To manage today's complex manufacturing companies managers need relevant, accurate and readily available information in order to develop and operate functional strategies and to decide on product mix and to control production costs. Although manufacturing systems have changed to satisfy the developing demands of the market, the internal management accounting systems have usually stayed the same. Therefore, managers and accountants have become discontented with traditional costing systems.

Activity based costing (ABC) has appeared as an alternative to traditional costing systems. It is an extremely helpful guide to management action that can translate directly into higher profits (Cooper and Kaplan,1991). It is a process of individually listing and measuring the cost of each activity contributing to the production and delivery of a particular product or service. According to Innes and Mitchell (1990), ABC provides more exact product line costing especially where non-volume related overheads are important. It is flexible enough to analyze costs by cost objectives. It gives meaningful financial and non-financial measures, which are relevant for cost management and performance assessment at an operational level. It facilitates understanding of cost behavior and thus has the potential to upgrade cost estimation. It generates a more logical, suitable and extensive base for costing work. Consequently, companies' practices over activity based costing are analyzed in question *Pro4*

Among several management tools and techniques emerging in 1990s "benchmarking" has proved to be useful in helping individual organizations to evaluate their position relative to their competitors. Benchmarking is the process of measuring an organization's internal operations and then identifying, learning, and adapting excellent practices from other companies approved to be best in the market (TBE, 2008). Benchmarking is recognized as a necessary tool for CI of quality which proved by the literature. Benchmarking has established its position as a tool to improve an organization's performance and competitiveness by identifying and adopting the best

practices from others and also by developing the best practices with others (Kyrö, 2004). Hanson and Voss (995) stated that best practice benchmarking technique can offer a significant insight into the workings of an individual. As a result, benchmarking facilitates organizations to determine the most critical processes that require improvement, and to discover applicable solutions from the best company in class (Fernandez et al., 2001). In question *Pro5* of the survey, it is explored whether companies have standard documented benchmarking procedures in place.

The self-assessment audit is a very strong management tool resulting in several benefits for the organization. The results of the self-evaluation study reveal the overall picture of the quality situation in the company. Shortly, areas in need of improvement can be identified. Although not every opportunity for improvement can be identified, audits will help determining priorities for managers by showing which changes will have the highest affect on overall performance.

When self-assessment information is regularly collected and shared, it provides several departments of the organization to work together effectively. This is crucial in the light of the high integration between functional units and between companies. This breaking down of barriers facilitates a company to answer faster to the needs of customers and other players. Determining the organization's strengths and challenges assists the company in identifying the best actions to achieve its objectives. While company self-assessment studies are an important part of process improvement, their success depends on understanding how to use them effectively.

The process of self assessment study will increase the commitment of people throughout the organization to change. The results may convince top management to review its priorities, and may help to focus the vision of employees at all levels in the company. Realizing the differences between targeted and current performance is the initial step in creating the action to close that gap (CSP, 2008). In our survey companies' practices over self- assessment are covered in question *Pro6*

Deming described CI as an improvement initiative that increases successes and lowers failures (Juergensen, 2000). Bhuiyan and Bagehel (2005) defined CI as a culture of sustained improvement targeting the elimination of waste in all systems and processes of an organization. CI is clearly a worthwhile goal. Each company must develop a CI approach, which is appropriate for organization's culture and mission. As mentioned by Bessant et al. (1994) CI has huge advantages such as requiring low-levels of financial investment and having the ability to utilize the ideas of all people. Woods

(1997) stated that CI provides a healthy workplace, satisfied customers and increased financial returns for the company. According to Fryer et al. (2007), CI is an approach that everybody in the organization work together for improving processes and reducing failures to improve overall performance for the customer. He also indicated that it provides improved performance or quality, reduction of waste, reduced costs and, improved customer satisfaction. Additionally, ideas and suggestions come from those who are actually doing the job and thus, employee commitment increases.

Often, main improvements appear as a result of several incremental improvements. These improvements are achieved through the help of tools and techniques used for searching sources of problems, waste, variation, and identifying methods to minimize them. Until now, a number of CI approaches have been developed. The best known of them are lean manufacturing, six sigma, balanced scorecard, and BPR. As a result, executing CI projects have several benefits over the organization. In question *Pro7* of the survey, we investigate whether companies have written standard procedures for defining and applying CI projects. It is also analyzed whether companies have written standard procedures for reviewing the completed or terminated CI projects in question *Pro8*, and finally in question *Pro9*, it is questioned whether companies share findings of CI projects with all employees.

Procedures are described as organization design declarations written for managing an aspect of a business operation or subsystem. Procedural development is a system for accepted execution of tasks, a formal due date of task process or a plan for operating requirements and policy (Rogers, 1995). Procedures guide people toward a requested result through a structured self organizing framework appearing from procedural design (Brodbeck, 2002). Examples of procedures may be created in companies' human resource manuals, personnel practice letters, accounting and treasury manuals. Such procedures may involve the mechanism for bonus or salary increment, for hiring and firing of employees, for manufacturing methodologies etc. In the survey, the existence of written standard working procedures for the entire company are investigated in question *Pro10.*

3.5 Planning

Determining, clarifying and communicating organizational mission is the main part of the planning process. Organizations might be motivated to develop a mission

statement. Company may feel that it needs to reconfirm its aim and to remind itself why it exists. According to David (1989) customers, products or services, location, technology, concern for survival, philosophy, self-concept, concern for public image and concern for employees are nine key critical elements that a mission statement should contain. It has to be long enough to be meaningful and to be effective in its operation however, it cannot be so long that it cannot be remembered and the affect of its major points lost.

The statement may be displayed always in the workplace to act as a reminder for all employees. It should be especially displayed in semi-public areas like reception area, meeting and conference rooms to inform visitors. It may create the starting point for presentations about the company to important customers and investors. It may be the beginning point of employee training. (Wickman,1997). In the survey, companies' practices over their mission statement are asked in question *P1*.

Benchmarking may be described as the process of analyzing the best products or processes of leading competitors in the same industry or leading companies in other industries (Camp, 1995). Benchmarking is recognized as an essential tool for CI of quality. The benchmarking concept is usually perceived as an act of imitating or copying however, actually it s a concept that helps driving innovation rather than imitation (Thompson and Cox, 1997).

Benchmarking has an ability to draw on existing knowledge and tools for strategic planning, competitive analysis, process analysis and improvement, team building, data collection and organizational development. It provides a high return in terms of quality, productivity and customer satisfaction and it helps in the implementation of change when linked to a strategic planning framework (Daniels, 1996).

On the other hand, the self-assessment process is another tool for CI that provides the organization to recognize clearly its strengths and weaknesses in which improvements can be made. According to Ritchie and Dale (2008) self-assessment and its acknowledgement are key incomings of the business planning process and organizations have figure out this hence, they are supporting the use of self-assessment results in making their future business plans. Ritchie and Dale's research states that 8 of the 10 organizations fully integrated self-assessment results into their business planning processes. The evidence from the interviews shows that the measurement of the self-assessment results has usually been problematic but there is a concurrence that the self-assessment process is successful if the outputs that are the feedback retrieved are used

in developing strategy and this is approved as one of the fundamental indicators of success. We have researched whether companies use their benchmarking and self assessment results in their plans or not in question *P2*.

Planning concentrates on the direction of the organization and actions essential to improve its performance. It is the process which companies derive a strategy to provide them to analyze and answer to the changing dynamic environment in which they operate (Hewlett, 1999). Planning is widely considered to be related to goal setting and choosing the actions to reach these goals. It is important to define these goals as clearly as possible. Cigolini and Grillo (2006) indicated that strategic planning represents a roadmap of companies on their way to achieve their mission.

Both short and long term planning are essential to obtain optimal results. The planning methods are used on several planning horizons and levels of detail such as in long-term planning, the planning object is usually the end product or product group, while on the detailed material planning, the planning object may be an individual dependent item. We have discovered in question *P3* whether companies have a well established planning process which determines short and long termed objectives and audits processes or not.

An increasing number of organizations, as a part of strategic planning approach for CI, are starting to use policy deployment. Developing policy and plans helps creating cohesiveness within the company and enables a consensus of the company objectives at all levels, integrates and organizes the efforts of all within an organization into actions that move the whole organization towards its objectives, and creates commitment to both the direction and implementation of chosen plans (Lee and Dale, 1998). Principles that companies follow in this process can be summarized as focusing on goals based on customer needs, supplier advantages and needs of the community and other people who hold a share or interest in the company. In question *P4* we investigate whether companies consider customer demands, supplier opportunities, and requirements of society and other stakeholders when developing their plans, policies and objectives.

A strategy is a plan of actions to reach a desired business goal. Company's strategy determines the direction it will try to follow over several years; manages the allocation of financial, physical, and human resources. Strategy will only succeed if the managers believe in it. Identifying an effective strategy necessitates the effective

arrangement of objectives, the identification and evaluation of alternative actions and the application of the selected preferences. (Tan and Platts, 2005).

Skinner (1969) defined strategy in manufacturing as the description of how a company competes in the market and identified the manufacturing task as one that has to make internally coherent preferences that express the company's competitive priorities in order to encourage the corporate strategy and competitiveness. The manufacturing strategy process covers the formulation, justification, and application of strategic decisions (Swink and Way, 1995). Brown et al., (2007) state that world-class manufacturing should include a consideration of the strategy process which analyzes and integrates manufacturing issues with business strategy. Therefore, in question *P5* it is questioned whether companies have a strategy, which is approved by top managers and is defined clearly and includes all manufacturing structure.

3.6 Manufacturing Structure and Operations

New products are goods and services that have a significant difference in their characteristics. Product innovations may involve both the production of new goods or services and important improvements in the functional or user characteristics of existing goods and services such as technical characteristics, components and materials, imbedded software, user friendliness or other characteristics. Product innovations can be the result of new knowledge or technologies, or can utilize knowledge or technologies that already exist in the company. A new product or process can be the source of competitive advantage for a company in the market (OECD, 2005). On the other hand, in order to effectively compete in the marketplace, companies should develop a unique set of skills for market that give competitive differentiation. The core competency of a company not only creates the distinct corporate signature but also provides company competitive advantage. In the survey, we tried to discover whether companies focus on producing high number of different products or not in question *Mso1*.

Innovation projects improve firm's performance by creating or strengthening a competitive advantage or keeping competitiveness by increasing the demand for the firm's products. Innovation may increase demand by improving product quality, offering new products, launching into new markets. Affects of innovation projects on firm performance extend from increase on sales and market share to improvements in

productivity and efficiency and hence, in cost. It is mentioned in the literature that company's competitive success is dependent upon their management of the innovation process (Adams et al., 2006). But executing many projects in the same time will prevent to focus on each one sufficiently. We have analyzed whether companies manage several innovation projects simultaneously in question *Mso2.*

Launching on the new segments of the market helps companies to find new advantages in under-served customer groups. This can be an opportunity especially in mature or declining markets (Hooley and Saunders, 1993). For organizations, which perform across a wide range of markets that have different competitive priorities, market analysis play a critical role in managing marketing activities that highly contribute to market share and profitability. (Hammermesh *et al*., 1978). It is necessary to coordinate various customer needs with the capabilities and resources of the organization in the marketplace. In most markets, customer requirements are too much for single organization to meet all the time therefore it will be very hard to successfully launch on various markets that have different competitive priorities. In the questionnaire, in question *Mso3* we tried to find out whether companies launch on markets that have different competitive priorities.

Technology is becoming more and more vital to the success of all business firms, and to national economic growth. The process of globalization is driven by technology development and the capability of companies to control technology effectively and rapidly. The effective management of technology as a source of competitive advantage has a significant importance for companies' sustainable competitiveness (OECD, 2005). It has become necessary to consider development and integration of different technologies.

Technology absorption is, hence, a significant concern for most countries which seek to achieve greater technological competence and economic growth. Managing several new technologies effectively requires absorption. The effectiveness of technology absorption and capability creation is dependent upon linkages among the main players such as business firms, universities, research institutions, and so on (Arogyaswamy and Emler, 2004). Consequently, we inquire about companies' practices over developing and supporting several new technologies in question *Mso4.*

The intensity of global competition has attracted an even greater interest on CI of products, services and processes. CI is believed to be a fundamental part of quality management for satisfying customers' changing demands. Never-ending improvement

is possibly the strongest tool to guide management. CI paradigm guides a company to learn from its results, to standardize what it does well in a documented form, and to improve operations and outputs. Therefore, in our survey we have analyzed companies' improvement activities in question *Mso5.*

The mission statement of a company serves as a guide when determining the business strategy of that company. . Business strategy determination process involves actions like company overview, determination of market segments, determination of key success factors, assessment of competitors' position and planning for medium and long term objectives, which together lead to a statement of the organization's business strategy. After determination of the organization's business strategy, process continues with an evaluation of the existing manufacturing system and is concluded with the description of a manufacturing strategy, which is then converted into specific action plans. Identifying aims and priorities constitute the most important stages in development of a business strategy. However, these stages are worthless, if they are not followed by manufacturing activities intended to achieve these priorities and objectives (Jalham and Abdelkader, 2006). Therefore, we question whether the company's manufacturing activities are in accordance with its business mission or not in question *Mso6*

In the past, the goal of manufacturing was to position itself with market needs rather than providing a source of competitive advantage or reshaping the market (Hill, 1985). However, an emerging theme is that a company's resources and capabilities are the main factor of competitiveness and in many companies manufacturing function is the custodian of a large amount of these resources. In Hayes and Pisano's (1994) model, manufacturing takes on a central position rather than a secondary role in the competitive strategy of the company. Englyst (2007) also stated that manufacturing makes a strategic contribution to the competitive strength of the company. Therefore, we aim to assess in question *Mso7* whether the manufacturing capabilities of the company constitutes the basis of its success in the market.

New product development is a critical process for achieving economic success in manufacturing organizations. Organizations should try to develop new products to meet the requirements of the customers in order to secure success in the market. Here, one of the more important points is the design of the product and its alignment to the existing infrastructure and capabilities of the firm. Designing and producing new products that are compatible with the existing manufacturing processes, technologies and capabilities

of the company will be more efficient and easier (Taylor et al., 1994). In questions *Mso8* and *Mso9* of the survey, we try to investigate whether new products of the company, which are designed in-house or are asked to be adopted, are in harmony with its manufacturing and other capabilities.

Companies must have both efficient maintenance and effective manufacturing strategies to be successful in the highly competitive environment. Effectively adaptation and application of Total Productive Maintenance (TPM) approach in manufacturing companies are of strategic importance for improving the performance of maintenance activities. TPM is an approach developed in Japan to sustain lean manufacturing system, because reliable and effective equipments are necessary for applying lean manufacturing in the organizations (Sekine and Arai, 1998). Nakajima (1989) describes TPM as an innovative technique to remove breakdowns and support self-directed maintenance by operators for daily operations. TPM activities concentrate on addressing main losses and waste associated with the manufacturing systems.

TPM aims to maximize equipment effectiveness. Its implementation in the company can provide higher productivity and quality, fewer collapses, lower costs, on time deliveries, appealing working environments, improved safety and improved motivation of the employees (Tripathi, 2005). It has been recognized as a very successful way for improving maintenance performance in order to survive in the highly challenging market conditions. Consequently, we try to discover whether the company exercises TPM extensively in its manufacturing facility in question *İ10* of the survey.

The importance of the core competence management is widely known in the literature and there is an agreement that organizational competitiveness depends on organizational core competence (Hamel and Parahalad, 1990; Drejer, 2000). Competencies represent skills, qualifications, characteristics and behaviours that differentiate an individual. On the other hand, at the organisational level competencies are those functions and activities that a company performs effectively. The competence building process must be designed to support and improve the competitive strategies of the organization (Hafeez and Essmail, 2007). Core competencies provide organisations to access a wide variety of markets, to make an important contribution to customer perception, and to be difficult for competitors to imitate. In question *İ11* of the survey we inquire whether there is an agreement in the company about the company's existing core competencies and what they should be. Further, in question *İ12*, it is investigated

whether or not the company develops its core competencies based on a plan and with the necessary funds secured,.

In the early 1970s Toyota started to implement just in time (JIT) production system. It then spread over to other Japanese organizations in the late 1970s. At the beginning of 1980s JIT became a popular manufacturing innovation in many Western and other Asian countries (Kazazi, 1993). The adoption of JIT requires implementation of a series of strategies for improving facility layout, product design, production planning and scheduling, material flow, supply chain and human management aspects. It focuses on waste elimination, where waste includes all activities, which do not add value to the production process. Waste can be in several forms like scrap, rework, equipment downtime, excess lead time, overproduction, and lower space utilization.

The secondary objective of the JIT system focuses on CI towards lower production costs, higher productivity, better quality and dependability of products, achievement of promised delivery times of goods and improvement of relations with suppliers and customers. (Kazazi, 1994). Wallace (1990) described JIT as “a method to achieve excellence in a manufacturing company based on continuous waste reduction and regular improvement in productivity”. In the survey, we question whether companies make their production plans in order to secure JIT production in question *İ13*.

Product recovery is a legal requirement for companies but it is not only a legal responsibility of the organization towards supporting the environment but also a consequence of its intention to make profit (Gungor and Gupta, 1999). It has to be identified by the company to which level product recovery can be a profitable method of dealing with used products. An important field of product recovery is remanufacturing, which includes activities that bring used products or their main parts back to such a form that recovered ones are just as good as new ones. In many industries, original product manufacturers are also active in the remanufacturing business because of their specific know-how in products and markets. For high-valued industrial products like copiers, computers, vehicle engines or medical equipment, the recovery rate is widely high-level (Rogers and Tibben-Lembke, 2001). As a result, remanufacturing of used products is a developing business area, which is attractive from both an economic and an environmental point of view.

Another form of product recovery is through disassembly of the scrapped product and recovering parts and material for recycling. Recycling is the reprocessing of old materials into new products, with the purposes of prevention of the waste of useful

materials, reduction of the usage of fresh raw materials, energy consumption, air and water pollution. In question *İ14* of the survey we investigate whether a threshold recovery ratio is a prior criterion for companies while they are designing new products or modifying existing ones.

In order to meet various challenges of entering into or surviving in markets with new or better products, many firms decide that they must find outside partners to share the risk. Also the complexity of developments in technology and production methods, high product obsolescence rates, and the relatively easing access requirements to markets have strengthened the motivation for collaboration (Kent, 1991).

Collaboration between two or more companies has been determined as one of the ways of achieving a low cost product development and reduced risk of failure (Hagedoorn, 1993). According to Günday's (2007) research in Turkish manufacturing industry, 34% of firms in the sample go into some form of production collaboration, which is performed usually to match capacity deficiencies resulting mainly from unexpected orders. On the other hand, complementary collaboration is defined as the collaboration for a common project/product among companies that have different complementary core competencies. These companies come together and contribute with their own specialty tasks. In Günday (2007)'s study, 28% of the companies in the sample claim to perform complementary collaboration. Results of analysis show that this collaboration type makes a significant positive difference for organizational innovations. And it is discovered that firms, which go into complementary collaboration, are more innovative. In question *İ15* of the questionnaire, we inquire about companies' practices over production collaboration and complementary collaboration.

3.7 Manufacturing Strategy

Researchers discussed that the manufacturing decisions on a variety of investment alternatives should be analyzed by the company's strategic objectives rather than traditional cost accounting methods only. Kim and Arnold (1996) selected some manufacturing objectives related with cost (unit variable cost, materials cost and overhead cost), while others are more related with time (delivery lead time, procurement lead time, new product development cycle), or quality (defect rates). Skinner (1969) stated that companies' manufacturing function should cover more than

simply production and shipment of the products. He defined manufacturing objectives as cost, quality, delivery and flexibility.

3.7.1 Manufacturing Quality

Perceived quality represents the opinion of the customers depending on the superiority or global excellence of a product or service. Kasper and Lemming (1994) defined quality as the satisfaction of customer needs. Customer satisfaction is one of the major ways a company can determine, if its quality improvement programme has been a success. If service and product quality measurement and management depend on customer expectations as several researches suggest, a strategic attempt should be made to monitor and manage those expectations.

The SERVQUAL model (Parasuraman et al., 1985) identifies five specific criteria, which customers employ when evaluating service quality: the form of physical facilities, equipment, personnel, and materials, the ability to perform delivery promises accurately, the motivation to help customers, the ability of the system and its credibility in providing a courteous and safe service, and attempt to understand customers' requirements. The emphasis companies put into improving product and service quality as perceived by customers is investigated in question *P6* of the questionnaire.

Quality improvement is an effective method for a company to improve its competitiveness. For many organizations it has become the driver of quality improvement efforts (Tan et al., 2000). Due to intense competition, monitoring competitors for understanding their behaviour and predicting their moves becomes increasingly more important. Companies have to differentiate and to improve the quality of their services and products continuously in order to capture a higher share in the market. We try to understand the level of significance attached by the companies to improving product and service quality relative to their competitors in question *P7* of the questionnaire.

To survive in the marketplace firms should concentrate on excellence to obtain and to keep a pool of loyal and profitable customers. The process of providing customer delight out of a deficient situation is through listening, empathising, innovating and caring.

Customer's general feeling about the company is mostly formed as a result of the company's handling of the complaints. Complaints have to be analysed in a productive,

positive and professional way. Smart organisations promote their customers to complain because nearly 50 per cent of the customers do not bother complaining in most industries although they have a reason to complain. Therefore, the non-existence of complaints is not a true indicator of customer satisfaction (Karatepe, 2006). Gilly and Hansen (1992) mentioned that successful complaint handling may convert ordinary customers into contented and loyal ones. Question *P8* of the questionnaire tries to understand what the level of significance of reducing customer complaints is for the companies. .

A defect is described as a deviation from specification or the performance gap between a desired result and the achieved result. Equipment failures, process variations, unsuitable process operations and human error can cause defects. A standard process for recording and analysing defects has to be in use in the company. Sources of quality defects should be continuously monitored and corrected in order to reach lower defect levels with the ultimate goal being zero defects. Both academics and practitioners confirm that high production quality requires a quality management system with an emphasis for the prevention of defective products supported by a sophisticated inspection system (Dhafr et al., 2006). We try to find out the level of significance attached to reducing the number of defects by the companies through question *P9* of the questionnaire.

One of the crucial indicators of quality is the number of units returned per period to retailers and to manufacturers for replacement during warranty or for reimbursement. Companies that produce products with lower return rates can expect to have higher levels of customer satisfaction and loyalty. Hence, companies should analyze and reduce product returns for securing customer satisfaction and loyalty. We question the level of significance level of attached by the companies to product return rates from customers in question *P10* of the questionnaire.

3.7.2 Manufacturing Cost

Unit incoming costs can be defined as the amount of an incoming used to make a unit of the product times the price of the incoming. Therefore, changes in unit incoming costs affect the price of the incoming directly. The relationship between a unit of output and the amount of incoming needed to produce it is measure of productivity. It is

important to examine the link between productivity and unit incoming costs (Dean and Sherwood, 1994).

The cost of the incomings for producing a unit of output is an important determinant of competitiveness. When one firm's incoming costs for a product are rising less than other's in real terms, we would anticipate the first firm's trading position is improving relative to that of the second. Hence, in our survey we have tried to explore whether companies strive for the reduction of the incoming costs in question *P11*.

Competitive business strategies emphasize the significance of human resource management. People, their skills and contributions, may constitute the most precious asset in the company. On the other hand, salaries, benefits, and administrative costs associated with the human resources may result in a relatively high personnel cost. Further, many companies consider training as a cost rather than an investment; and companies that consider it as a cost limit the training by technical requirements of the job rather than aiming to develop employees more holistically that can successfully support the company's strategy (Wirtz et al., 2008). Gollan (1998) also state that organizations, which do not use their management power for development of employee skills, may be cutting costs but may also be locking themselves into a low skill and low quality strategy of the work environment are two main focuses.

One of the more obvious motivational incentives for increasing employee productivity is often thought to be different forms of financial incentives but this is not always the case. Recent research on the nature of effective human resource management has shown that in a many cases, financial incentives have less to do with motivation than do other factors. A motivating workplace must be one in which employees are treated fairly. Also, building loyalty is a key element of motivating workers and in that way increasing the general productivity of operations. Other important factors cover setting goals about the work being done, creating disciplinary guidelines, developing a healthy level of communication in the workplace and the actual physical layout of an office (Hrvillage, 2008). Hence, in question *P13*, we try to understand the company’s stand towards increasing of personnel productivity.

Transaction costs are the costs of carrying out any exchange, whether between companies or within a company. It is useful to divide transaction costs into three major classifications: information costs, negotiation costs, and monitoring costs. Companies encounter costs in the search for information about products, prices, incomings and buyers or sellers. Negotiation costs result from the physical act of the transaction, such

as negotiating and writing contracts or paying for the services of an intermediary to the transaction. Monitoring or enforcement costs take place after an exchange has been negotiated. This may include such activities as monitoring the quality of goods. For lessening transaction costs cooperation, teamwork and the quick interchange of data between firms in a supply chain will be useful. To analyze transaction costs and to reduce those, companies require information (Hobbs, 1996). In question *P14*, we question the level of importance attached by the company to the reduction of the transaction costs.

In today's competitive environment, working better, smarter, and more cost effective leading to reduced waste, scrap, and rework have become even more critical for proper everyday management. However, production of scrap and waste during manufacturing or reprocessing can become a very serious problem leading to diminishing cost-effectiveness and the resulting excessive costs may affect the manufacturing team's performance, customer orders, and delivery schedule and lessen company's competitive edge (Daigle and Powell, 1996).

Vakurka et al. (1996) stated that reduction of waste and scrap can be achieved through the coordinated elements of leadership, organization, measurement, quality improvement teams, communication, awareness, and recognition. According to their research, one of the more important contributors to the reduction process was top management leadership. Teamwork at every level of the organization was also found to be critical for the success of the reduction process.. Each plant can be given a monthly target for waste reduction. The result of each plant's performance can be monitored by the headquarters based on this target. Major projects should be assigned to quality improvement teams as part of the reduction process. Successful scrap and waste reductions should be communicated to other teams within the plant. All employees should realize that scrap and waste reduction is a very important goal in the company. Successful projects, teams, individuals, and plants should be recognized as they reached their reduction objectives. In the survey, we ask about the significance level the firm attaches to the reduction of waste, scrap, and rework costs in question *P15.*

In today's global competitive market, managing cost in supply chains is a key element for achieving competitive advantage. However, the costing systems used in many companies do not align themselves to supply chain operations. This can result in incorrect or misleading information causing poor management decisions (Whicker et al., 2006). The purchasing department has a vital role to play in a company's efficiency and

effectiveness because its actions directly affect cost, profitability and flexibility of the organization. With the increasing importance of the logistic function, supplier management decisions have become more critical. As companies become more dependent on suppliers, the direct and indirect costs of poor decision making become important (Gonzalez and Eckelman, 1994). Selecting the most suitable suppliers considerably decreases the purchasing cost and improves corporate competitiveness that is why several experts claim that the supplier selection is the most significant activity of a purchasing department.

Other more important elements of successfully reducing logistic process costs are using an organized approach including cross functional teams, obtaining management and stakeholder support, learning supply chain cost-saving techniques, studying and analyzing internal and external logistic process deeply, setting metrics and standards for measurement of supply chain performance (Kauffman, 2004). Internal logistics costs cover all logistics activities that take place within a company. It leaves out all outsourced logistics activities and all production processes. Try to apply just-in-time deliveries from suppliers that can minor firm's inventory as well as internal logistics costs. Logistics managers should make sure that every internal logistics function performs in a way that produces the total lowest-cost logistics operation. The attention to details is the heart of excellence in logistics (Canadian Transportation and Logistics, 2008). In the survey, we question the significance level attached to total cost in external and internal logistic processes in question *P16.*

Manufacturing is the act of making things, particularly the act of making products that will be traded or sold commercially. Nowadays, the interest of many manufacturers has obviously turned to cost reduction because of their competition with global markets, "low cost" countries, and uncertain home economies (Wikipedia, 2008).

Although varying over industries, roughly 70 percent of the cost of manufacturing is shaped by decisions made during the design and early manufacturing process development phases of the product. Thus, the most useful method of gaining the required performance levels of cost and quality is specifically focusing on the design and manufacturing of the product from a cost and quality perspective (Anonymous, 2004). In question *P17*, we inquire about the level of importance attached by the firm to the total cost of manufacturing process.

3.7.3 Manufacturing Flexibility

Global nature of competition, rapidly changing technology, and shorter product life cycles are some of the reasons behind the transformation of current manufacturing environment to an extremely competitive one. Conventional manufacturing approaches, such as mass production of a few standardized products, are no longer sufficient weapons to secure survival.

The competitive conditions of today have created an increased interest in flexibility as a response mechanism. Upton (1994) described flexibility as the ability to adjust or reply with little penalty in time, performance, cost or effort. An organization that is flexible and has a set of various strategic options can adjust effectively to dynamic environments. Organizations must consequently build new methods and perspectives to meet these market needs in a well-timed and cost effective way. In the questionnaire, we question the level of significance for increasing the flexibility in manufacturing systems in question *P18.*

Routing flexibility has been frequently studied in shop floor control and flexible manufacturing systems (FMS) scheduling literature. Routing flexibility is the ability to use alternate processing centres. It provides alternatives in the event of machine breakdowns, overloads or changing task priorities. The use of alternate routes changes the location of processing, but not the order of operations. In the questionnaire, we have questioned the level of significance of changing the assignment of equipments according to priority of tasks in question *P20.* On the other hand, operation flexibility provides development of various different processing plans. Operation flexibility covers changing the current order of operations performed, while routing flexibility changes the machines that do the processing for an identified order of operations (Kosta and Malhotra, 1999). When unexpected customer orders occur, operation flexibility will provide a great opportunity to the company to meet those orders. In the questionnaire, we have analyzed the significance level of increasing the flexibility of changing task priorities according to customer orders in question *P19.*

Companies can cross-train workers within a single department or across departments. The workers who are trained across departments will likely be able to face a more different set of tasks and hence, their ability to work in different tasks increases. The number and heterogeneity of tasks an employee performs define the range of labour flexibility. The existence of labour flexibility plays a fundamental role in most

production processes and affects firm performance. Implementation of group technology cells (Hyer and Wemmerlov, 1984) or one worker multiple machines cells (Krajewski and Ritzman, 1996) can improve the level of labour flexibility. Process choice and managerial policies can determine the level of labour flexibility. Managerial policies on cross-training and suitable reward systems can reduce transition penalties and lead to motivated employees. In question *P22*, we investigate the level of significance associated with improving the ability of the manufacturing workers to handle diversified tasks.

Product flexibility covers both the introduction of new products and the modification of existing ones. The organizational skills and abilities needed to produce new products may be significantly different from those required to modify existing ones. Dixon (1992) states that a product is considered new if its characteristics differed from those of any other product produced by the plant in the past. The number and portfolio of new products introduced by a company represent the range of new product flexibility. Vesey (1991) states that introduction of a new product can considerably affect profitability of companies that are motivated to be consistent in their product development activities.

On the other hand, a product is considered as modified, if its functional characteristics are kept but other aspects of the product are changed to meet customer needs better (Dixon, 1992). These may often be driven by customer requests. An actual design can be modified for a particular customer. Modifications also include extensions of the product line with an enhanced product design or characteristic. The number of modified products developed and the variety of the modifications represent the range of modification flexibility. It also serves as an indication of the responsiveness of the company to customer requests. The ability to customize products may offer several competitive advantages such as charging premium prices and entering small niche markets that would otherwise be unprofitable (Koste and Malhotra, 1999). The level of significance associated with increasing the ability of producing non-standard products according to different customer orders is questioned in question *P21* and similarly, in question *P23*, reduction of the frequency of rejecting non-standard product orders is investigated. The reduction in the frequency of rejecting such orders is considered to be an indication of an increase in the level of manufacturing flexibility. The level of significance attached with increasing the ability of using the existing equipment and

employees in a flexible way for the production of non-standard products is questioned in *P24.*

3.7.4 Delivery Reliability and Speed

As most manufacturers try to improve quality and reduce cost, quality and cost become qualifier and no longer enough for the manufacturers to compete in the world market. Results of empirical studies in the literature showed that delivery reliability and speed is order winning in modern business now. This new shift is found as time-based competition. Most of the firms started to concentrate on maximizing speed of information transmission within the firm, the time of their operations like supply time, set up time, manufacturing time and delivery time (Kim and Tang, 1997). It became obvious that time-based competition is a critical strategy for companies to survive in the market. In order to compete effectively, companies have to differentiate themselves on price, length and reliability of the lead time. Stalk and Hout (1990) mentioned that the benefits of the time-based competition include increased market share, increased price premium, and reduced cost. In the survey, we have analyzed in question *P27* the level of importance for a company to increase the delivery speed of finished goods. We have also investigated the level of importance for a company to increase the ability of keeping delivery promises in question *P28* and the level of importance of increasing just in time delivery in question *P29.*

Blackburn (1991) mentioned that in 1990s many companies compete on three basic time interval: product development cycle time, manufacturing lead time, and response time. Reduction in these time intervals may provide company several advantages. Product development cycle time is the time that is required to convert an idea to a product. Shorter product development cycle time provides company to launch in the market first and obtain reputation as the leader. The time between the customer order and the customer receives the order is defined as a response time. Finally, shorter response time increases customer satisfaction which leads to a higher market share. In question *P25* whether reduction of response time is important for the company is questioned.

Manufacturing lead time includes the time of converting raw material to finished goods and waiting time of final goods for delivery. Short manufacturing lead time is known as the fundamental factor for successfully performing world-class manufacturing

goals of on-time delivery, quality, flexibility and productivity. The length of manufacturing lead time is frequently used as an indicator of a company's competitiveness. Shorter manufacturing lead time enables manufacturers to decrease amount of finished goods inventories as well as in-process inventories, which decrease the obsoleteness risk (Kim and Tang, 1997). In question *P26* whether reduction of manufacturing time is important for the company is questioned. Additionally, it is mentioned that the product development cycle time is vital for strategic planning on the other hand, the manufacturing lead time and response time is significant for tactical planning. In the survey, whether reducing the difficulties about distribution and delivery is important for the company is analyzed in question *P30* of the survey.

3.8 Customer Focus

Nowadays companies find it more and more important to respond both rapidly and effectively to varying patterns of customer demand. There is a growing recognition that companies should develop product and service differentiation studies through a greater focus on the end-user. In order to improve the results, companies should be more customer focused and attempt to understand the customer. Only when organizations really understand their customers, it is possible for them to generate innovations, which are necessary for success in the dynamic markets of today. Robledo (2001) states that understanding customer needs is a precondition for delivering better-quality service because customers evaluate service quality by comparing their perceptions with their expectations. Organizations should conduct surveys and use extensive data collection tools in order to understand their customers' requirements. In the questionnaire, we have questioned whether companies know their customers' current and future requirements in question *Cf1*.

Customer satisfaction is surely the key factor to success for every organization. It is emphasized frequently in the literature that customer satisfaction is related with concepts such as customer loyalty, repetition of orders and the word-of-mouth effect. There are also numerous empirical studies that have reported on a positive relationship between customer satisfaction and business results (Fernandez-Gonzalez and Prado Prado, 2007). In the organization every employee should be aware of the requirements put forward by the customer, particularly the effect they will have on the tasks within his/her responsibility domain and the resulting expectations and try to meet those

requirements and expectations. Information concerning customer requirements and expectations should be communicated throughout the organization and must be clear to every one. The corporate culture should encourage all employees to use their creativity and mental power for meeting customer requirements. In the questionnaire, in question *Cf2* we have questioned whether customer requirements are communicated throughout the organization and every employee is made to understand them.

Company strategies should emphasize listening to customers before designing new products or services. This might need intensive and complex information sharing with customers to find out all the specifications of the product and service offering, which lead to close customer relationships (Sousa, 2003). Such a collaboration is expected to lead to better products and services and hence, to higher level of customer satisfaction and success in the marketplace. In question *Cf3*, we have tried to discover whether companies consider customer expectations, ideas, and suggestions during their new product and service design processes.

Effective handling of customer complaints is essential for building a good reputation as a caring company among the customers. When customers complain and their complaints are met with satisfactory solutions, then they will probably make a repeat purchase and contribute to the word-of-mouth improvement of the company profile in the marketplace. Customers, whose problems are solved sufficiently and quickly, will tell their friends and neighbours about it and it would be very difficult for a company to gain this kind of advantage through any kind of competition measure. Companies that bring satisfactory solutions to complaints on the first time improve customer satisfaction and product loyalty, increase employee satisfaction, and decrease costs. Companies should even seek complaints because most of the unsatisfied customers do not complain. By encouraging people to complain, more customers will come to the company with their problems and provide a greater occasion to upgrade service delivery or production processes. Training of customer service representatives is also essential for ensuring just-in-time resolution to customers' problems (NPR, 1996). In question *Cf4* of the questionnaire, we investigate companies' problem solving process over customer complaints. In question *Cf5*, we question whether companies make use of the complaints to initiate process improvements.

In order to understand the customer and the market, it is necessary to listen to the customers. Customer satisfaction assessment may be considered as the most useful feedback method. It provides an effective, direct, meaningful and objective manner to

evaluate clients' preferences and expectations. In order to assess the level of satisfaction, companies use various methods and survey methodology is probably the most popular one. Customers are surveyed to explore their level of satisfaction with the current services, delivery of services, kindness of employees, and general performance of the organization. Surveys are sent out with questions often with a Likert scale measurement scale, where customers can indicate their degree of satisfaction.

The value that the companies gain from the practice of measuring and analyzing customer satisfaction will be superior, if companies use a combination of methods to evaluate customer satisfaction without depending so much on surveys only. It is especially needed for the company managers to make an effort to develop their know-how in these techniques through training activities or by the help of other bodies, such as research centres, universities, business colleges, etc (Fernandez-Gonzalez and Prado, 2007). In question *Cf6* of the questionnaire, it is questioned whether companies measure customer satisfaction regularly.

Organization and maintenance of long-term relationships make a significant difference on corporate success. The importance of marketing interest shifted from analyzing the market share of a company to focusing on its share of customers. While for a long time marketing had been considered as just trying to win new customers, the new trend is based on increasing the profitability of current customer relations and the duration such relationships last. Collection of information about partners and creation of an atmosphere of trust, satisfaction, and commitment are the most important criteria for building and keeping strong customer relations (Bauer et al., 2002). Studies have proved that obtaining new customers can be up to five times more expensive than keeping existing customer relations. In question *Cf7* of the questionnaire, manager's perception about their relations with customers in the following time is questioned.

3.9 Supplier Relations

Globalization and greater customer expectations have converted the supply chain into an integral element of strategic planning. Building cooperative long-term relationship with suppliers is a vital factor in conducting successful mutual operational developments. Developing and keeping strong relationships with the supplier can be achieved through collaborations. To develop a reactive supply chain, continuous collaborative improvement among companies has become very important. If the supply

chain players work together and manage the process properly, it can be a source of sustainable competitive advantage. It is emphasized in the literature that the adaptation and application of successful supply chain management practices can facilitate the development of innovative systems, which may enable improved productivity of production and service processes of the trading partners through diffusion of knowledge and mutual assistance, with the performance of good practices (Edwards et al., 2004). Operational practices like suppliers being physically involved in the buyer's plant and the buyers spending time in the supplier's plant help to increase the success rate in new product and service development.

A company should promote and strengthen excellent communications with suppliers and give sufficient assistance to them. Supplier development programmes are described as long-term cooperative efforts between a buying firm and its suppliers to improve the suppliers' technical, quality, delivery, and cost capabilities for promoting in progress improvements (Watts and Hahn, 1993). Supplier development programmes are accepted to be a successful strategy for numerous organisations in Japan, over the last 50 years (Giannakis, 2008). Krause (1995) identified that the support of top management, development of cross functional teams, growth of effective communication channels with the supplier and proactive performance measurement are necessary factors for successful supplier development programmes. In question Sr*1* of the questionnaire, we inquire whether companies aspire to have a more extensive and efficient supplier development programs.

In question *Sr2*, it is questioned whether companies make use of their suppliers' knowledge stock for developing their production and service processes and similarly in question *Sr3*, whether they employ their suppliers' knowledge stock for developing their product and service designs.

Supply chain management can be defined as the arrangement of products and information flows between customers, retailers, manufacturers and suppliers. To promote CI in the supply chain, the partners must follow the same vision and have a strong spirit of teamwork and partnership (Dornier et al., 1998). La Londe (2002) claims that trust and risk issues are very important in supply chain relationships because of the interdependency among organizations. Liker and Choi (2004) mention that strong partnerships are vital to successful supply chain management. Successful supply chain relationships also necessitate the management of the suppliers, the progress of technical capabilities, and sharing information intensively and selectively. Collaborative planning

and information-sharing have been found to make a positive difference on supply chain performance, but the quality of information shared and the level of trust between the organizations must be considered carefully (Peterson et al., 2005). It is possible to decrease costs and improve customer service levels with sharing information between suppliers and retailers appropriately and coordinating their replenishment and production decisions.

Information sharing can be characterized according to operations areas such as inventory, sales, demand forecasting, order state, and production plan. There are partial and complete information sharing levels. Information sharing is said to be partial, when the supplier gets information from retailers about the demand distribution and the related inventory plans. If the supplier also gets information about retailers' daily inventory amount, and customers' daily demand change, it is called a complete information sharing. Generally, the deeper the information sharing level is, the more advantage is implied but higher risk and cost may be involved as well. It is significant to balance these factors in information sharing in practice (Li et al., 2005).

According to Zhao's (2002) study, information sharing can affect the performance of the supply chain significantly and sharing future order amount with the supplier is more useful than sharing only the future demand amount. The availability and quality of forecasts is one of the critical factors influencing the performance of a supply chain. The forecasts are required for players in a supply chain to make their planning and inventory decisions more effective. Most retailers do not know their demand with certainty. Therefore they have to make their inventory decisions based on demand forecasts. When the forecast is not very accurate, the quantity ordered does not show the real demand. The retailer's inaccurate forecasts are transmitted to the supplier in the form of distorted orders. Lee *et al*. (1997) have stated that the correctness of the forecasts can meaningfully impact the performance of the supply chain in the sense of increased inventory cost, backorders or loss of sales, and customer's good will. Incorrect forecasts can also bring low usage of capacity and other problems in production. In order to improve the performance of a supply chain under demand uncertainty, companies should share information and coordinate orders between them. In question Sr*4*, we question whether companies share their production planning and control information with their main suppliers and in question Sr*5*, we question whether their main suppliers share their production planning and control information with the companies.

Organizations can improve their performance by developing cooperative long-term buyer-supplier relationships. Yeung and Lo (2002) stated that supplier quality management is essential for creating an operating environment in which a manufacturer can combine its supplier's capabilities with its operational processes. According to their study about performance improvement, companies can develop their quality performance not only by analyzing their internal operations, but also through more effective organization of their supply quality.

The control of the supplier facility is a significant measure for supplier management in order to evaluate their quality standards. Supplier quality management system should include both internal and external controls of the supplier, from employee management to supplier management.

Companies exercise some form of quality control evaluation of the incoming goods. A measure for the supplier performance can be obtained from this incoming goods quality control, since the supplier quality performance can be measured, for example, by the number of defect-free deliveries divided by the number of deliveries recorded (Ryder and Fearne, 2003). The knowledge of material standards, material features design requirements, finishing standards, machine operations, tools, and packing standard, and good analysis of statistical control results are essential to get satisfactory control of the quality in the whole process. (Gonzales and Quasada 2004). In question *Sr6*, we ask for the assessments of the companies whether they exercise quality audit to their main suppliers regularly and in question *Sr7* whether their main suppliers have a quality assurance system in place.

There are a number of benefits for a company to include environmental protection among the performance indicators of its suppliers. Such a policy eventually protects and increases the company's investments and reputation (Simpson, 2005). A high level of performance obtained by one firm may be affected adversely by a poor level of environmental management by its suppliers (Faruk et al., 2002). Therefore companies should condition having ISO 14000 certificate which is the international specification for an environmental management system (EMS). It exist to help organizations minimize how their operations negatively affect the environment. In question *Sr8*, we ask whether companies require their main suppliers to have environment certificate ISO 14000.

Just in time (JIT) purchasing is a system that organizes delivery of goods just as they are required for production. Suppliers have to make frequent deliveries as needed

in the accurate quantity. Because of frequent deliveries, central delivery areas and warehouses are not necessary. Generally materials are delivered directly to the production process area. Company's entire production line could be shut down, if damaged or defective goods are delivered. (Swanson and Lankford, 1998). In this partnership, the purchaser should build a close cooperative relationship with a relatively small number of carefully selected suppliers (Leavy, 1994). Both the company and the supplier are expected to benefit from JIT purchasing system. The company benefits from reduced costs and the supplier benefits from long-term business relationships with companies as long as they supply quality products on time. In question Sr*9*, we try to discover whether companies request JIT delivery from their main suppliers.

Many companies are realizing that they must find external partners to share the risks and develop collaborative alliances in order to meet the challenges of entering or maintaining markets with new and better products. The collaboration between a customer and its suppliers is identified as a key facilitator for the successful long-term enlargement of production systems and supplier capabilities (Handfield et al., 2000). According to the depth of the relation there are three levels of collaboration: strategic, tactical and operational. The international business literature has mentioned several positive results for companies to develop strategic alliances, such as higher return on equity, better return on investment, and higher success rates (Todeva and Knoke, 2005). In *Sr10*, we question whether companies cooperate with their main suppliers in the form of strategic collaborations.

3.10 Leadership

Managing, developing and recognizing the full potential of employees at individual, team-based, and organisational levels and encouraging fairness and faithfulness, involving, empowering, communicating, rewarding and recognising people in a motivating way, which create commitment for using their abilities and knowledge for the benefit of the company, is very essential for reaching the Business Excellence objective of the company.

Application of all improvement approaches requires a culture of trust and self devotion and the effective utilization of the organization's intellectual capital. According to Tonnessen (2005), for improving a company's innovativeness, competitiveness and providing manufacturing excellence, active participation and

involvement of people from different levels of the company is very important. In order to keep organisations running; the cultures of commitment and trust, cooperation, conflict handling and self devotion have become imperative. In our questionnaire, we question in *L1* whether the top management of the company has adopted the culture of trust, active participation and self devotion in seeking Business Excellence.

It is a common belief of both academics and business practitioners that effective top management commitment is one of the most critical factors in the encouragement of change within a company, and in case of lack of such a positive commitment, it is doubtful that any strategy for change is likely to be successful. For supporting continuous change management can develop and implement strategies, and adopt special management practices (Prabhu and Robson, 2000).

To overcome resistance, an organization's vision for change must be recognized throughout all levels of the organization, particularly functional and middle-level managers affected by the process change (Kaplan and Norton, 2001). Achieving this requires continuous communication of the results with the employees and how each person contributes to the whole company's change attempt (Guha et al. 1997). Successful change needs leaders who discuss its all aspects such as objectives, priorities, structure and programme with their employees. Managing change within the culture of an organisation is very important excellence objective of the company therefore in *L2*, we inquire whether top management supports continuous change effectively for achieving the Business Excellence objective and motivates the employees accordingly.

Development can be defined as a process of a company to become more effective over time for achieving its goals. The core of organizational development is defined as two or more people working together for one or more shared goals. The identification of shared objective is one of the main factors of successful partnering arrangement (Allen and Cooper, 1999) and it can be considered as a primary condition of any successful project or team (Weick, 1995). Well-defined and shared mutual goals should be the first concern of every organization. In question *L3*, we question whether a unity of goals is achieved among the employees in the company.

Determining communication requirements and building communication policies, strategies and plans based on these requirements, forming and utilizing top down, bottom up and horizontal communication channels, identifying the organisation’s information and knowledge requirements and enabling easy access to them are the main drivers of a successful communication performance in a company. Setting two-way

communication channels with all stakeholders contributes to a culture of trust and openness. Multi-level and cross-functional communications constitute the basis for employee participation and contribution towards Business Excellence.

In reality, most of the managers are weak at evaluating their effectiveness as communicators (Quirke, 1996). Literature suggests that internal communication improves the possibility of a company to be successful. Hanson's (1986) study analyzed the profitability of 40 major companies over a five-year period and the results showed that the profitability of an organisation, which possesses good interpersonal relationships between managers and staff, was three times more powerful than the four next most powerful companies. Additionally, Clampitt and Downs (1993) indicated that the benefits gained from quality communications are improved productivity, a decrease in absenteeism, improved levels of innovation, a reduction in the number of strikes, higher quality of services and products, and a reduction in costs. In question *L4*, we investigate whether top management executes effective plans and policies for securing continuous development of communication among the individuals and among functions within the company.

Leaders play the most important role in developing the vision, mission and principles that are deployed and followed throughout the company. Communicating with and supporting people make them to contribute to the accomplishment of the organisation's objectives. Research has confirmed that success in a work group particularly on creative tasks is related to better group motivation and coordination (Isen, 2004). In human resource management and organisational behaviour fields, motivation is often defined as being "intrinsic" or "extrinsic" in nature (Sansone and Harackiewicz, 2000). Motivated employees are required to keep up with the dynamic work environments. They are more productive and help organizations to survive. Managers must find out what motivates employees within the context of the work they do.

On the other hand, effective leadership is achieved through individual efforts and by working in teams. Mutual events and challenges between groups of employees can promote team spirit. Realizing how to encourage a sense of team spirit definitely helps in improving employee retention. If employee retention is achieved, one can be sure that employees will serve in the best way for the customers and their own satisfaction as well. In question *L5*, it is questioned whether companies' top management uses team spirit and motivation approaches in an effective way in order to reach best practices.

CI is a regular never-ending change, which is concentrated on improving the effectiveness and/or efficiency of a company to perform its policies and objectives. For CI purpose all members of the company work together on a continuing base improving processes and reducing errors to develop general performance for both public sector and manufacturing. (Fryer et. al., 2007). Modern manufacturing companies are operating in a worldwide competitive environment, which necessitates CI in also crisis management.

Crisis management is a new field of management. It is the systematic study to prevent organizational crises or to manage those crises events that take place (Pearson & Clair, 1998). Typically, proactive crisis management activities comprise forecasting potential crises and planning how to deal with them, for example, how to recover if your computer system completely fails. Organizations should have time and resources to complete a crisis management plan before they experience a crisis. Crisis management also includes discovering the real nature of a current crisis, intervening to minimize harm and getting strength back from the crisis. In question *L6*, we explore whether top management adopts a management style based on interactive CI rather than one exercised through momentary interventions and crisis management.

Sustainable development concentrates on good management and usage of resources effectively (Spricis, 2001). The big economic growth creates resource shortage and also pollutants that might go above the assimilative capability of natural environments. The economy is dependent on the environment through extraction, production and consumption of natural resources and production of wastes. The short-term profitability motivates the companies to consider the environmental protection as a barrier to profit making (Rojsek, 2001). But the performance of a company can no longer be analyzed on the basis of economic parameters only and it should include environmental performance as well. Recent research results have provided proof of a positive relationship between environmental performance and firm productivity. The benefits of environmental management practice to the company includes cost reduction (through such as efficient use of raw materials, decrease in fines, decrease in risks and insurance costs), quality improvement, early adoption of new regulations and improved human resource management practices (Simpson and Power, 2005). Therefore in question *L7*, it is investigated whether environmental protection issues are managed by top management in a proactive manner.

The OECD (1999) describes corporate governance as a set of relationships between a company's management, its board and stakeholders. Corporate governance is

the process and structure used to manage the business dealings of the company towards improving business prosperity and corporate accountability with the eventual objective of realizing long-term shareholder value, though considering the interest of other stakeholders (Keasey et al., 1997). Gillan and Starks (1998) describe corporate governance as the system of laws, policies, and factors that organize operations at a company. Particularly, discussions on corporate governance have focused on the relations between the directors and managers of the corporation and other parties.

Conventionally larger companies adopt corporate governance but it can greatly help the SME sector by introducing better management practices and internal auditing, greater advantages for growth and new strategic view through non-executive managers. Corporate governance also enables the structure through which the objectives of the company are set, and the ways of achieving those objectives. In question *L8* it is questioned whether top management exerts effectively any effort to establish corporate governance in the company.

3.11 Firm Performance Indicators

In the general firm performance module, questions aim to find out useful insights about general innovative, production, market and financial performance.

Questions about firm performance indicators are presented by using two types of "five-point Likert scale" called part A and B. In part A, we ask questions about firms' current performance. In part B, we ask the same performance evaluation questions with part A but we request managers to assess their performance trend in the last 3 years based on their perceptions. Here, subjective data is used for evaluation firm performance based on manager's perception because access to performance data on privately-held firms is usually restricted. Such information is not publicly available. On the other hand, some small firms are often facing an inability to obtain objective performance measures on a consistent basis.

According to Robinson and Dess's (1984) research, subjective perceptions of performance strongly correlated with objective measures over the same time period. In other words, the managers' perception of how well their firm had performed was consistent with how the firm actually performed. Although the objective measures would be preferred, this finding suggests that a researcher might consider using a

subjective perceptual measure of organizational performance (return on assets and growth in sales) if accurate objective measures are unavailable,

In order to measure innovative performance of the firms we ask five questions:

- New production introduction time,
- Percentage of 3 years old or younger products in the existing product portfolio,
- Percentage of 3 years old or younger products in total sales,
- Percentage of R&D expenditures in total sales (We define R&D as research based studies in order to obtain new scientific and technological knowledge, to design and develop new products and processes, to use newly obtained knowledge for improving products and processes for a considerable amount. R&D costs include all expenditures about these operations. However, we can't include in the R&D expenditures the cost of obtaining technology developed by other corporations),
- Assessment of technological level.

In order to measure the production management performance, we ask questions concerning production quality, production flexibility, delivery reliability, productivity and inventory management. Production quality part includes four questions:

- Percentage of quality cost in total sales (Quality cost includes four components: prevention, inspection, internal defects, external defects),
- Percentage of production workers involved in quality activities/problem solving groups in total production workers,
- Percentage of quality control personnel in total production workers,
- Percentage of incoming material quality control personnel in total production workers,
- Percentage of defects in total production volume.

In the literature, Flynn et al. (1995) specified quality performance indicators as feedback (detecting and feeding back information about defective parts to the operators and engineers), product design process, process flow management, percent of items passed final inspection without rework requirement and top management support.

Production flexibility part includes three questions:

- Average time of production process change,
- Level of meeting unexpected amount increases in order or production plans,
- Adaptation level to unexpected due date changes in order or production plans

We have asked two questions about inventory management:

- Percentage of average total stocks (incoming goods + work-in-process + finished goods) in annual sales,
- Percentage of average annual level of incoming material stocks in annual sales.

As we mentioned before in section 3.6 customer focus, customer satisfaction is surely the key factor to success for every organization so we inquire about customer satisfaction as a performance indicator in the survey.

Employees are the greatest asset of a company and organizational performance is extremely affected by employee satisfaction therefore we have analyzed two human resources indicators in the survey:

- Employee satisfaction,
- Percentage of employee training expenditures in gross total personal wage and salary.

Also, pre-investment cash flow is questioned to measure financial performance of firms. Additionally some numerical questions asked in financial data module in order to discover the relations between general performance indicators and financial results.

3.12 Financial Indicators

Financial indicators provide vital information for analyzing the relation between Business Excellence determinants and financial performance. Financial data module includes questions requesting quantitative data about firms' financial performance (total sales, export, and added value which is described in ***Figurev3.5***) and employees (number of total employees and blue collar employees). We have computed complex variables from data including total sales per employee, export per employee, added value per employee, export trend, total sales trend, and added value trend. In the survey we have also asked financial results of the company during three years period (from 2004 to 2006) in order to compute trends.

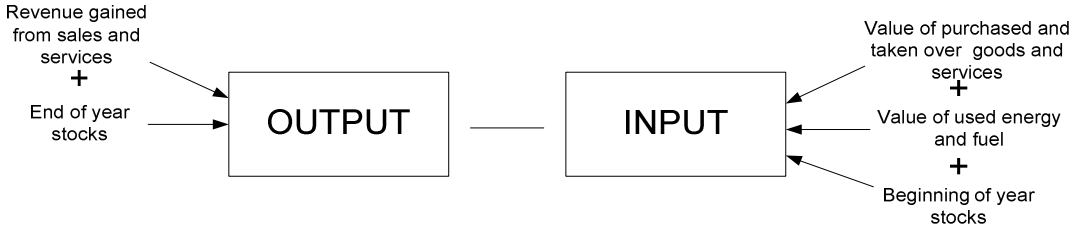

Figure 3.5: Description of added value

Financial module is very important for gathering essential quantitative information both for descriptive and statistical analysis. The number of quantitative questions is few in the survey although more quantitative data is better because it is very difficult to collect numerical data from companies in Turkey due to the confidentiality issues.

4 EXECUTION OF THE SURVEY

4.1 Data Collection

There is a long-term debate for determining how to measure and to evaluate company applications in term of its strategic targets. Collecting data from primary and secondary sources are both possible. Primary sources depend on perceptions of respondents because the data is provided from firms' managers using surveys and interviews. As for the secondary sources, the data is obtained from firms' own records and from open sources. Both methods have advantages and disadvantages. According to Venkatraman and Ramanujam (1986), it is difficult to collect secondary source data on the other hand, it is difficult to validate primary source data.

In this thesis, required data is gathered by survey methodology from ten sectors in Turkish manufacturing industry. Most of the participant firms are located in Marmara region but there firms from other regions as well.

We have acquired most of the participants' contact information from KalDer but then, we have extended this list by other firms from various Chambers of Industries across Turkey. A website has been designed where firms attend our survey through a user name and password provided by VIP, which had constructed this website. We have informed participants about this study, sent our website address, a user name and a password via mail. This method offered us a great easiness for collecting data. It is much less time consuming than face to face interviews. Additionally firms are reminded to complete the survey by mail and telephone calls.

4.2 Sample

By the first two months of this study (October and November 2007), a sample containing 90 firms had been obtained and we had applied pilot statistical analyses and obtained some inspiring results from these data. Our data collecting process terminated on 18th April 2008 and eventually the final sample size has reached 140 firms.

Information on completed questionnaire forms are transferred from web site to MS Excel for descriptive analysis such as geographic and sector distribution, firm size, firm age, and respondent distribution.

In the sample, we have participants from five different regions but mostly from the Marmara region which is shown in ***Figure 4.1***. There are 98 companies from the Marmara region accounting for 70% of the sample; 18 companies from the Central Anatolia (13%); 16 companies from the Aegean region (11%); 7 companies from the Mediterranean region (7%) and 1 company from the Black Sea region (1%).

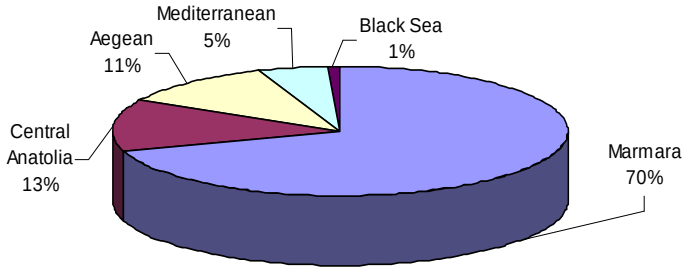

Figure 4.1: Distribution of participants

We have collected data from ten sectors including electrical-electronic, food, building-forestry products, metal, machinery, and packaging, textile, automotive, chemical and energy-mining. Percentages of these sectors are given in ***Figure 4.2***

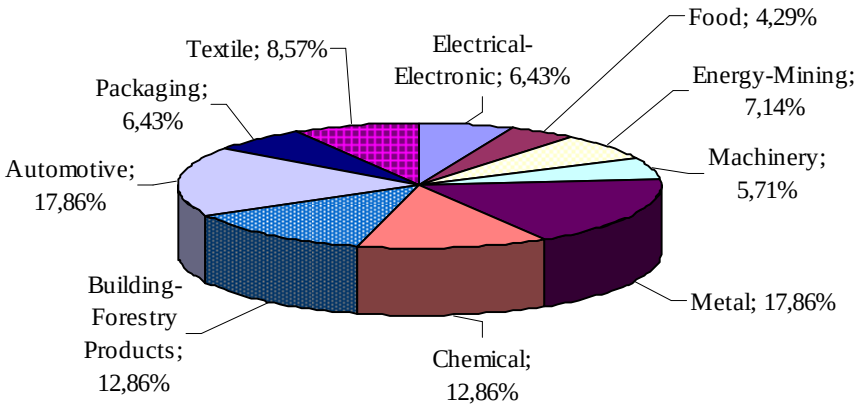

Figure 4.2: Distribution of sectors

Figure 4.3 displays firm sizes which are identified according to the number of employees. Companies with less than 50 employees are labelled as small; between 50 and 250 employees are labelled as medium; more than 250 employees are labelled as large.

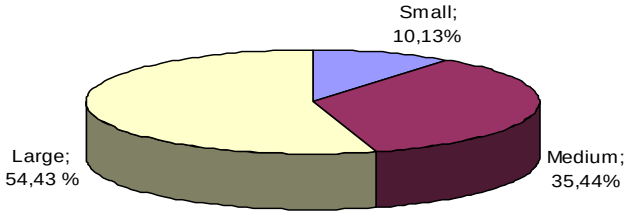

Figure 4.3: Firm size

Firms are also classified into three categories according to their production start dates: ≤ 1975 are labelled as old; from 1976 to 1992 labelled as moderate; ≥1993 are labelled as young. Figure 4.4 presents firm age distribution.

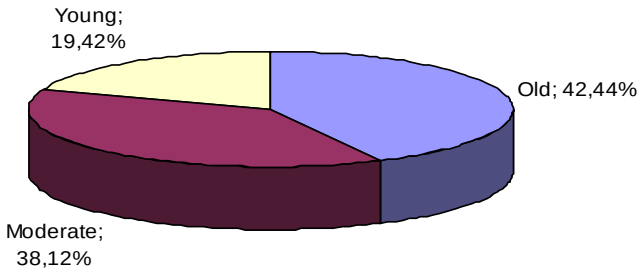

Figure 4.4: Firm Age

It is very important to select the right respondent having knowledge and authority to answer all questions. According to Pagell and Boyer (2000), a good research design needs a prior decision of who in the organization has required knowledge. Respondents of our survey are from various positions such as quality manager, quality specialist, CEO or board member. **Figure 4.5** displays the dispersion of the respondents' functions in details.

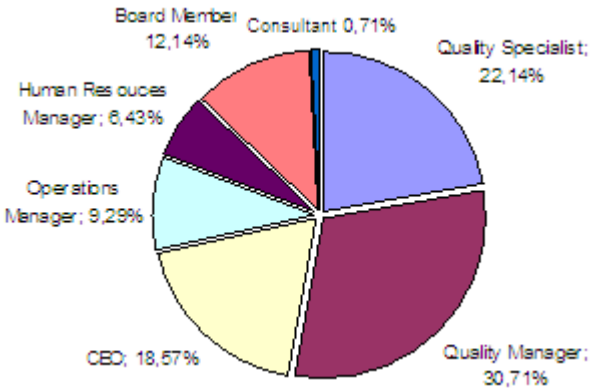

Figure 4.5: Distribution of survey respondents

We have analyzed firms' ownership status in our sample, 47,1% of the firms are family-owned business and the rest of the firms are not. Also, 87,8% of the firms are joint venture and 12,2% of them are limited company. Additionally, foreign capital exists in the 18,6% of participants.

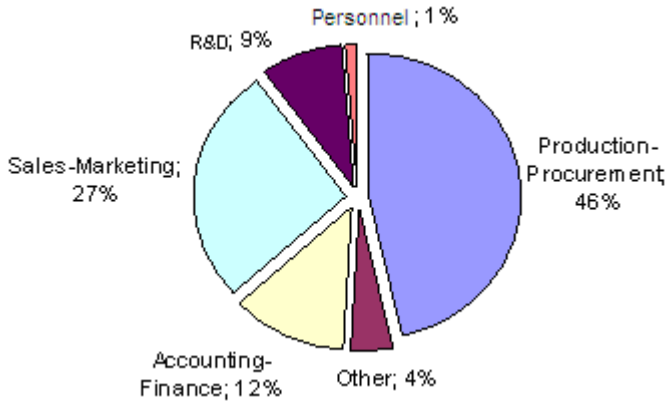

Figure 4.6: Distribution of managerial experience

In ***Figure 4.6***, we have illustrated the fields which top managers in the company had experience mostly through their business life. Production-procurement is the dominant field in that examination.

4.3 Data Validity

In this section we present the results of multicollinearity and randomness tests that we performed before starting with the analysis. Examination of a set of data for the existence of multicollinearity should always be performed as an initial step because it may have an adverse effect on the analysis (Mansfield and Helms, 1982).

4.3.1 Multicollinearity

Multicollinearity arises when there is a high degree of correlation (either positive or negative) between two or more independent variables. There is perfect multicollinearity, if the correlation between two independent variables is equal to 1 or -1. A commonly given rule of thumb for correlation detection is variance inflation factor (VIF). Variance inflation factor measures the multicollinearity in independent variables. VIF can be calculated by: $VIF = 1 / (1-R^2)$, where R is the correlation coefficient. VIF can also be interpreted by its reciprocal (1/VIF). In that case, VIF is referred as the tolerance value. When VIF is under 0,10 or tolerance value is 10 or higher, there is a multicollinearity between variables (Marquardt, 1970).

We have performed multicollinearity test for our performance data and factors by using SPSS v.13.0. In ***Table 4.1,*** the tolerance and VIF values of our performance data are displayed. As it can be observed, there is not a multicollinearity problem among our

performance variables. In ***Table 4.2,*** we see the tolerance and VIF values of the factors extracted. The determination of these factors is explained in a detailed way in the next chapter. It is also clear that multicollinearity does not exist between these factors.

	Collinearity Statistics	
	Tolerance	VIF
PV1a	,539	1,854
PV2a	,436	2,296
PV3a	,601	1,663
PV4a	,405	2,467
PV5a	,474	2,110
PV6a	,501	1,998
PV7a	,259	3,855
PV8a	,229	4,365
PV9a	,529	1,889
PV10a	,179	5,601
PV11a	,195	5,134
PV12a	,687	1,457
PV13a	,468	2,137
PV14a	,475	2,105
PV15a	,660	1,515
PV16a	,634	1,576
PV17a	,711	1,406
PV18a	,632	1,583
PV19a	,575	1,738
PV20a	,686	1,458
PV21a	,545	1,834

	Collinearity Statistics	
	Tolerance	VIF
PV1b	,395	2,533
PV2b	,343	2,917
PV3b	,361	2,770
PV4b	,253	3,955
PV5b	,285	3,506
PV6b	,248	4,031
PV7b	,144	6,937
PV8b	,288	3,474
PV9b	,369	2,709
PV10b	,131	7,636
PV11b	,111	8,995
PV12b	,183	5,451
PV13b	,321	3,117
PV14b	,259	3,868
PV15b	,127	7,883
PV16b	,198	5,039
PV17b	,402	2,486
PV18b	,216	4,624
PV19b	,296	3,380
PV20b	,187	5,345
PV21b	,246	4,061

Table 4.1: Multicollinearity test of performance variables

	Collinearity Statistics	
Factors	Tolerance	VIF
Core Manufacturing Technology	,438	2,283
Technology Mgmt	,330	3,031
Innovation Mgmt	,348	2,870
Human Resources	,117	8,580
Quality Management	,264	3,782
Process Mgmt and Cont Improv.	,243	4,112
Operation Diversity	,403	2,484
Operation Structure	,325	3,074
Manufacturing Capabilities	,363	2,755
Planning	,227	4,408
Delivery Reliability	,395	2,533
Manufacturing Flexibility	,411	2,433
Manufacturing Cost	,635	1,574
Manufacturing Quality	,446	2,240
Customer Focus	,374	2,676
Supplier Information Accumulation	,422	2,370
Information Sharing	,292	3,421
Supplier Quality Mgmt	,308	3,246
Leadership	,287	3,480

Table 4.2: Multicollinearity test of factors

4.3.2 Randomness

Runs tests are performed for testing the randomness of the performance variables and factors. The runs test is a non-parametric test that checks whether the order of occurrence of two values of a variable is random. It can be used to test the hypothesis that the elements of the sequence are mutually independent. Runs test specifies a cut point to dichotomize the variable that is chosen. Mean, median, or mode, or a specified value can be used as a cut point. They all give similar results. Here, we have used median as a cut point. Cases with values less than the cut point are assigned to one group, and cases with values greater than or equal to the cut point are assigned to another group. One test is performed for each cut point chosen. Runs test results of current performance data are given in ***Table 4.3***. For this test the null hypothesis is that all variables are random. Therefore, we can accept this hypothesis when the significance value is greater than 0,5 at 95% significance level. Fortunately, all our variables except "Percentage of quality cost in annual sales" are random.

Runs Test

	PV1a	PV2a	PV3a	PV4a	PV5a	PV6a	PV7a	PV8a	PV9a	PV10a
Cut Point	4	3	3	4	4	4	4	4	4	4
Cases < Cut Point	30	16	13	45	52	44	41	47	53	53
Cases >= Cut Point	87	103	101	72	61	73	76	70	56	56
Total Cases	117	119	114	117	113	117	117	117	109	109
Number of Runs	47	32	26	60	55	53	59	60	58	56
Z	,338	1,319	,927	,709	-,407	-,575	,967	,533	,489	,104
Asymp. Sig. (2-tailed)	,735	,187	,354	,478	,684	,565	,334	,594	,625	,917

Runs Test

	PV11a	PV12a	PV13a	PV14a	PV15a	PV16a	PV17a	PV18a	PV19a	PV20a	PV21a
Cut Point	4	3	3	2	4	3	3	4	3	4	2
Cases < Cut Point	54	29	46	32	35	41	45	30	33	35	41
Cases >= Cut Point	55	79	57	70	66	54	58	77	73	71	66
Total Cases	109	108	103	102	101	95	103	107	106	106	107
Number of Runs	62	40	56	42	56	50	55	43	47	51	54
Z	1,252	-,845	,819	-,676	2,046	,502	,668	-,284	,125	,688	,498
Asymp. Sig. (2-tailed)	,211	,398	,413	,499	,041	,615	,504	,776	,901	,492	,619

Table 4.3: Runs tests of performance variables

Runs test results of performance trend data are given in ***Table 4.4***. All trend variables are random except "Percentage of quality cost in annual sales trend" and "percentage of incoming material quality control personnel in production workers".

Nevertheless, we keep these variables and compute mean comparison tests using them in order to gain some insights for the information they hold – even if their test results are not so reliable.

Runs Test

	PV1b	PV2b	PV3b	PV4b	PV5b	PV6b	PV7b	PV8b	PV9b	PV10b
Cut Point	4	3	3	4	4	4	4	4	3	4
Cases < Cut Point	30	12	22	23	53	35	38	40	20	38
Cases >= Cut Point	86	107	92	94	60	82	79	77	91	70
Total Cases	116	119	114	117	113	117	117	117	111	108
Number of Runs	45	23	34	38	52	53	54	54	35	46
Z	-,118	,217	-,762	,013	-1,002	,652	,357	,072	,392	-,904
Asymp. Sig. (2-tailed)	,906	,829	,446	,990	,316	,514	,721	,942	,695	,366

Runs Test

	PV11b	PV12b	PV13b	PV14b	PV15b	PV16b	PV17b	PV18b	PV19b	PV20b	PV21b
Cut Point	4	2	3	3	3	3	3	4	3	3	3
Cases < Cut Point	33	13	38	27	31	10	16	40	20	14	22
Cases >= Cut Point	76	94	63	47	67	83	85	64	84	90	81
Total Cases	109	107	101	74	98	93	101	104	104	104	103
Number of Runs	48	23	52	36	35	17	29	52	35	19	35
Z	,224	-,388	,766	,178	-1,972	-1,023	,405	,368	,540	-2,665	-,178
Asymp. Sig. (2-tailed)	,823	,698	,444	,859	,049	,306	,686	,713	,589	,008	,858

Table 4.4: Runs tests of performance trend variables

Runs test results of factors are given in ***Table 4.5.*** All the factors are found to be random.

Runs Test

	Core Manufacturing Technology	Technology Mgmt	Innovation Mgmt	Human Resources	Quality Management	Process Mgmt and Cont Improv.
Cut Point	4,50	3,75	4,07	3,90	4,33	3,71
Cases < Cut Point	64	54	69	68	69	61
Cases >= Cut Point	74	84	69	72	70	78
Total Cases	138	138	138	140	139	139
Number of Runs	64	65	65	69	73	79
Z	-,968	-,312	-,854	-,330	,426	1,649
Asymp. Sig. (2-tailed)	,333	,755	,393	,742	,670	,099

Runs Test

	Operation Diversity	Operation Structure	Manufacturing Capabilities	Delivery Reliability	Manufacturing Flexibility	Manufacturing Cost	Manufacturing Quality
Cut Point	3,80	3,60	4,20	5,00	4,14	4,71	5,00
Cases < Cut Point	63	50	59	64	57	59	52
Cases >=Cut Poin	72	85	76	67	75	73	80
Total Cases	135	135	135	131	132	132	132
Number of Runs	65	62	69	64	60	69	65
Z	-,555	-,364	,276	-,433	-1,028	,485	,177
Asymp. Sig. (2-tailed)	,579	,716	,783	,665	,304	,628	,859

Runs Test

	Planning	Customer Focus	Supplier Information Accumulation	Information Sharing	Supplier Quality Mgmt	Leadership
Cut Point	4,00	4,29	4,00	3,67	3,75	4,00
Cases <Cut Point	50	60	49	55	54	48
Cases >= Cut Point	85	73	83	77	78	79
Total Cases	135	133	132	132	132	127
Number of Runs	67	69	69	67	73	60
Z	,563	,375	1,195	,330	1,479	-,136
Asymp. Sig. (2-tailed)	,574	,707	,232	,742	,139	,892

Table 4.5: Runs tests of factors

4.3.3 Normality

It is a generally accepted fact that independent sample t-test procedure can be applied, if the tested variable (e.g. X) is normally distributed. In such a case, t statistic is t-distribution with (N-1) degrees of freedom, where N is the total number of observations. But if X is not normally distributed, then the distribution of t is unpredictable, and thus t-test is not appropriate. Nonetheless, the central limit theorem helps in these cases, if the sample size is large enough. If the sample size is large, t-test can be applied even if X is not normally distributed, because t tends to be normal. But it is difficult to determine when the sample size value is large enough, since this is contingent upon how much X deviates from the normal distribution. However, there are numerous sources indicating N should be at least 30 to prevent the normality problem (e.g. Miller, 1997). Since N is larger than 30 in all our cases, we have decided to employ t-test procedure in our analysis.

5 EFFECTS OF BUSINESS EXCELLENCE DETERMINANTS ON GENERAL FIRM PERFORMANCE INDICATORS

In this chapter, we will analyze the relation between Business Excellence determinants and general firm performance indicators by utilizing factor analysis, reliability analysis, correlation analysis to test the one-to-one relationship of factors, one way ANOVA analysis, T-tests and path analysis..

First, organized data are transferred from MS Excel to software SPSS (Statistical Package for Social Sciences) v.13.0 for applying statistical analysis. In order to determine the relationships between Business Excellence determinants and firm performance, it is essential to begin with explanatory factor analysis (EFA) to identify the factor structures. Factor analysis is a general name for a class of multivariate statistical methods whose main principle is reduction of data. It facilitates the analysis of the interrelationships among a large number of variables and then describes these variables in term of their common factors. It is a method mostly appropriate for solving the complex, multidimensional problems encountered by researchers. It provides an opportunity to examine the fundamental patterns or relationships of a large number of variables and decide, if the information can be summarized in a smaller group of factors or components with a minimum loss of information.

Explanatory factor analysis is applied with SPSS v13.0 using principal component analysis with varimax rotation. Mostly, eigenvalue over 1 criterion is used to identify the number of extracted factors. Eigenvalue shows the amount of variance accounted for by a factor.

In order to test the reliability of the factors, reliability analysis are applied (Cronbach and Shavelson, 2004; Hair et al., 2003). Generally, when Cronbach α value is greater than 0.70 the scale is accepted as reliable but in the literature there are discussions about whether α value can be smaller (Streiner, 2003).

After confirming the reliability of the factors, correlation analysis is performed in order to check the one-to-one relationship between factors. Results of the correlation analysis present information similar to linear regression between two factors. The linear association between two variables gives the correlation coefficient. It ranges in value from -1 to +1 and its value predicts the strength of the relationship (Norusis, 2003). If the coefficient is positive, it means the values of the two variables increase together; if

the coefficient is negative, it means while one variable is increasing, the other one is decreasing.

Beside the correlation analysis, the independent-samples t-tests are applied for comparing two groups of cases. If possible, for this test, the subjects should be randomly assigned to two groups, so that any discrepancy in response is checked with respect to this ability and not to other factors.

Finally, we performed a structural equation modelling approach and conducted path analyses in order to reveal latent relationships between determinants of Business Excellence and firm performance indicators in our research model.

5.1 General Firm Characteristics

In this section, we analyze the relations between general firm characteristics and Business Excellence determinants as well as the relations between general firm characteristics and firm performance indicators. General firm characteristics include firm age (in terms of first production year), firm size (in terms of number of full-time employee), and firm ownership status, existence of foreign capital and percentage of foreign capital.

5.1.1 T-tests for General Firm Characteristics and Business Excellence Determinants

Firm characteristics act in fact as a control variable, thus one-way ANOVA or independent t-tests are conducted while everything else are kept constant in order to analyze their effects on Business Excellence determinants.

Family Business		N	Mean	Sig
Core Manufacturing Technology	No	74	4,4932	,075
	Yes	64	4,3047	
Technology Mgmt	No	74	3,8919	,037
	Yes	64	3,5859	
Innovation Mgmt	No	74	4,1039	,087
	Yes	64	3,9208	
Human Resources	No	74	3,9542	,013
	Yes	66	3,6621	
Manufacturing Capabilities	No	72	4,2729	,042
	Yes	63	4,0881	
Manufacturing Flexibility	No	71	4,2575	,040
	Yes	61	4,0141	
Information Sharing	No	71	3,8357	,014
	Yes	61	3,4344	

Table 5.1: T-test results for family business variable and Business Excellence determinants

Non-family businesses have significantly better core manufacturing technology, technology management, innovation management, human resources, manufacturing capabilities, manufacturing flexibility and information sharing mean scores. We can conclude that non-family businesses provide better results for many Business Excellence determinants.

Foreign Capital		N	Mean	Sig
Core Manufacturing Technology	No	112	4,3348	,005
	Yes	26	4,7115	
Technology Mgmt	No	112	3,6607	,011
	Yes	26	4,1346	
Innovation Mgmt	No	112	3,9507	,007
	Yes	26	4,3132	
Human Resources	No	114	3,7501	,018
	Yes	26	4,1077	
Operation Structure	No	110	3,6064	,021
	Yes	25	3,9520	
Manufacturing Capabilities	No	110	4,1395	,029
	Yes	25	4,3940	
Planning	No	110	4,0095	,062
	Yes	25	4,3040	
Manufacturing Cost	No	107	4,5981	,023
	Yes	25	4,7600	
Customer Focus	No	108	4,1975	,060
	Yes	25	4,4286	
Information Sharing	No	107	3,5779	,068
	Yes	25	3,9600	
Leadership	No	103	4,0309	,090
	Yes	24	4,2917	
Quality Management	No	113	4,0487	,006
	Yes	26	4,4487	
Process Mgmt and Cont Improv.	No	113	3,6640	,021
	Yes	26	4,0330	

Table 5.2: T-test results for foreign capital and Business Excellence determinants

Foreign capitalized firms provide significantly better core manufacturing technology, technology management, innovation management, human resources, operation structure, manufacturing capabilities, planning, manufacturing cost, customer focus, information sharing with supplier, leadership, quality management and process management and CI scores than non-foreign capitalized firms. We can summarize that foreign capitalized firms obtain higher Business Excellence determinant mean scores.

Firm Size		N	Mean	Sig
Core Manufacturing Technology	Small	7	3,8571	,004
	Medium	28	4,2857	
	Large	43	4,6163	
	Total	78	4,4295	
Manufacturing Capabilities	Small	8	3,7750	,015
	Medium	28	4,1571	
	Large	43	4,3314	
	Total	79	4,2133	
Planning	Small	8	3,8750	,051
	Medium	28	3,8929	
	Large	43	4,2860	
	Total	79	4,1051	
Delivery Reliability	Small	8	4,8750	,002
	Medium	28	4,4345	
	Large	43	4,8062	
	Total	79	4,6814	
Manufacturing Cost	Small	8	4,7500	,033
	Medium	28	4,5306	
	Large	43	4,7542	
	Total	79	4,6745	

Table 5.3: T-tests results for firm size and Business Excellence determinants

When we analyze the relationship between firm size and Business Excellence determinants, large firms have higher core manufacturing technology, higher manufacturing capabilities, higher planning and higher manufacturing cost mean scores. On the other hand, small firms provide better delivery reliability and speed mean scores.

Firm Age		N	Mean	Sig
Core Manufacturing Technology	Old	58	4,4397	,063
	Moderate	52	4,2596	
	Young	27	4,5926	
	Total	137	4,4015	
Operation Diversity	Old	57	3,8246	,077
	Moderate	51	3,6784	
	Young	27	3,3704	
	Total	135	3,6785	
Manufacturing Capabilities	Old	57	4,3053	,058
	Moderate	51	4,1353	
	Young	27	4,0333	
	Total	135	4,1867	

Table 5.4: T-tests results for firm age and Business Excellence determinants

According to the ***Table 5.4***, old firms have better operation diversity and manufacturing capabilities score. On the other hand, young firms provide better core manufacturing technology scores.

5.1.2 Correlation Analysis for General Firm Characteristics and Performance Indicators

First, one to one relationships between firm characteristics and performance data are analyzed by correlation analysis, and then one way ANOVA or t-tests are applied. Firm characteristics act in fact as a control variable, thus one-way ANOVA or independent t-tests are conducted while everything else are kept constant in order to analyze their effects on qualitative firm performance.

Table 5.5 displays the significant results of correlation analysis which is applied in order to inspect one-to-one relationship between general firm characteristics and current firm performance indicators. Insignificant relations are removed from the table. Additionally, in this table and in the rest of the thesis “pro.” symbolizes “production” and “prod.” symbolizes “product”.

Ownership status (family business or not) is significantly correlated to both production process change time and employee satisfaction. It has also significant correlation with time to market, technological level and percentage of total incoming material stocks in total sales. Non-family businesses obtain better performance results in all of these performance indicators

Foreign capital existence makes a significant difference on customer satisfaction, production process change time, productivity, percentage of workers involved in quality circles, pre-investment cash flow, technological level and percentage of quality cost in total sales. On the other hand, foreign capital existence makes negative difference on percentage of 3 years or younger products in total sales.

Percentage of foreign capital makes a significant difference on percentage of R&D expenditure and percentage of employee training expenditure in salary and wage.

Firm size is significantly correlated with customer satisfaction, productivity, time to market, technological level, percentage of quality cost in total sales and level of meeting unexpected increases in order or production plan changes and percentage of incoming material quality control personnel in production workers. Large firms have better results than small firms on these performance indicators

Firm age is significantly correlated with on time delivery and percentage of 3 years or younger products in total sales and percentage of 3 years or younger products in existing product portfolio. Older firms have better performance about on time delivery but on the other hand, younger firms have better performance on percentage of

3 years or younger products in total sales and percentage of 3 years or younger products in existing product portfolio.

Table 5.6 displays the significant results of correlation analysis between general firm characteristics and change of firm performance in last 3 years. Here, we deal with a trend analysis in the performance indicators involved.

Ownership status (family business or not) is significantly correlated to level of meeting unexpected increases in production or order plans trend, adaptation level to unexpected due date changes earlier than planned trend, percentage of 3 years old or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend, percentage of quality cost in total sales trend. Non-family businesses obtain better performance on those trends.

Foreign capital existence makes a significant difference on delivery on time trend, pre-investment cash flow trend and average time of production process change trend.

Percentage of foreign capital is significantly correlated to average time of production process change trend and percentage of quality control personnel in production workers trend.

Time to market trend has increased in young firms in the last 3 years. On the other hand, percentage of 3 years or younger products in existing product portfolio trend and percentage of R&D expenditure in total sales trend have been increased in the last 3 years in younger firms.

Firm size is significantly correlated to average time of production process change trend and percentage of quality control personnel in production workers trend. Average time of production process change trend and percentage of quality control personnel in production workers trend have been decreased in large firms in the last 3 years. Correlation analyses can’t say much about the meaning of the relationship. For that reason, the t-tests might be more useful for interpreting relations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	23
1-Ownership Status	1	,341**	-,051	-,099	,284*	,139	,191*	,191*	,116	,215*	,283**	,069	,044	-,054	,048	-,187	127	,042	,102	,022	,014	,109
2-Foreign Capital Existence		1	,299	,056	-,226*	-,283**	-,12	-,188*	-,242**	,077	,159	-,083	,178	,183	,020	,028	-,2*	-,01	-,263**	-,083	,060	-,06
3-Percentage of Foreign Capital			1	,241	,138	-,040	,143	-,093	,101	,158	,107	-,087	,195	-,020	-,14	,162	071	,425	,247	,302	,220	,504*
4-Firm Age				1	-,161	-,071	-,04	,028	,024	,070	,030	-,003	,050	,167	,231*	-,046	,0	,147	,044	-,220*	-,039	,107
5-Firm Size					1	,407**	,168	,143	,405**	,274*	,369**	,211	,161	,028	,028	-,047	236*	-,15	,074	,069	,199	-,13
6-Customer Satisfaction						1	,481**	,129	,498**	,428**	,320**	,400**	,367**	,106	,066	,061	185	,094	,096	,114	,050	,088
7-Employee Satisfaction							1	,351**	,367**	,322**	,355**	,309**	,389**	,017	,002	,106	160	-,02	,254*	,135	,169	,197*
8-Average Time of Production Process Change								1	,259**	,037	,147	,060	,276**	,078	-,01	,178	160	-,10	,077	-,087	,034	-,04
9-Productivity									1	,523**	,557**	,501**	,411**	,126	,105	,251*	297**	,127	,142	,124	-,082	,001
10-Time to Market										1	,485**	,404**	,354**	,326**	,234*	,144	158	,133	,195	,122	,012	-,01
11-Technological Level											1	,458**	,327**	,008	,052	,112	244*	,065	,125	,215*	-,007	,00
12- Level of Meeting Unexpected Increases in Order or Production Plans												1	,323**	,032	,084	,058	185	,100	,212*	,390**	-,061	,027
13-Pre-investment cash flow													1	,247*	,238*	,214*	181	,104	,063	,141	-,019	,085
14-Perc. of 3 Years old or Younger Products in Total Sales														1	,828**	-,008	002	,205	-,024	,004	,009	,199*
15-Perc. of Three Years old or Younger Prod. in the Existing Prod. Portfolio															1	-,038	044	,156	-,008	-,068	-,096	,148
16-Perc. of Tot. Incoming Mat. Stocks in Annual																1	224*	,222*	,062	,208*	-,097	-,01
17-Perc. of Quality Expenditure in Total Sales																	1	,166	,063	,274**	,135	-,13
18-Perc. of R&D Expenditure in Total Sales																		1	,072	,143	,106	,273**
19-Perc. of Pro. Work. Involved in Quality Activ																			1	,175	,093	,368**
20-Delivery on Time																				1	,133	,117
21-Perc. of Input Material Quality Control Personnel in Production Workers																					1	-,03
22-Perc. of Employee Training Expenditure in Gross Total Personnel Wage and Salary																						1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.5: Correlation analysis between general firm characteristics and performance indicators (current status)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1-Ownership Status	1	-,34**	-,051	-,099	,284*	,120	,087	,103	**,162**	**,166**	,148	**,211***	**,180**	,017	**,175**	,034	,000	-,13
2-Foreign Capital Existence		1	-,299	,056	-,226*	-,069	**,156**	,117	-,06	-,068	**-,159**	,041	-,080	-,2	-,020	-,010	**-,17**	,079
3-Percentage of Foreign Capital			1	,241	,138	**-,470***	**-,42***	-,3	-,33	-,157	-,141	-,087	-,119	-,1	-,038	,089	-,19	**-,38**
4-Firm Age				1	-,161	,020	-,03	**,217***	,019	,080	,032	,137	**,159**	-,1	-,019	**,221***	-,14	,097
5-Firm Size					1	-,099	**-,20**	-,1	,052	,144	,031	,137	,138	-,1	,034	-,152	-,18	**-,33****
6-Customer Satisfaction						1	,310**	,414**	,280**	,300**	,403**	,275**	,113	,069	-,026	,027	,239*	-,08
7-Average Time of Production Process Change							1	,476**	,267**	,224*	,037	,232*	,026	,071	,051	,125	,023	,128
8-Time to Market								1	,370**	,350**	,286**	,364**	,211*	,016	-,001	,163	,169	,175
9-Level of Meeting Unexp.Increases in Order or Pro. Plans									1	,601**	,326**	,394**	,382**	,096	,014	,218*	,490**	,112
10-Level of Adap. to Unexp. Due Date Changes in Order or Pro. Plans										1	,340**	,292**	,288**	-,1	,000	,133	,309**	,081
11-Pre-invest. Cash Flow											1	,271**	,337**	,061	-,002	,073	,355**	,100
12-Perc. of 3 Years old or Younger Products in Total Sales												1	,653**	,017	-,038	,072	,063	-,04
13-Perc. of 3 Years or Younger Products in Existing Product Portfolio													1	,0	-,043	,132	,080	,045
14-Perc. of Average Total Stocks in Annual Sales														1	,365**	,172	,192	,095
15-Perc. of Quality Cost in Total Sales															1	,223*	,00	,141
16-Perc. of R&D Expenditure in Total																1	,119	,228*
17-Delivery on Time																	1	,035
18-Perc. of Quality Control Personnel in Production Workers.																		1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.6: Correlation analysis between general firm characteristics and performance indicators (change in the last 3 years)

5.1.3 T-tests Results for General Firm Characteristics and Performance Indicators

In ***Table 5.7,*** we see the significant results of t-tests about the relationship between ownership status and general firm performance indicators. Here, t-test divides all firms into two groups: family businesses and non-family businesses. According to our findings at significance level of 95%, non-family businesses provide high employee satisfaction than other firms. In family businesses average time of production process change and time to market is significantly longer; technological level is significantly lower and finally, percentage of total average incoming stocks in annual sales is relatively lower.

Familiy business		N	Mean	Sig
Employee Satisfaction	no	65	3,46	,037
	yes	54	3,17	
Time of Production Process Change	no	62	3,39	,038
	yes	52	3,10	
Time to Market	no	63	3,73	,022
	yes	50	3,34	
Technological Level	no	65	3,94	,003
	yes	52	3,42	
Perc. of Total Average Incom Stocks in Annual Sales	no	55	2,20	,059
	yes	47	2,68	

Table 5.7: Significant t-test results for firms' ownership status and current firm performance

Familiy business		N	Mean	Sig
Level of Meeting Unexp. Prod. or Order Increases Tr	no	64	3,78	,087
	yes	53	3,57	
Level of Adap. to Unexp. Due Date Changes Trend	no	64	3,73	,082
	yes	53	3,51	
Perc. of 3 Years or Younger Prod. in Total Sales Trend	no	58	3,83	,028
	yes	50	3,44	
Perc. of 3 Years or Younger Prod.in Exist. Prod. Portf. Tr.	no	61	3,90	,061
	yes	48	3,60	

Table 5.8: Significant t-test results for firms' ownership status and change of performance in the last 3 years.

.

In ***Table 5.8,*** it is obvious that level of meeting unexpected increases in production or order plan, adaptation level to unexpected due date changes and percentage of 3 years or younger products in existing product portfolio have increased more in non-family businesses than family businesses at a significance level of 90% in the last 3 years. Additionally, percentage of 3 years or younger products in total sales has increased relatively more in non-family businesses at a significance level of 95%.

Foreign Capital Existence		N	Mean	Sig
Customer Satisfaction	no	95	3,84	,002
	yes	22	4,36	
Productivity	no	94	3,59	,008
	yes	23	4,09	
Technological Level	no	94	3,64	,088
	yes	23	4,00	
Pre-invest. cash flow	no	90	3,22	,064
	yes	19	3,74	
Perc. of 3 Years Old or Young. Prod. in Tot. Sales	no	89	3,45	,056
	yes	20	2,85	
Perc. of Quality Cost in Total Sales	no	82	3,54	,002
	yes	19	4,21	
Perc. of Pro. Work Inv. in Qual. Activities	no	83	2,49	,026
	yes	20	3,40	

Table 5.9: Significant t-test results for foreign capital existence and current performance

Foreign Capital Existence		N	Mean	Sig.
Average Time of Production Process Change Trend	no	92	3,27	,096
	yes	22	2,95	
Pre-invest. CashFlow Trend	no	91	3,21	,024
	yes	20	3,55	
Perc. of 3 Years old or Younger Prod. in Total Sales Trend	no	81	2,67	,061
	yes	20	3,00	
Perc. of 3 Years or Younger Prod. in Exist. Prod. Portfolio Tr	no	60	2,67	,071
	yes	14	3,00	
Perc. of Delivery on Time Trend	no	83	3,55	,078
	yes	21	3,90	

Table 5.10: Significant t-test results for foreign capital existence and change of firm performance in the last 3 years.

Here, t-test divides all firms into two groups: foreign capitalized and non-foreign capitalized. According to ***Table 5.9*** foreign capital existence results are in a significant difference in customer satisfaction, productivity, percentage of quality cost in total sales at 99% level and percentage of production workers involved in quality activities at 95% level. On the other hand, existence of foreign capital also makes a significant difference on technological level, pre-investment cash flow and percentage of 3 years old or younger products in total sales ($p<0,1$).

According to ***Table 5.10,*** average time of production process change has increased significantly in non-foreign capitalized companies ($p<0,1$). Pre-investment cash flow, percentage of 3 years old or younger products in total sales, percentage of 3 years old or younger products in existing product portfolio and percentage of delivery on time all have an improving trend in firms with foreign capital in the last 3 years.

Percentage of Foreign Capital		N	Mean	Sig.
Perc. of Employee Train. Expen. in Gross Personnel Total Wage and Salary	>= 50,0	9	2,67	,081
	< 50,0	12	1,75	

Table 5.11: Significant t-test results for the percentage of foreign capital and current performance.

Percentage of Foreign Capital		N	Mean	Sig.
Customer Satisfaction Trend	>= 50,0	11	3,64	,096
	< 50,0	11	4,09	
Level of Meeting Unexp. Incr in Order or Pro. Plans Trend	>= 50,0	11	3,64	,089
	< 50,0	11	4,00	

Table 5.12: Significant t-test results for foreign capital percentage and change of firm performance in the last 3 years.

For testing the relationship between foreign capital percentage and performance indicators, t-test divides all firms into two groups: greater than or equal to 50% and less

than 50% foreign capital. In ***Table 5.11***, we see that firms having a foreign capital share greater than or equal to 50% incur a significantly higher percentage of employee training expenditure in gross personnel total wage and salary.

Firm Age		N	Mean	Sig.
Perc. of 3 Years or Younger Prod. in Exist. Prod. Portfolic	young and moderate	65	3,62	,053
	old	44	3,16	
Delivery on Time	young and moderate	63	3,71	,034
	old	44	4,18	

Table 5.13: Significant t-test results for firm age and current performance

Firm Age		N	Mean	Sig.
Time to Market trend	young and moderate	66	3,62	,019
	old	47	3,23	
Delivery on Time	young and moderate	61	3,49	,039
	old	43	3,81	

Table 5.14: Significant t-test results for firm age and change of firm performance in the last 3 years.

For firm age analysis, t-test divides all firms into two groups: young and moderate, old. In ***Table 5.13*** first, percentage of 3 years old or younger products in existing product portfolio is significantly low in older companies than young and moderate aged companies. Second, old firms have significantly better on time delivery performance than others.

According to ***Table 5.14,*** time to market has increased significantly more in young and moderate aged companies and on time delivery percentage has increased significantly more in old companies in the last 3 years.

Firm Size		N	Mean	Sig.
Customer Satisfaction	large	41	4,22	,000
	middle and small	35	3,63	
Average Time of Production Process Change	large	40	3,38	,085
	middle and small	35	3,06	
Productivity	large	42	3,98	,000
	middle and small	34	3,29	
Time to Market	large	42	3,74	,047
	middle and small	32	3,28	
Technological Level	large	42	4,02	,012
	middle and small	34	3,47	
Pre-invest. Cash Flow	large	41	3,44	,088
	middle and small	35	3,00	
Perc. of R&D Expenditure in Total Sales	large	37	2,43	,021
	middle and small	33	3,12	

Table 5.15: Significant t-test results for firm size and current performance

Firm Size		N	Mean	Sig.
Perc. of Quality Control Personnel in Pro. Workers Trend	large	39	2,92	,060
	middle and small	33	3,24	

Table 5.16: Significant t-test results for firm size and change of firm performance in the last 3 years.

In order to perform t-test on firm size factor, we divide firms in the sample into two groups: large firms, middle and small sized firms. In ***Table 5.15***, we see that firm size makes a significant difference on customer satisfaction and productivity at 99% significance level. Large firms have higher customer satisfaction and productivity than middle and small sized firms. Average time of production process change is better in large companies ($p<0,1$). Time to market and technological level are also better in large companies at 95% significance level. Pre-investment cash flow is better in large firms ($p<0,1$) and finally percentage of R&D cost in total sales is smaller in large firms ($p<0,05$).We can conclude that firm size is an important Business Excellence indicator because large firms have better results about many of the performance indicators.

We see from ***Table 5.16*** that firm size significantly affects percentage of quality control personnel in production workers ($p<0.1$). In the last 3 years, this percentage has decreased in large firms but it has increased in middle and small sized firms significantly ($p<0.1$).

5.2 Technology and Innovation Tendency

In this section, we will describe the relationship between technology and innovation tendency and firm performance indicators. First, explanatory factor analysis procedure is applied using SPSS v.13.0.

5.2.1 Factor Analysis and Reliability Analysis

The extracted factor structure of technology and innovation tendency can be seen in ***Table 5.17***, where the numbers represent the factor loadings. For this analysis, all of the technology and innovation tendency questions in the survey are placed together into principal component analysis and summarized in 3 dimensions

Table 5.18 shows α values of technology and innovation tendency factors which is obtained from reliability analysis. It shows that all the factors are internally consistent and reliable since all α values are greater than 0.70.

		Factors		
Questions		1	2	3
Innovation Management	Our firm always searches for new methods for managing business.	,814		
	Our firm tries to implement new ideas frequently	,800		
	It is important to have an appropriate environment for innovation in our firm.	,783		
	Our firm puts emphasis on new product and service development	,729		
	Open innovative sources are utilized	,597		
	Enough resource is allocated for developing new products and services	,593		
	R&D collaboration with universities or research centers are performed.	,524		
Technology Management	Our procedures are well defined for monitoring and developing technology		,887	
	The function for tracking technological developments and gathering information is well defined and is added to the related employee's job description		,860	
	Technology absorption process is managed by a team consisting of personnel coming from different functions.		,738	
	Employees receive sufficient training for using new technologies		,588	
Core Manufacturing Technology	Our core manufacturing technology is appropriate for our requirements			,888
	Our core manufacturing technology allows us to compete in the market			,869

Total Variance Explained: 67,38%

Table 5.17: Factor structure of technology and innovation tendency

Factors	Number of Questions	α Value
Innovation Management	7	0,852
Technology Management	4	0,864
Core Manufacturing Technology	2	0,822

Table 5.18: Results of reliability analysis for technology and innovation tendency

Reliability analysis of technology and innovation tendency is followed by correlation analysis.

5.2.2 Correlation Analysis

Correlation analysis results between technology and innovation tendency and firm performance indicators are shown in ***Table 5.19*** and ***Table 5.20.***

Table 5.19 displays the significant results of correlation analysis, which is applied in order to inspect one-to-one relationship between technology and innovation tendency factors and current firm performance indicators. It is observed that core manufacturing technology factor has a significant positive correlation with customer satisfaction, employee satisfaction, production process change time, productivity, time to market, technological level, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans, pre-investment cash flow, defects in total production volume, percentage of average total stocks in annual sales, percentage of quality cost in total sales. On the other hand, core manufacturing technology factor has a significant negative correlation with percentage of 3 years or younger products in total sales.

Technology management factor also has a significant correlation with most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, productivity, time to market, technological level, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans, pre-investment cash flow, percentage of defects in total production volume, percentage of R&D expenditure in total sales,

percentage of production workers involved in quality activities and percentage of training expenditure in total gross wage and salary.

Innovation management factor has a positive affect on customer satisfaction, employee satisfaction, productivity, time to market, technological level, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans, pre-investment cash flow, percentage of 3 years or younger products in total sales, percentage of R&D expenditure in total sales.

Table 5.20 displays the significant results of correlation analysis between innovation and technology tendency and firm performance trend in the last 3 years. It is clear that technology and innovation tendency factors are less effective on change of the performance in the last 3 years comparing to their effect on current performance. Core manufacturing technology makes a significant difference on employee satisfaction trend, technological level trend, pre-investment cash flow trend, percentage of average total stocks in annual sales trend, percentage of average incoming material stocks in annual sales trend, percentage of R&D expenditure in total sales trend, percentage of 3 years or younger products in existing product portfolio trend and percentage of training expenditure in gross total wage and salary trend.

Technology management factor is effective on most of the performance indicators. It is positively correlated to customer satisfaction trend, employee satisfaction trend, technological level trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend and percentage of 3 years or younger products in existing product portfolio trend.

Innovation management factor makes a significant difference on customer satisfaction trend, employee satisfaction trend, productivity trend, production process change time trend, productivity trend, time to market trend, technological level trend, level of adaptation to unexpected due date changes in production or order plans trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend and percentage of 3 years or younger products in existing product portfolio trend, percentage of training expenditure in gross total wage and salary trend, percentage of production workers involved in quality activities trend, percentage of quality control personnel in production workers trend, percentage of total average incoming material production workers in production workers trend.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1-Core Manufacturing Technology	1	,414**	,328**	,332**	,389**	,349**	,453**	,315**	,578**	,307**	,286**	,418**	-,001	,215	,189	,345**	,079	,137	,033
2-Technology Mgmt		1	,608**	,209	,349**	,141	,360**	,293**	,395**	,185	,261**	,343**	,033	,169	,034	-,03	,175	,241	,228
3-Innovation Mgmt			1	,214	,304**	,113	,317**	,339**	,247**	,154	,229	,327**	,186	,136	,059	,083	,251	,160	,148
4-Customer Satisfaction				1	,481**	,129	,498**	,428**	,320**	,400**	,476**	,367**	,106	,229	,176	,185	,094	,096	,088
5-Employee Satisfaction					1	,351**	,367**	,322**	,355**	,309**	,379**	,389**	,017	,232	,097	,160	-,021	,254	,197
6-Time of Production Process Change						1	,259**	,037	,147	,060	,116	,276**	-,078	-,03	,092	,160	-,101	,077	-,04
7-Productivity							1	,523**	,557**	,501**	,475**	,411**	,126	,180	,257**	,297**	,127	,142	,001
8-Time to Market								1	,485**	,404**	,427**	,354**	,326**	,101	,133	,158	,133	,133	-,01
9-Technological Level									1	,458**	,383**	,327**	,008	,181	,117	,244	,065	,125	,00
10-Level of Meeting Increase in Pro. or Order Plans										1	,764**	,323**	,032	,056	,059	,185	,100	,212	,027
11- Level of Adaptation to Unexp. Due Date Changes											1	,408**	,108	,098	,088	,111	,197	,226	,142
12-Pre-invest. Cash Flow												1	,247	,151	,068	,181	,104	,063	,085
13-Perc. of 3 Years Old or Young. Prod. in Tot. Sales														-,10	-,07	,002	,205	-,02	,199
14-Perc. of Defects in Total Production Volume														1	,037	,153	,052	,182	,056
15-Perc. of Ave.Total Stocks in Annual Sales															1	,349**	,180	,108	,183
16-Perc. of Quality Expenditure in Total Sales																1	,166	,063	-,13
17-Perc. of R&D Expenditure in Total Sales																	1	,072	,273**
18-Perc. of Pro. Workers Involved in Qual. Activities																		1	,368**
19-Emplo. Train. Expen. in GrossTotal Pers. Wage and Salary																			1

**. Correlation is significant at the 0.01 level (2-tailed). *.Correlation is significant at the 0.05 level (2-tailed). . Correlation is significant at the 0.1 level (2-tailed).

Table 5.19: Correlation analysis between core manufacturing technology, technology management, innovation management and performance indicators (current status)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1-Core Manufacturing Technology	1	,414**	,328**	,072	,185*	140	,051	,306**	,126	,245**	,136	,215*	,173	,214	,177	,125	-,05	,135	,183
2-Technology Management		1	,608**	,230*	,207*	048	,121	,207*	,107	,377**	,177	,208*	,047	079	,056	,114	-,01	,057	106
3-Innovation Management			1	,154	,228*	,173	,183	,270**	,156	,326**	,322**	,300**	,033	131	,107	,172	,169	,202*	,234*
4-Customer Satisfaction				1	,285**	365**	,414**	,317**	,300**	,403**	,275**	,113	,069	087	,027	,256*	-,08	,140	268**
5-Employee Satisfaction					1	292**	,337**	,291**	,378**	,394**	,240*	,274**	-,10	138	,035	,226*	,142	,144	,264**
6-Productivity						1	,321**	,318**	,297**	,147	,429**	,283**	-,04	,0	,056	,319**	,050	,166	,173
7-Time to Market							1	,337**	,350**	,286**	,364**	,211*	,016	006	,163	,155	,175	,175	,238*
8-Technological Level								1	,287**	,263**	,476**	,427**	,017	006	,221*	,266**	,010	,186	,115
9-Level of Adaptation to Unexp. Due Date Changes									1	,340**	,292**	,288**	-,08	-,2	,133	,187	,081	,071	,117
10-Pre-invest. Cash Flow										1	,271**	,337**	,061	095	,073	,059	,100	,125	,282**
11-Perc. of 3 Years Old or Younger Prod. in Tot. Sales											1	,653**	,017	-,1	,072	,298**	-,04	,137	,259*
12-Perc. of 3 Years Old or Younger Products in Existing Product Portfolio												1	-,02 ,858	101 404	,132 ,214	,272** ,007	,045 ,658	,216* ,032	,260* ,010
13-Perc. of Ave.Tot. Stocks in Annual Sales													1	755**	,172	-,04	,095	,218*	,086
14-Perc. of Ave.Tot. Incoimg Mat. Stocks in Annual Sales														1	,006	-,11	,259*	,258*	037
15-Perc. of R&D Expenditure in Total Sales															1	,232*	,228*	,190	,173
16-Perc. of Pro. Work. Involved in Qual. Activities																1	,103	,256*	,453**
17-Perc. of Quality Control Pers. in Production Workers																	1	,602** ,000	,204* 043
18-Perc. of Incoming Material Quality Control Pers. in Production Workers																		1	,326**
19-Perc. of Training Exp. in GrossTot. Pers. Wage and Sal																			1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.20: Correlation analysis between core manufacturing technology, technology management, innovation management and performance indicators (change in the last 3 years)

5.2.3 T-tests

In order to analyze the meaning of these correlations, t-tests are performed in the following step. For analyzing core manufacturing technology factor by applying t-test, we divided the firms' responses into two groups. The threshold point is selected as "5", which represents "absolutely agree". Findings in ***Table 5.21*** explain that core manufacturing technology significantly affects customer satisfaction, employee satisfaction, average time of production process change, productivity, time to market, technological level, level of meeting unexpected increases in production or order plans, pre-investment cash flow, percentage of defects in total production volume, percentage of average total stocks in annual sales and percentage of quality cost in total sales in a positive way.

Core Manufacturing Technology		N	Mean	Sig.
Customer Satisfaction	>= 5,00	52	4,21	,000
	< 5,00	64	3,73	
Employee Satisfaction	>= 5,00	52	3,62	,000
	< 5,00	66	3,11	
Ave. Time of Production Process Change	>= 5,00	49	3,59	,000
	< 5,00	64	3,03	
Productivity	>= 5,00	52	4,06	,000
	< 5,00	64	3,42	
Time to Market	>= 5,00	50	3,80	,019
	< 5,00	63	3,40	
Technological Level	>= 5,00	52	4,19	,000
	< 5,00	65	3,34	
Level of Meeting Unexp. Prod. or Order Increases	>= 5,00	51	3,92	,038
	< 5,00	65	3,57	
Level of Adaptation to Unexpected Due Date Changes	= 5,00	51	3,84	,020
	< 5,00	65	3,45	
Pre-invest. CashFlow	>= 5,00	47	3,77	,000
	< 5,00	61	2,97	
Perc. of Defects in Total Production Volume	>= 5,00	47	3,72	,031
	< 5,00	60	3,18	
Perc. of Ave.Total Stocks in Annual Sales	>= 5,00	42	3,19	,047
	< 5,00	60	2,72	
Perc. of Quality Expen. in Total Sales	>= 5,00	41	4,00	,006
	< 5,00	59	3,41	

Table 5.21: Significant t-test results for core manufacturing technology and current performance

Core Manufacturing Technology		N	Mean	Sig.
Technological Level Trend	>= 5,00	52	4,04	,001
	< 5,00	65	3,60	
Pre-invest. Cash Flow Trend	>= 5,00	47	3,51	,009
	< 5,00	63	3,10	
Perc. of Ave.Total Incoming Mat.Stocks in Annual Sales Trend	>= 5,00	30	2,93	,046
	5,00	44	2,59	

Table 5.22: Significant t-test results for core manufacturing technology and change of firm performance in the last 3 years.

Table 5.22 displays the relationship between core manufacturing technology factor and firm performance indicators in the last 3 years. It makes a significant positive difference on the improvement of technological level and on the increase of pre-investment cash flow in the last 3 years.

Technology Management		N	Mean	Sig
Customer Satisfaction	>= 4,00	51	4,12	,027
	< 4,00	65	3,82	
Employee Satisfaction	>= 4,00	53	3,55	,006
	< 4,00	65	3,15	
Ave. Time of Production Process Change	>= 4,00	51	3,43	,062
	< 4,00	62	3,15	
Productivity	>= 4,00	52	3,96	,003
	< 4,00	64	3,50	
Time to Market	>= 4,00	52	3,79	,021
	< 4,00	61	3,39	
Technological Level	>= 4,00	53	3,98	,004
	< 4,00	64	3,50	
Level of Adaptation to Unexpected Due Date Changes	>= 4,00	52	3,79	,072
	< 4,00	64	3,48	
Pre-invest. CashFlow	>= 4,00	48	3,67	,003
	< 4,00	60	3,03	
Perc. of Pro. Work. Involved in Qual. Activities	>= 4,00	47	2,98	,047
	< 4,00	56	2,46	
Perc. of Quality Control Pers. in Pro. Workers	>= 4,00	48	2,85	,054
	< 4,00	58	3,28	
Train. Expen. in GrossTot. Pers. Wage and Salary	>= 4,00	48	2,46	,024
	< 4,00	58	1,93	

Table 5.23: Significant t-test results for technology management factor and current performance

Technology Management		N	Mean	Sig.
Customer Satisfaction Trend	>= 4,00	51	3,94	,010
	< 4,00	64	3,63	
Employee Satisfaction Trend	>= 4,00	54	3,46	,075
	< 4,00	64	3,23	
Technological Level Trend	>= 4,00	54	3,94	,038
	< 4,00	63	3,67	
Pre-invest. cash flow Trend	>= 4,00	50	3,54	,002
	< 4,00	60	3,05	
Perc. of 3 Years Old or Young. Prod. in Tot. Sales Tr.	>= 4,00	46	3,83	,083
	< 4,00	62	3,52	

Table 5.24: Significant t-test results for technology management factor and change of firm performance in the last 3 years.

In technology management factor, firms are divided into two groups: firms that answer the corresponding question as “agree” (4) or “strongly agree” (5) and those that don’t. Findings presented in ***Table 5.23*** show that technology management factor makes a significantly positive difference for customer satisfaction, employee satisfaction, average time of production process change, productivity, time to market, technological level, level of adapting unexpected due date changes in production or order plans, pre-investment cash flow, percentage of workers involved in quality activities, percentage of quality control personnel in production workers, percentage of employee training expenditure in gross total personnel wage and salary.

Table 5.24 displays the relationship between technology management and firm performance trend in the last 3 years. Technology management factor makes a significantly positive difference not only on increase of customer and employee

satisfaction, but also of pre-investment cash flow, of percentage of 3 years old or younger products in total sales and of technological level in the last 3 years.

Innovation Management		N	Mean	Sig
Customer Satisfaction	>= 4,00	61	4,05	,087
	< 4,00	55	3,82	
Employee Satisfaction	>= 4,00	63	3,51	,005
	< 4,00	55	3,11	
Productivity	>= 4,00	63	3,89	,004
	< 4,00	53	3,45	
Time to Market	>= 4,00	62	3,76	,009
	< 4,00	51	3,31	
Technological Level	>= 4,00	63	3,89	,021
	< 4,00	54	3,50	
Level of Adaptation to Unexpected Due Date Changes	>= 4,00	62	3,77	,044
	< 4,00	54	3,43	
Pre- investment Cash Flow	>= 4,00	56	3,61	,003
	< 4,00	52	2,98	
Perc. of 3 Years Old or Yong. Prod. in Tot. Sales	>= 4,00	56	3,59	,034
	< 4,00	53	3,08	
Perc. of R&D Expenditure in Annual Sales	>= 4,00	50	2,98	,011
	< 4,00	45	2,31	
Perc. of Pro. Work. Involved in Qual. Activities	>= 4,00	55	2,96	,019
	< 4,00	48	2,33	

Table 5.25: Significant t-test results for innovation management factor and current performance

Innovation Management		N	Mean	Sig
Customer Satisfaction Trend	>= 4,00	62	3,87	,071
	< 4,00	53	3,64	
Employee Satisfaction Trend	>= 4,00	64	3,50	,006
	< 4,00	54	3,15	
Productivity Trend	>= 4,00	64	3,89	,121
	< 4,00	52	3,71	
Time to Market Trend	>= 4,00	63	3,63	,015
	< 4,00	50	3,24	
Technological Level Trend	>= 4,00	64	3,98	,002
	< 4,00	53	3,57	
Level of Meeting Unexp. Prod.or Order Increase Trend	>= 4,00	63	3,79	,066
	< 4,00	53	3,57	
Level of Adaptation to Unexpected Due Date Changes	>= 4,00	63	3,78	,016
	< 4,00	53	3,47	
Pre-invest. Cash Flow Trend	>= 4,00	59	3,53	,000
	< 4,00	51	2,98	
Perc. of 3 Years Old or Young. Prod. in Tot. Sales Trend	>= 4,00	57	3,98	,000
	< 4,00	51	3,27	
Perc. of 3 Years or Young. Prod. in Exis. Prod. Portfolio Trend	>= 4,00	59	4,02	,001
	< 4,00	50	3,48	
Perc. of Pro. Work. Involved in Qual. Activ Trend	>= 4,00	55	3,55	,014
	< 4,00	46	3,09	
Perc. of Incoming Mat. Qual. Control Per. in Pro. Workers Trend	>= 4,00	55	3,18	,109
	< 4,00	49	2,96	

Table 5.26: Significant t-test results for innovation management factor and change of firm performance in the last 3 years.

Findings in ***Table 5.25*** implies that innovation management factor significantly affects customer satisfaction, employee satisfaction, productivity, time to market, technological level, level of adapting unexpected due date changes in production or order plans, pre-investment cash flow, percentage of workers involved in quality activities, percentage of 3 years old or younger products in total sales, percentage of R&D expenditure in annual sales in a positive way.

Table 5.26 displays that innovation management factor has a significant relation with the increase of most of the firm performance indicators in the last 3 years. We can conclude that innovation management factor is an important factor for improvement of the firm performance indicators.

5.3 Human Resources

In this section, we describe the relationship between human resources factor and firm performance indicators.

5.3.1 Factor Analysis and Reliability Analysis

Factor analysis procedure is applied with SPSS and the extracted factor structure of human resources can be seen in ***Table 5.27***, where the numbers represent the factor loadings. Human resources questions in our questionnaire resulted in one factor.

Questions		Factors 1
Human Resources	There is a corporate development process including career plans of all employees in the firm	,828
	We have a human resources policy for developing required basic capabilities of producing competitive products	,805
	Employee work performance is measured regularly and evaluated	,796
	Our employment process is based on selecting the right employee to the right position approach	,795
	There is an efficient "upwards" and "downwards" communication in the company	,766
	Work analysis and design are made for improving employee satisfaction	,764
	Employees are trained to improve their capability to adjust and perform different jobs easily	,761
	We support and encourage social activities in the company	,672
	Employee satisfaction is measured regularly in our company	,663
	Workplace security and health applications are excellent in our firm	,605

Total Variance Explained % 56,061

Table 5.27: Factor structure of human resources

Table 5.28 shows α value of the human resources factor obtained. It is consistent and reliable because α value is greater than 0.70

Factor	**Number of Questions**	**α Value**
Human Resources	10	0,908

Table 5.28: Result of reliability analysis for human resources factor

5.3.2 Correlation Analysis

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1-Human Resources	,684**	,699**	,272**	,514**	,247**	,343**	,319**	,332**	,376**	,452**	,452**	,182	,361**	,210*	,292**
2-Quality Management	1	,633**	,319**	,438**	,103	,267**	,221*	,294**	,289**	,314**	,288**	,118	,346**	,098	,254**
3-Process Mgmt and Cont Improvment		1	,278**	,364**	,123	,282**	,168	,231*	,270**	,382**	,297**	,211*	,352**	,253**	,215*
4-Customer Satisfaction			1	,481**	,129	,498**	,428**	,320**	,400**	,476**	,367**	,229*	,096	,114	,088
5-Employee Satisfaction				1	,351**	,367**	,322**	,355**	,309**	,379**	,389**	,232*	,254*	,135	,197*
6-Aveage Time of Production Process Change					1	,259**	,037	,147	,060	,116	,276**	,0	,077	-,1	-,04
7-Productivity						1	,523**	,557**	,501**	,475**	,411**	,180	,142	,124	,001
8-Time to Market							1	,485**	,404**	,427**	,354**	,101	,195	,122	-,01
9-Technological Level								1	,458**	,383**	,327**	,181	,125	,215*	,00
10-Level of Meeting Unexpected Increases in Production or Order Plans										,764**	,323**	,056	,212*	,390**	,027
11-Level of Adaptation to Unexp. Due Date Changes in Pro. or Order										1	,408**	,098	,226*	,310**	,142
12-Pre-invest. Cash Flow											1	,151	,063	,141	,085
13-Perc. of Defects in Total Pro. Volume												1	,182	,113	,056
14-Perc. of Pro. Work. Involved in Qual. Activities													1	,175	,368**
15-Delivery On Time														1	,117
16-Perc. of Train. Exp. in GrossTot. Wage and Salary															1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).
Correlation is significant at the 0.1 level (2-tailed).

Table 5.29 Correlation analysis between human resources, process management and CI, quality management factors and performance indicators (current)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1-Human Resources	1	,684**	,699**	,204*	,338**	,072	,195*	,228*	,278**	,403**	,221*	,176	,220*	,306**
2-Quality Management		1	,633**	,247**	,260**	,187*	,119	,246**	,273**	,247**	,184	,088	,297**	,185
3-Process Mgmt and Cont Improvement			1	,204*	,238**	,023	,126	,152	,240**	,267**	,124	,125	,161	,088
4-Customer Satisfaction				1	,285**	,365**	,317**	,280**	,300**	,403**	,275**	,113	,256*	,268**
5-Employee Satisfaction					1	,292**	,291**	,273**	,378**	,394**	,240*	,274**	,226*	,264**
6-Productivity						1	,318**	,410**	,297**	,147	,429**	,283**	,319**	,173
7-Technological Level							1	,387**	,287**	,263**	,476**	,427**	,266**	,115
8-Level of Meeting Unexpected Increases in Production or Order Plans								1	,601**	,326**	,394**	,382**	,349**	,236*
9-Level of Adaptation to Unexp. Due Dates in Pro. or Order PLans									1	,340**	,292**	,288**	,187	,117
10-Pre-invest. Cash Flow										1	,271**	,337**	,059	,282**
11-Perc. of 3 Years Old or Younger Prod. in Tot. Sales											1	,653**	,298**	,259*
12-Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio												1	,272**	,260*
13-Perc. of Pro. Work. Involved in Qual. Activities													1	
14-Train. Exp. in GrossTot. Wage and Salary														1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.30: Correlation analysis between human resources, process management and CI, quality management factors and performance indicators (change in the last 3 years)

After completing reliability analysis, correlation analysis is applied. ***Table 5.29*** shows the results of the correlation analysis both between human resources factor and firm performance indicators; and process management and CI factor and firm performance indicators

Human resources factor is an effective factor on most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, production process change time, productivity, time to market, technological level, pre-investment cash flow, percentage of training expenditure in gross total wage and salary, percentage of production workers involved in quality activities, percentage of defects in total production volume, level of meeting unexpected increases in order or production plan and level of adaptation to unexpected due date changes in production or order plans and percentage of delivery on time.

Table 5.30 shows the relationship between human resources factor and performance indicators trend. It is positively correlated to customer satisfaction trend, employee satisfaction trend, technological level trend, pre-investment cash flow trend, percentage of training expenditure in gross total wage and salary trend, percentage of production workers involved in quality activities trend, percentage of defects in total production volume trend, level of meeting unexpected increases in order or production plan trend, level of adaptation to unexpected due date changes in production or order plans trend, percentage of 3 years or younger products in total sales trend and percentage of 3 years or younger products in existing product portfolio trend

5.3.3 T-tests

Correlation analyses are followed by t-tests. According to t-test results reported in ***Table 5.31***, human resources factor imparts a significant difference on most of the firm performance indicators. At 99% significance level, human resources factor makes a significant positive difference on customer satisfaction, employee satisfaction, productivity, time to market, flexibility, pre-investment cash flow, percentage of workers involved in quality activities and training expenditures. On the other hand, as is shown in ***Table 5.32,*** human resources factor is a very effective factor for improvement of most of the performance indicators in the firm in the last 3 years.

Human Resources		N	Mean	Sig.
Customer Satisfaction	>= 4,00	58	4,14	,003
	< 4,00	59	3,75	
Employee Satisfaction	>= 4,00	60	3,72	,000
	< 4,00	59	2,93	
Ave. Time of Production Process Change	>= 4,00	57	3,47	,002
	< 4,00	57	3,04	
Productivity	>= 4,00	59	3,93	,001
	< 4,00	58	3,43	
Time to Market	>= 4,00	57	3,77	,010
	< 4,00	56	3,34	
Technological Level	>= 4,00	59	3,90	,023
	< 4,00	58	3,52	
Level of Meeting Unexp Incr. in Pro.or Order Plan	>= 4,00	59	3,93	,007
	< 4,00	58	3,48	
Level of Adaptation to Unexpected Due Date Changes	>= 4,00	59	3,95	,000
	< 4,00	58	3,26	
Pre-invest. Cash Flow	>= 4,00	54	3,78	,000
	< 4,00	55	2,85	
Perc. of Production Work involved in Quality Activities	>= 4,00	51	3,06	,004
	< 4,00	52	2,29	
Train. Exp. in GrossTot. Pers. Wage and Salary	>= 4,00	53	2,45	,007
	< 4,00	54	1,83	

5.31: Significant t-test results for human resources factor and current performance

Human Resources		N	Mean	Sig.
Customer Satisfaction Trend	>= 4,00	59	3,90	,033
	< 4,00	57	3,63	
Employee Satisfaction Trend	>= 4,00	61	3,59	,033
	< 4,00	58	3,09	
Productivity Trend	>= 4,00	60	3,90	,000
	< 4,00	57	3,72	
Time to Market Trend	>= 4,00	58	3,62	,043
	< 4,00	55	3,29	
Technological Level Trend	>= 4,00	60	3,97	,008
	< 4,00	57	3,61	
Level of Meeting to Unexp. Incr. in Pro.or Order Plans Trend	>= 4,00	60	3,87	,002
	< 4,00	57	3,49	
Level of Adaptation to Unexp. Due Dates Changes Trend	>= 4,00	60	3,85	,000
	< 4,00	57	3,40	
Pre-invest. Cash Flow Trend	>= 4,00	56	3,59	,000
	< 4,00	55	2,95	
Perc. of 3 Years Old or Younger Prod. in Tot. Sales Trend	>= 4,00	52	4,00	,000
	< 4,00	56	3,32	
Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio Trend	>= 4,00	54	3,96	,015
	< 4,00	55	3,58	
Perc. of Defects in Total Pro. Volume Trend	>= 4,00	52	2,21	,039
	< 4,00	55	2,58	
Perc. of Production Work involved in Quality Activities.	>= 4,00	51	3,61	,003
	< 4,00	50	3,06	
Perc. of Train. Exp. in GrossTot. Pers. Wage and Salary Trend	>= 4,00	52	3,29	,022
	< 4,00	51	2,92	

5.32: Significant t-test results for human resources factor and change of firm performance in the last 3 years.

5.4 Process Management and Continuous Improvement

5.4.1 Factor Analysis and Reliability Analysis

The factor structure of process management and CI questions can be seen in ***Table 5.33***, where the numbers represent the factor loadings. All of process management and CI questions in the survey are grouped into two factors.

Questions		Factors 1	2
Process Management and CI	We have written standard procedures to review the completed or terminated continuous improvement projects for learning	,827	
	We have written standard procedures for defining and applying continuous improvement projects	,820	
	We share continuous improvement projects and their results with all employees	,744	
	We have a written standard benchmarking procedure in order to compare our performance with our rivals	,713	
	We have written standard working procedures for the entire company	,583	
	Self-assessment is performed regularly	,577	
	We use activity based costing	,528	
Quality Management	Everyone in the company should believe that quality is his/her own responsibility		,836
	All employees of the company understand and apply "internal customer" notion		,810
	We have well established techniques for measuring the quality of our products and services		,790

Total Variance Explained %62, 011

Table 5.33: Factor structure of process management and continuous improvement

Table 5.34 shows the reliability analysis. Process management and CI factors are consistent and reliable since α values are greater than 0,70.

Factors	**Number of Questions**	**α Value**
Process Mgmt and CI	7	0,866
Quality Management	3	0,811

Table 5.34: Results of reliability analysis for process management and CI and quality management factors

5.4.2 Correlation Analysis

It is displayed in ***Table 5.29*** that quality management factor is an effective factor on most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, productivity, time to market, technological level, pre-investment cash flow, percentage of training expenditure in gross total wage and salary, percentage of production workers involved in quality activities, level of meeting unexpected increases in order or production plan and level of adaptation to unexpected due date changes in production or order plans.

On the other hand, process management and CI factor makes a significant difference on customer satisfaction, employee satisfaction, productivity, time to market, technological level, pre-investment cash flow, percentage of training expenditure in gross total wage and salary, percentage of production workers involved in quality activities, percentage of defects in total production volume, level of meeting unexpected increases in order or production plan and level of adaptation to unexpected due date changes in production or order plans and percentage of delivery on time.

Table 5.30 shows significant correlations between process management and CI factor and firm performance trend in the last 3 years. Quality management factor positively correlated to customer satisfaction trend, employee satisfaction trend, pre-investment cash flow trend, percentage of training expenditure in gross total wage and salary trend, percentage of production workers involved in quality activities trend, percentage of defects in total production volume trend, level of meeting unexpected increases in order or production plan trend, level of adaptation to unexpected due date changes in production or order plans trend, percentage of 3 years or younger products in total sales trend and productivity trend.

Process management and CI factor is positively correlated to customer satisfaction trend, employee satisfaction trend, pre-investment cash flow trend, level of adaptation to unexpected due date changes in production or order plans trend.

5.4.3 T-tests

Quality Management		N	Mean	Sig.
Customer Satisfaction	>= 4,00	82	4,05	,021
	< 4,00	35	3,69	
Employee Satisfaction	>= 4,00	84	3,52	,000
	< 4,00	35	2,86	
Productivity	>= 4,00	82	3,77	,091
	< 4,00	35	3,49	
Time to Market	>= 4,00	79	3,66	,071
	< 4,00	34	3,32	
Technological Level	>= 4,00	82	3,82	,050
	< 4,00	35	3,46	
Level of Meeting Unexp. Increases in Production or Order Plans	>= 4,00	82	3,82	,047
	< 4,00	35	3,46	
Level of Adaptation to Unexpected Due Date Changes	= 4,00	82	3,76	,022
	< 4,00	35	3,26	
Pre-invest. Cash Flow	>= 4,00	76	3,45	,051
	< 4,00	33	3,00	
Perc. of Pro. Work. Involved in Qual. Activities	>= 4,00	70	3,04	,000
	< 4,00	33	1,88	
Perc. of Train. Exp. in GrossTot. Wage and Salary	>= 4,00	74	2,31	,009
	< 4,00	33	1,76	

Table 5.35: Significant t-test results for quality management factor and current performance

Quality Management		N	Mean	Sig.
Employee Satisfaction Trend	>= 4,00	84	3,44	,019
	< 4,00	35	3,11	
Level of Meeting Unexpected Increases in Production or Order Plans Trend	>= 4,00	82	3,79	,006
	< 4,00	35	3,43	
Level of Adaptation to Unexp. Due Dates Changes in Pro. or Order Plans Trend	>= 4,00	82	3,76	,005
	< 4,00	35	3,34	
Pre-invest. Cash Flow Trend	>= 4,00	77	3,36	,075
	< 4,00	34	3,06	
Perc. of Defects in Total Pro. Volume Trend	>= 4,00	73	2,27	,037
	< 4,00	34	2,68	
Perc. of Pro. Work. Involved in Qual. Activities Trend	>= 4,00	71	3,56	,000
	< 4,00	30	2,80	
Perc. of Train. Exp. in GrossTot. Wage and Salary Trend	>= 4,00	74	3,20	,056
	< 4,00	29	2,86	

Table 5.36: Significant t-test results for quality management factor and change of firm performance in the last 3 years.

As is shown in ***Table 5.35*** and ***Table 5.36***, quality management factor imparts a positive significant difference on both current firm performance and its change in the last 3 years..

Process Mgmt and Cont Imp		N	Mean	Sig.
Customer Satisfaction	>= 4,00	54	4,07	,063
	< 4,00	63	3,83	
Employee Satisfaction	>= 4,00	55	3,58	,001
	< 4,00	64	3,11	
Productivity	>= 4,00	54	3,91	,006
	< 4,00	63	3,49	
Technological Level	>= 4,00	54	3,91	,025
	< 4,00	63	3,54	
Level of Meeting Unexp. Incr. in Pro. or Order Plans	>= 4,00	55	3,91	,021
	< 4,00	62	3,53	
Level of Adaptation to Unexp. Due Date Changes	>= 4,00	55	3,89	,001
	< 4,00	62	3,35	
Pre-invest. Cash Flow	>= 4,00	50	3,68	,001
	< 4,00	59	3,00	
Delivery on Time	>= 4,00	49	4,20	,012
	< 4,00	58	3,66	

Table 5.37: Significant t-test results for process management and continuous improvement factor and current performance

Process Mgmt and Cont Imp		N	Mean	Sig.
Employee Satisfaction Trend	>= 4,00	55	3,49	,032
	< 4,00	64	3,22	
Level of Adaptation to Unexp. Due Dates Changes in Pro. or Order Plans Trend	>= 4,00	55	3,75	,089
	< 4,00	62	3,53	
Pre-invest. Cash Flow Trend	>= 4,00	52	3,48	,012
	< 4,00	59	3,08	
Perc. of Ave.Tot. Stocks in Annual Sales Trend	>= 4,00	48	2,56	,048
	< 4,00	53	2,89	

Table 5.38: Significant t-test results for process management and continuous improvement factor and change of firm performance in the last 3 years.

Process management and CI factor significantly affects customer and employee satisfaction, productivity, flexibility, technological level, pre-investment cash flow and delivery on time. Process management and CI have also a significant positive affect on increase of the employee satisfaction, on pre-investment cash flow and on adaptation level to unexpected due date changes in the last 3 years. On the other hand, it makes a significant difference on the decrease of percentage of average total stocks in annual sales. (***Table 5.37*** and ***Table 5.38***).

5.5 Manufacturing Structure and Operations

5.5.1 Factor Analysis and Reliability Analysis

In order to describe the relationship between manufacturing structure and general firm performance indicators factor analysis procedure is performed with SPSS and the factor structure of manufacturing structure questions are reduced into 3 groups that can be seen in ***Table 5.39*** where the numbers represent the factor loadings.

Table 5.40 shows α values of factors obtained. They are consistent and reliable because α values are greater than 0.70.

Questions		Factors		
		1	2	3
Operation Diversity	We manage several innovation projects simultaneously	,850		
	We operate in markets that have different competitive priorities	,769		
	There are several new technologies we develop and support	,740		
	We focus on producing high number of different products	,726		
	We manage several improvement activities simultaneously	,687		
Operation Structure	We make our production plans in order to secure JIT production		,766	
	We develop our core competencies based on a plan and with the necessary funds secured		,679	
	Recycling ratio is a primary criterion for us when designing new products or modifying existing ones		,645	
	We perform collaboration for production and complementary collaboration		,608	
Manufacturing Capability	We pay attention to accept only those production orders from our customers such that their design is in harmony with our manufacturing and other capabilities			,741
	Capability of our manufacturing activities constitutes the basis of our success in the market			,711
	We pay attention to the design of our new products to be in harmony with our manufacturing and other capabilities			,579
	There is an agreement in the company about the company's existing core competencies and what they should be			,578
	Our manufacturing activities are in accordance with our business mission			,545

Total Variance Explained % 58,381

Table 5.39: Factor structure of manufacturing structure and operations

Factors	**Number of Questions**	**α Value**
Operation Diversity	5	0,832
Operation Structure	4	0,714
Manufacturing Capabilities	5	0.735

Table 5.40: Reliability analysis of manufacturing structure and operations

5.5.2 Correlation Analysis

Table 5.41 displays correlation analysis between manufacturing structure and operations, planning factors and general performance indicators. Operation diversity factor makes a significant difference on productivity, time to market, technological level, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans, pre-investment cash flow. On the other hand, it is negatively correlated to the percentage of quality control personnel in production workers.

Operation structure factor is positively correlated to customer satisfaction, employee satisfaction, productivity, time to market, technological level, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans, pre-investment cash flow, percentage of 3 years or younger products in total sales, percentage of production workers involved in quality activities, percentage of training expenditure in gross total wage and salary.

Manufacturing capabilities factor makes a significant difference on customer satisfaction, employee satisfaction, productivity, time to market, technological level, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans, pre-investment cash flow, percentage of production workers involved in quality and percentage of incoming material quality control personnel in production workers.

Table 5.42 indicates correlations between manufacturing structure factors and change of firm performance in the last 3 years. Operation diversity factor is positively correlated to productivity trend, technological level trend, level of meeting unexpected increases in order or production plan trend, level of adaptation to unexpected due date changes in production or order plans trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend.

Operation structure factor is positively correlated to customer satisfaction trend, employee satisfaction trend, level of adaptation to unexpected due date changes in production or order plans trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1-Operation Diversity	1	,324**	,438**	,426**	,091	,069	,228	,187	,181	,178	,181	,259**	,158	,025	,044	-,084	-,247	-,14	-,042
2-Operation Structure		1	,580**	,645**	,324**	,331**	,386**	,373**	,332**	,349**	,362**	,252**	,193	,018	,319**	,069	-,045	-,01	,180
3-Manufacturing Capabilities			1	,568**	,393**	,404**	,320**	,346**	,299**	,299**	,292**	,237	,096	,096	,246	,064	-,064	,165	,079
4-Planning				1	,332**	,439**	,396**	,297**	,322**	,378**	,374**	,275**	,045	,172	,296**	,188	-,130	-,07	,188
5-Customer Satisfaction					1	,481**	,498**	,428**	,320**	,400**	,476**	,367**	,106	,229	,096	,114	-,074	,050	,088
6-Employee Satisfaction						1	,367**	,322**	,356**	,309**	,379**	,389**	,017	,232	,254	,135	,126	,169	,197
7-Productivity							1	,523**	,557**	,501**	,475**	,411**	,126	,180	,142	,124	-,068	-,08	,001
8-Time to Market								1	,485**	,404**	,427**	,354**	,326**	,101	,195	,122	,023	,012	-,006
9-Technological Level									1	,458**	,383**	,327**	,008	,181	,125	,215	-,106	-,01	-,001
10- Level of Meeting Unexp. Incr. in Pro. or Order Plans										1	,764**	,323**	,032	,056	,212	,390**	,013	-,06	,027
11- Level of Adaptation to Unexp. Due Date Changes											1	,408**	,108	,098	,226	,310**	,054	-,05	,142
12-Pre-invest. Cash Flow												1	,247	,151	,063	,141	-,046	-,02	,085
13-Perc. of 3 Years Old or Younger Prod. in Tot. Sales													1	-,1 ,335	-,024 ,816	,004 ,966	-,121 ,234	,009 ,933	,199 ,047
14-Perc. of Defects in Total Pro. Volume														1	,182	,113	-,036	-,07	,056
15-Perc. of Pro. Work. Involved in Qual. Activties															1	,175	,208	,093	,368**
16-Delivery on Time																1	,167	,133	,117
17-Perc. of Quality Control Pers. in Production Workers																	1	,444**	,072
18-Perc. of Incoming Material Quality Control Pers. in Production Workers																		1	-,029
19-Perc. of Train. Exp. in GrossTot. Wage and Salary																			1

**. Correlation is significant at the 0.01 level (2-tailed). *.Correlation is significant at the 0.05 level (2-tailed). . Correlation is significant at the 0.1 level (2-tailed).

Table 5.41: Correlation analysis between manufacturing structure, planning factors and general performance indicators (current)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1-Operation Diversity	1	,324**	,438**	,426**	,095	,112	,221*	,300**	,239**	,179	,235*	,296**	,348**	,055
2-Operation Structure		1	,580**	,645**	,205*	,222*	,072	,152	,065	,190*	,298**	,218*	,230*	,214*
3-Manufacturing Capabilities			1	,558**	,100	,283**	,121	,193*	,119	,200*	,307**	,247**	,212*	,093
4-Planning				1	,087	,281**	,142	,148	,115	,214*	,164	,171	,195*	,071
5-Customer Satisfaction					1	,285**	,365**	,317**	,280**	,300**	,403**	,275**	,113	,140
6-Employee Satisfaction						1	,292**	,291**	,273**	,378**	,394**	,240*	,274**	,144
7-Productivity							1	,318**	,410**	,297**	,147	,429**	,283**	,166
8-Technological Level								1	,387**	,287**	,263**	,476**	,427**	,186
9-Level of Meetring Unexpected Increases in Production or Order Plans									1	,601**	,326**	,394**	,382**	,064
10-Level of Meeting Adaptation to Unexpected Due Date Changes in Pro. or Order Plans										1	,340**	,292**	,288**	,071
11-Pre-invest. Cash Flow											1	,271**	,337**	,125
12-Perc. of 3 Years Old or Younger Prod. in Tot. Sales												1	,653**	,137
13-Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio													1	,216*
14-Perc. of Quality Control Pers. in Production Workers														1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.42: Correlation analysis between manufacturing structure, planning factors and performance indicators (change in the last 3 years)

Manufacturing capabilities factor is positively correlated to employee satisfaction trend, level of adaptation to unexpected due date changes in production or order plans trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend and technological level trend.

5.5.3 T-tests

It is clear from ***Table 5.43***, that companies which have rated operation diversity factor questions greater than or equal to 4 (agree and highly agree) obtained significantly better results in productivity, time to market, technological level and flexibility. On the other hand, according to ***Table 5.44*** operation diversity factor has been an effective factor for the improvement of technological level, meeting level of unexpected increases in production or order plans, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend and increase in pre-investment cash flow in the last 3 years.

Operation Diversity		N	Mean	Sig.
Productivity	>= 4,00	48	3,85	,063
	< 4,00	69	3,57	
Time to Market	>= 4,00	49	3,73	,069
	< 4,00	64	3,42	
Technological Level	>= 4,00	49	3,88	,090
	< 4,00	68	3,59	
Level of Meeting to Unexp. Incr. in Pro.or Order Plans	>= 4,00	48	3,92	,027
	< 4,00	69	3,57	
Level ofAdaptation to Unexp. Due Dates Changes in Pro or Order Plan	>= 4,00	48	3,83	,017
	< 4,00	69	3,45	

Table 5.43: Significant t-test results for operation diversity factor and current performance

Operation Diversity		N	Mean	Sig.
Technological Level Trend	>= 4,00	49	3,98	,017
	< 4,00	68	3,66	
Meeting Level of Unexp.Incr. in Pro. or Order Plans Trend	>= 4,00	48	3,83	,042
	< 4,00	69	3,58	
Pre-invest. Cash Flow Trend	>= 4,00	45	3,47	,039
	< 4,00	66	3,14	
Perc. of 3 Years Old or Younger Prod in Tot. Sales Trend	>= 4,00	47	3,89	,013
	< 4,00	61	3,46	
Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio Trend	>= 4,00	45	4,07	,001
	< 4,00	64	3,56	

Table 5.44: Significant t-test results for operation diversity factor and change of firm performance in the last 3 years.

According to ***Table 5.45*** companies which have rated operation structure factor questions greater than or equal to 4 (agree and highly agree) have significantly higher

customer and employee satisfaction, productivity, technological level, flexibility, pre-investment cash flow and shorter time to market.

Operation Structure		N	Mean	Sig.
Customer Satisfaction	>= 4,00	46	4,22	,001
	< 4,00	71	3,76	
Employee Satisfaction	>= 4,00	48	3,54	,012
	< 4,00	71	3,18	
Productivity	>= 4,00	47	3,98	,001
	< 4,00	70	3,49	
Time to Market	>= 4,00	47	3,87	,002
	< 4,00	66	3,33	
Technological Level	>= 4,00	47	3,98	,008
	< 4,00	70	3,53	
Level of Meeting Unexp. Incr.in Pro.or Order Plan:	>= 4,00	47	4,00	,002
	< 4,00	70	3,51	
Level of Adaptation to Unexpected Due Date Changes	>= 4,00	47	3,89	,003
	< 4,00	70	3,41	
Pre-invest. Cash Flow	>= 4,00	42	3,64	,012
	< 4,00	67	3,10	

Table 5.45: Significant t-test results for operation structure factor and current performance

Operation Structure		N	Mean	Sig.
Customer Satisfaction Trend	>= 4,00	44	3,91	,078
	< 4,00	72	3,68	
Level of Adaptation to Unexpected Due Date Changes Trend	>= 4,00	46	3,78	.041
	< 4,00	71	3,54	
Pre-invest. Cash Flow Trend	>= 4,00	42	3,50	,022
	< 4,00	69	3,13	
Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio Trend	>= 4,00	44	3,93	,082
	< 4,00	65	3,66	
Perc. of Defects in Total Pro. Volume Trend	>= 4,00	40	2,15	,021
	< 4,00	67	2,55	

Table 5.46: Significant t-test results for operation structure factor and change of firm performance in the last 3 years.

On the other hand, in ***Table 5.46*** operation structure factor has affected improvement of customer satisfaction, of adaptation to unexpected due dates, of pre-investment cash flow, of percentage of 3 years or younger products in the existing portfolio and decrease of percentage of defects in the last 3 years period.

Manufacturing Capabilities		N	Mean	Sig.
Customer Satisfaction	>= 4,00	89	4,10	,000
	< 4,00	28	3,43	
Employee Satisfaction	>= 4,00	91	3,52	,000
	< 4,00	28	2,71	
Productivity	>= 4,00	89	3,87	,000
	< 4,00	28	3,11	
Time to Market	>= 4,00	86	3,79	,000
	< 4,00	27	2,81	
Technological Level	>= 4,00	89	3,89	,000
	< 4,00	28	3,14	
Level of Meeting Unexp.Incr. in Pro. or Order Plans	>= 4,00	89	3,89	,002
	< 4,00	28	3,14	
Level of Adapt. to Unexp. Due Date Changes	>= 4,00	89	3,76	,008
	< 4,00	28	3,11	
Pre-invest. Cash Flow	>= 4,00	82	3,44	,035
	< 4,00	27	2,93	
Perc. of 3 Years Old orYounger Prod. in Tot. Sales	>= 4,00	81	3,47	,070
	< 4,00	28	2,96	
Perc. of Quality Expenditure inTotal Sales	>= 4,00	74	3,78	,070
	< 4,00	27	3,33	
Perc. of Pro. Work. Involved in Qual. Activities	>= 4,00	77	2,87	,010
	< 4,00	26	2,08	

Table 5.47: Significant t-test results for manufacturing capabilities factor and current performance

Manufacturing Capabilities		N	Mean	Sig.
Employee Satisfaction Trend	>= 4,00	90	3,47	,001
	< 4,00	29	2,97	
Time to Market Trend	>= 4,00	85	3,54	,083
	< 4,00	28	3,21	
Technological Level Trend	>= 4,00	88	3,89	,017
	< 4,00	29	3,52	
Pre-invest. Cash Flow Trend	>= 4,00	82	3,44	,000
	< 4,00	29	2,79	
Perc. of 3 Years Old or Young. Prod. in Tot. Sales Trend	>= 4,00	80	3,79	,007
	< 4,00	28	3,25	
Perc. of 3 Years Old or Young.Prod. in Exis. Prod. Portfolio Trend	>= 4,00	83	3,90	,002
	< 4,00	26	3,35	

Table 5.48: Significant t-test results for manufacturing capabilities factor and change of firm performance in the last 3 years.

According to ***Table 5.47,*** manufacturing capabilities factor makes a significant difference on most of the performance indicators. We can conclude that manufacturing capabilities is a very effective factor for a manufacturing company to obtain successful general performance results. On the other hand, the results in ***Table 5.48*** indicate that manufacturing capabilities factor affected significantly and positively the improvement trend in time to market, percentage of 3 years or younger products in total sales, percentage of 3 years or younger products in existing product portfolio, employee satisfaction, technological level, and pre-investment cash flow in the last 3 years.

5.6 Planning

5.6.1 Factor Analysis and Reliability Analysis

Planning questions in the survey built one group through factor analysis as can be seen in ***Table 5.49***.

Table 5.50 reports on the α value of the factor obtained. It is consistent and reliable, because α is greater than 0.70.

Questions		Factor 1
Planning	We have a well established planning process which determines short and long termed objectives and audits all process	,846
	We use our benchmarking and self-assessment results in developing our plans	,775
	When developing our plans, policies and objectives we take into consideration the customers' requests, suppliers' resources, and the requirements of society at large and other stakeholders'	,749
	We have a clearly expressed strategy document approved by top managers encompassing all our manufacturing structure	,747
	We have a well known and supported mission statement all over the company	,681

.

Total Variance Explained %57,957

Table 5.49: Factor structure of planning

Factor	Number of Questions	α Value
Planning	5	0,805

Table 5.50: Results of reliability analysis for planning factor

5.6.2 Correlation Analysis

According to ***Table 5.41***, planning factor makes a significant difference on customer satisfaction, employee satisfaction, productivity, time to market, technological level, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans, pre-investment cash flow, delivery on time, percentage of training expenditure in gross total wage and salary, percentage of production workers involved in quality activities and percentage of defects in total production volume.

On the other hand, planning factor has positive correlation with employee satisfaction trend, level of adaptation to unexpected due date changes in production or order plans trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend and percentage of 3 years or younger products in existing product portfolio trend (***Table 5.42***)

5.6.3 T-tests

The t-test results indicate that planning factor makes a significant positive difference on employee satisfaction, productivity, technological level, percentage of 3 years or younger products in total sales, percentage of 3 years or younger products in existing product portfolio, technological level and average total stocks in annual sales as displayed in ***Table 5.51***. On the other hand, in ***Table 5.52*** planning factor significantly affects improvement of the many performance indicators in the last 3 years. Therefore, we can say that planning has been an important factor for a manufacturing company to obtain improved performance results in the last 3 years.

Planning		N	Mean	Sig.
Employee Satisfaction	>= 4,00	79	3,46	,008
	< 4,00	40	3,13	
Productivity	>= 4,00	77	3,90	,039
	< 4,00	40	3,65	
Technological Level	>= 4,00	77	3,88	,068
	< 4,00	40	3,63	
Perc. of 3 Years Old or Younger Prod. in Tot. Sales	>= 4,00	70	3,81	,010
	< 4,00	38	3,34	
Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio	>= 4,00	73	3,93	,006
	< 4,00	36	3,44	
Perc. of Ave.Tot. Stocks in Annual Sales	>= 4,00	67	2,64	,078
	< 4,00	34	2,91	

Table 5.51: Significant t-test results for planning factor and current performance

Planning		N	Mean	Sig.
Customer Satisfaction Trend	>= 4,00	77	4,08	006
	< 4,00	40	3,68	
Emplovee Satisfaction Trend	>= 4,00	79	3,54	000
	< 4,00	40	2,90	
Productivity Trend	>= 4,00	77	3,91	000
	< 4,00	40	3,25	
Time to Market Trend	>= 4,00	73	3,73	007
	< 4,00	40	3,25	
Technological Level Trend	>= 4,00	77	3,90	006
	< 4,00	40	3,35	
Level of Meeting Unexpected Increases in Production or Order Plans Tr	>= 4,00	77	3,90	006
	< 4,00	40	3,35	
Level of Adaptation to Unexp. Due Date Changes Trend	>= 4,00	77	3,81	001
	< 4,00	40	3,23	
Pre-invest. Cash Flow Trend	>= 4,00	70	3,50	016
	< 4,00	39	2,97	
Perc. of Pro. Work. Involved in Qual Activities Trend	>= 4,00	67	2,88	032
	< 4,00	36	2,28	
On Time Delivery Trend	>= 4,00	69	4,06	061
	< 4,00	38	3,63	

Table 5.52: Significant t-test results for planning factor and change of firm performance in the last 3 years.

5.7 Manufacturing Strategy

5.7.1 Factor Analysis and Reliability Analysis

In order to describe the relationship between manufacturing objectives and general firm performance indicators factor analysis procedure is performed and the questions

related to manufacturing objectives are reduced into four groups that can be seen in ***Table 5.53.***

Reliability analysis results are displayed in ***Table 5.54.*** They are consistent and reliable because α values are greater than 0.70.

Delivery Reliability	Increasing the delivery speed of finished goods	,820			
	Reduction of manufacturing time	,786			
	Increasing the ability of keeping delivery promises	,773			
	Reduction of response time	,745			
	Reducing the difficulties about distribution and delivery	,720			
	Increasing just in time delivery	,688			
Manufacturing Flexibility	Increasing the ability of using existing equipment and employees in a flexible way for the production of non-standard products		,863		
	Increasing the ability of producing non-standard products according to different customer orders		,787		
	Reduction of the frequency of rejecting non-standard product orders		,713		
	Increasing the ability of producing non-standard products according to different customer orders		,689		
	Increasing the flexibility of changing task priorities according to customer orders		,639		
	Changing the assignment of equipments according to priority of tasks		,553		
	Improvement of the flexibility in manufacturing systems		,548		
Manufacturing Cost	Reducing transaction costs			,763	
	Reduction of waste, scrap, and rework costs			,723	
	Reducing personnel cost			,627	
	Reducing input costs			,617	
	Reduction of cost in external and internal logistic processes			,617	
	Reduction of total cost in manufacturing process			,603	
	Improving personnel productivity			,592	
Manufacturing Quality	Improving product and service quality relative to our competitors				,786
	Improving product and service quality as perceived by customers				,784
	Reducing product return rates from customers				,721
	Reducing customer complaints				,684
	Reducing the number of defects				,536

Total Variance Explained % 63,406

Table 5.53: Factor structure of manufacturing performance objective

Factors	Number of Questions	α Value
Delivery Reliability	6	0,913
Manufacturing Flexibility	7	0,887
Manufacturing Cost	7	0.832
Manufacturing Quality	5	0,823

Table 5.54: Results of reliability analysis for manufacturing performance objectives factors

5.7.2 Correlation Analysis

Table 5.55 indicates correlations between manufacturing strategy and current performance indicators. Manufacturing quality is an effective factor on most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, productivity, technological level, level of adaptation to unexpected due date changes in production or order plans and pre-investment cash flow.

Manufacturing cost factor is an effective factor on most of the performance indicators. It makes a significant difference on employee satisfaction and pre-investment cash flow.

Manufacturing flexibility factor is positively correlated to employee satisfaction, time to market, productivity, pre-investment cash flow, percentage of production workers involved in quality activities, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans.

Delivery reliability and speed factor is positively correlated to customer satisfaction, employee satisfaction, pre-investment cash flow, percentage of production workers involved in quality activities, level of meeting unexpected increases in order or production plan, level of adaptation to unexpected due date changes in production or order plans .

The correlations about change of firm performance in the last 3 years are displayed in ***Table 5.56***. Manufacturing quality factor is positively correlated to the improvement of employee satisfaction trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend.

Manufacturing cost factor is an effective factor on improvement of most of the performance indicators. It is positively correlated to customer satisfaction trend, productivity trend, technological level trend, level of adaptation to unexpected due date changes in production or order plans trend, level of meeting unexpected increases in order or production plan trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend, pre-investment cash flow trend, delivery on time trend and percentage of defects in total production volume trend.

Manufacturing flexibility factor is an important factor for improvement of most of the performance indicators. It is positively correlated to employee satisfaction trend, level of adaptation to unexpected due date changes in production or order plans trend, level of meeting unexpected increases in order or production plan trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend and pre-investment cash flow trend, percentage of production workers involved in quality activities trend.

Delivery reliability and speed factor is positively correlated to pre-investment cash flow trend, level of meeting unexpected increases in order or production plan trend, level of adaptation to unexpected due date changes in production or order plans trend.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1-Manufacturing Quality Objective	1	,524**	,411**	,519**	,336**	,263**	,277**	,149	,228*	,271**	,112	,201*	,165
2-Manufacturing Cost Objective		1	,540**	,547**	,120	,160	,114	,003	,129	,178	,084	,278**	,098
3-Manufacturing Flexibility Objective			1	,612**	,138	,237**	,204*	,283**	,052	,334**	,346**	,196*	,183
4-Delivery Reliability and Speed Objective				1	,168	,177	,151	,142	,036	,292**	,200*	,206*	,186
5-Customer Satisfaction					1	,481**	,498**	,428**	,320**	,400**	,476**	,367**	,096
6-Employee Satisfaction						1	,367**	,322**	,355**	,309**	,379**	,389**	,254*
7-Productivity							1	,523**	,557**	,501**	,475**	,411**	,142
8-Time to Market								1	,485**	,404**	,427**	,354**	,195
9-Technological Level									1	,458**	,383**	,327**	,125
10- Level of Meeting Unexp.Incr. in Pro. or Order Plans										1	,764**	,323**	,212*
11-Level of Adapt. to Unexp. Due Dates in Pro. or Order Plans											1	,408**	,226*
12-Pre-invest. Cash Flow												1	,063
13-Perc. of Pro. Work. Involved in Qual. Activities													1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.55: Correlation analysis between manufacturing strategy factors and performance indicators (current)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1-Manufacturing Quality Objective	1	,524**	,411**	,519**	,125	,170	,106	,025	,068	,084	,259**	,169	,104	-,035	,078	,026
2-Manufacturing Cost Objective		1	,540**	,547**	,156	,139	,198*	,210*	,337**	,238**	,294**	,298**	,288**	-,305**	,141	,195*
3-Manufacturing Flexibility Objective			1	,612**	-,017	,211*	,083	,032	,273**	,313**	,194*	,169	,215*	-,088	,200*	,114
4-Delivery Reliability and Speed Objective				1	,069	,142	-,1	-,031	,217*	,235*	,214*	,092	,085	-,081	,0	,148
5-Customer Satisfaction					1	,285**	,365**	,317**	,280**	,300**	,403**	,275**	,113	-,176	,256*	,239*
6-Employee Satisfaction						1	,292**	,291**	,273**	,378**	,394**	,240*	,274**	-,172	,226*	,261**
7-Productivity							1	,318**	,410**	,297**	,147	,429**	,283**	-,220*	,319**	,189
8-Technological Level								1	,387**	,287**	,263**	,476**	,427**	-,289**	,266**	,158
9-Level of Meeting Unexp.Incr. in Pro. or Order Plans									1	,601**	,326**	,394**	,382**	-,299**	,349**	,490**
10 Level of Adaptation to Unexp. Due Date Changes										1	,340**	,292**	,288**	-,224*	,187	,309**
11-Pre-invest. Cash Flow											1	,271**	,337**	-,163	,059	,355**
12-Perc. of 3 Years Old or Younger Prod. in Tot. Sales												1	,653**	-,102	,298**	,063
13-Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio													1	-,098	,272**	,080
14-Perc. of Defects in Total Pro. Volume														1	,0	-,2*
15-Perc. of Pro. Work. Involved inQual. Activities															1	,060
16-Delivery on Time																1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.56: Correlation analysis between manufacturing strategy factors and performance indicators (change in the last 3 years)

5.7.3 T-tests

After correlation analysis is completed, t-tests are performed to describe the relation between the individual manufacturing strategy factors and firm performance indicators in a more detailed way.

Manufacturing Quality		N	Mean	Sig.
Customer Satisfaction	>= 5,00	70	4,04	,060
	< 5,00	47	3,79	
Employee Satisfaction	>= 5,00	72	3,43	,072
	< 5,00	47	3,17	
Perc. of Pro. Work. Involved in Qual. Activities	>= 5,00	66	2,88	,035
	< 5,00	37	2,30	

Table 5.57: Significant t-test results for manufacturing quality factor and current performance

Manufacturing Quality		N	Mean	Sig.
Customer Satisfaction Trend	>= 5,00	69	3,86	,091
	< 5,00	47	3,64	
Employee Satisfaction Trend	>= 5,00	72	3,46	,021
	< 5,00	47	3,17	
Level of Meeting Unexp. Incr. in Pro. or Order Plans Trend	>= 5,00	71	3,82	,008
	< 5,00	46	3,48	
Level of Adaptation to Unexp. Due DateChanges Trend	>= 5,00	71	3,72	,089
	< 5,00	46	3,50	
Pre-invest. Cash Flow Trend	>= 5,00	68	3,41	,023
	< 5,00	43	3,05	
Perc. of 3 Years Old or Younger Prod. in Tot. Sales Trend	>= 5,00	64	3,88	,002
	< 5,00	44	3,32	
Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio Trend	>= 5,00	67	3,88	,093
	< 5,00	42	3,60	
Perc. of Defects in Total Pro. Volume Trend	>= 5,00	67	2,28	,089
	< 5,00	40	2,60	
Perc. of Pro. Work. Involved in Qual. Activities Trend	>= 5,00	63	3,51	,078
	< 5,00	38	3,05	
Perc. Train. Exp. in GrossTot. Wage and Salary Trend	>= 5,00	64	3,23	,041
	< 5,00	39	2,90	

Table 5.58: Significant t-test results for manufacturing quality factor and change of firm performance in the last 3 years.

First, the results for manufacturing quality factor are reported as in Table 5.54 and Table 5.55. It is observed from ***Table 5.57*** that manufacturing quality objective makes a significant difference on customer satisfaction and employee satisfaction ($p<0.1$) and on percentage of production workers involved in quality activities ($p<0,05$).

Manufacturing quality factor is especially effective on improvement of a large number of firm performance indicators as is shown in ***Table 5.58***. Hence, manufacturing quality factor appears to have been an important factor for a manufacturing company to improve performance in the last 3 years.

Manufacturing Cost		N	Mean	Sig.
Perc. of R&D Expenditure in Total Sales	>= 5,00	37	2,30	,026
	< 5,00	58	2,90	
Perc. of Incoming Material Quality Control Pers. in Production Workers	>= 5,00	42	4,05	,051
	< 5,00	64	3,58	

Table 5.59: Significant t-test results for manufacturing cost factor and current performance

Manufacturing Cost		N	Mean	Sig.
Level of Meeting Unexp.Incr. in Pro. or Order Plans	>= 5,00	45	3,82	,057
	< 5,00	72	3,60	
Level of Adapting to Unexp. Due Dates in Order or Pro. Plans	>= 5,00	45	3,78	,066
	< 5,00	72	3,54	
Perc. of 3 Years Old or Younger Prod. in Existing Prod. Portfolio	>= 5,00	42	3,95	,051
	< 5,00	67	3,66	
Perc. of Defects in Total Pro. Volume	>= 5,00	42	2,14	,015
	< 5,00	65	2,57	
Delivery on Time	>= 5,00	39	3,82	,058
	< 5,00	65	3,51	

Table 5.60: Significant t-test results for manufacturing cost factor and change of firm performance in the last 3 years.

Manufacturing cost factor imparts a significant difference on percentage of R&D expenditure in total sales ($p<0.05$) and on percentage of incoming material quality control personnel in production workers ($p<0.1$) (***Table 5.59)***. Companies that ranked manufacturing cost factor as 5 (very important) have higher percentage of R&D expenditure in total sales and lower percentage of incoming material quality control personnel in production workers. On the other hand, manufacturing cost factor makes a significant difference on the improvement trend of flexibility, percentage of defects, delivery on time and percentage of 3 years old or younger products in total sales in the last 3 years (***Table 5.60).***

Manufacturing Flexibility		N	Mean	Sig.
Employee Satisfaction	>= 4,00	83	3,43	,033
	< 4,00	36	3,14	
Level of Meeting Unexp. Incr. in Pro. or Order Plans	>= 4,00	81	3,78	,039
	< 4,00	36	3,47	
Level of Adaptation to Unexp. Due Dates Changes in Pro. or Order Plans	>= 4,00	81	3,77	,005
	< 4,00	36	3,33	
Pre-invest. Cash Flow	>= 4,00	76	3,38	,037
	< 4,00	35	3,03	
Perc. of 3 Years Old or Younger Prod. in Tot. Sales	>= 4,00	73	3,79	,027
	< 4,00	35	3,34	
Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio	>= 4,00	76	3,91	,015
	< 4,00	33	3,45	
Perc. of Pro. Work. Involved in Qual. Activities	>= 4,00	71	3,52	,002
	< 4,00	30	2,90	

Table 5.61: Significant t-test results for delivery flexibility factor and current performance

Manufacturing Flexibility		N	Mean	Sig
Employee Satisfaction Trend	>= 4,00	83	3,45	011
	< 4,00	36	3,06	
Productivity Trend	>= 4,00	81	3,78	065
	< 4,00	36	3,47	
Time to Market Trend	>= 4,00	77	3,68	043
	< 4,00	36	3,31	
Level of Meeting Unexp. Incr. in Pro. or Order Plans Tr.	>= 4,00	81	3,83	057
	< 4,00	36	3,44	
Level of Adaptation to Unexp. Due Date Changes Tr.	>= 4,00	81	3,74	016
	< 4,00	36	3,31	
Perc. of Pro. Work. Involved in Qual Activities Tr.	>= 4,00	73	2,92	004
	< 4,00	30	2,07	

Table 5.62: Significant t-test results for manufacturing flexibility factor and change of firm performance in the last 3 years.

As can be observed in ***Table 5.61,*** manufacturing flexibility factor has a significant positive affect on employee satisfaction, flexibility, pre-investment cash flow, percentage of 3 years old or younger products in total sales, percentage of 3 years old or younger products in existing product portfolio, percentage of production workers involved in quality activities. On the other hand, it has significantly made an improvement on employee satisfaction, productivity, time to new product introduction, flexibility and percentage of production workers involved in quality activities in the last 3 years.

Delivery Reliability .		N	Mean	Sig.
Employee Satisfaction	>= 5,00	61	3,49	,024
	< 5,00	57	3,18	
Level of Meeting Unexp.Incr. in Pro. or Order Plans	>= 5,00	61	3,84	,081
	< 5,00	55	3,55	
Level of Adapt. to Unexp. Due Date Changes	>= 5,00	61	3,74	,073
	< 5,00	55	3,44	
Pre-invest. Cash Flow	>= 5,00	58	3,52	,032
	< 5,00	50	3,06	
Perc. of Pro. Work. Involved in Qual. Activities	>= 5,00	58	2,86	,082
	< 5,00	44	2,39	

Table 5.63: Significant t-test results for delivery reliability factor and current performance

Delivery Reliability		N	Mean	Sig.
Employee Satisfaction Trend	>= 5,00	61	3,48	,027
	< 5,00	57	3,19	
Pre-invest. Cash Flow Trend	>= 5,00	59	3,42	,041
	< 5,00	51	3,10	
Perc. of Defects in Total Pro. Volume Trend	>= 5,00	57	2,25	,073
	< 5,00	49	2,57	

Table 5.64: Significant t-test results for delivery reliability factor and change of firm performance in the last 3 years.

Delivery reliability factor makes a significant positive difference on employee satisfaction, flexibility, pre-investment cash flow, percentage of production workers involved in quality activities. On the other hand, delivery reliability factor has significantly affected the improvement trend of employee satisfaction trend, pre-investment cash flow trend and percentage of defects positively in last 3 years trend.

5.8 Supplier Relations

5.8.1 Factor Analysis and Reliability Analysis

In this section, we will describe the relationship between supplier relations factors and firm performance indicators. First, factor analysis procedure is applied and the extracted factor structure of human resources can be seen in ***Table 5.65***, where the numbers represent the factor loadings. All of the supplier relations questions in the survey are placed together into principal component analysis and reduced into 3 factors.

Table 5.66 shows the results of the reliability analyses of the groups obtained. They are consistent and reliable since α values are greater than 0.70

		Factors		
Questions		1	2	3
Supplier Information Accumulation	We make use of our suppliers' knowledge stock for developing our production and service processes	,916		
	We make use of our suppliers' knowledge stock for developing our product and service designs.	,888		
	We aspire to have more extensive and efficient supplier development programs	,592		
Information Sharing	Our main suppliers share their production planning and control information with us		,892	
	We share our production planning and control information with our main suppliers		,844	
	We exercise quality audit to our main suppliers regularly		,599	
Supplier Quality Management	Our suppliers have a quality assurance system in place			,744
	We request just in time delivery from our main suppliers			,671
	We cooperate with our main suppliers in the form of strategic collaboration			,611
	We require our main suppliers to have "environmental protection certificate"			,593

Total Variance Explained %69,732

Table 5.65: Factor structure of supplier relations

Factors	Number of Questions	α Value
Supplier Knowledge Accumulation	3	0,835
Information Sharing	3	0.794
Supplier Quality Management	4	0,711

Table 5.66: Results of reliability analysis for supplier relations factors

5.8.2 Correlation Analysis

After obtaining the factors, correlation analysis is performed to discover the relationships between supplier relations factors and performance indicators (***Table 5.67*** and ***Table 5.68***).

Table 5.67 supplier knowledge accumulation factor makes a significant difference on customer satisfaction, employee satisfaction, productivity, technological level, level of adaptation to unexpected due date changes in production or order plans, level of meeting unexpected increases in order or production plan, percentage of average total stocks in annual sales, percentage of R&D expenditure in total sales

The information sharing factor is a very important factor because it is effective on most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, productivity, technological level, average time of production process change, time to market, level of adaptation to unexpected due date changes in production or order plans, level of meeting unexpected increases in order or production plan, percentage of 3 years or younger products in total sales, percentage of 3 years or younger products in existing product portfolio, pre-investment cash flow, percentage of production workers involved in quality activities, percentage of delivery on time, percentage of defects in total production volume, percentage of training expenditure in gross total wage and salary.

Supplier quality management factor is a very important factor because it is effective on most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, productivity, technological level, average time of production

process change, time to market, level of adaptation to unexpected due date changes in production or order plans, level of meeting unexpected increases in order or production plan, pre-investment cash flow, percentage of production workers involved in quality activities, percentage of defects in total production volume, percentage of training expenditure in gross total personnel wage and salary.

First**,** ***Table 5.68*** displays that supplier knowledge accumulation factor makes a significant difference on percentage of R&D expenditure in total sales trend.

Second, information sharing factor is a very important factor because it is effective on most of the performance indicators trend. It is positively correlated to customer satisfaction trend, technological level trend, level of adaptation to unexpected due date changes in production or order plans trend, level of meeting unexpected increases in order or production plan trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend, pre-investment cash flow trend, percentage of incoming material quality control workers in production workers trend, percentage of training expenditure in gross total wage and salary trend.

Third, supplier quality management factor is positively correlated to customer satisfaction trend, employee satisfaction trend, technological level trend, level of adaptation to unexpected due date changes in production or order plans trend, pre-investment cash flow trend, percentage of defects in total production volume trend.

	1	2	3	4	5	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1-Supplier Knowledge Accumulation	1	,460**	,469**	,178	,292**	,152	,206*	,072	,154	,156	,190*	,138	-,017	-,082	,120	,218*	,252*	,063	,044	,150
2-Information Sharing		1	,602**	,160	,264**	,167	,156	,211*	,192*	,241**	,353**	,302**	,217*	,203*	,277**	-,017	,215*	,247*	,181	,289**
3-Supplier Quality Mgmt			1	,252**	,368**	,179	,293**	,189*	,198*	,188*	,287**	,410**	,153	,053	,220*	,073	,155	,214*	,059	,163
4-Customer Satisfaction				1	,481**	,129	,498**	,428**	,320**	,400**	,476**	,367**	,106	,066	,229*	,176	,094	,096	,114	,088
5-Employee Satisfaction					1	,351**	,367**	,322**	,355**	,309**	,379**	,389**	,017	,002	,232*	,097	-,021	,254*	,135	,197*
6-Ave. Time of Production Process Change						1	,259**	,037	,147	,060	,116	,276**	-,078	-,015	-,03	,092	-,101	,077	-,087	-,04
7-Productivity							1	,523**	,557**	,501**	,475**	,411**	,126	,105	,180	,257**	,127	,142	,124	,001
8-Time to Market								1	,485**	,404**	,427**	,354**	,326**	,234*	,101	,133	,133	,195	,122	-,01
9-Technological Level									1	,458**	,383**	,327**	,008	,052	,181	,117	,065	,125	,215*	,00
10- Level of Meeting Unexp.Incr. in Pro. or Order Plans										1	,764**	,323**	,032	,084	,056	,059	,100	,212*	,390**	,027
11-Level of Adaptation to Unexp. Due Date Changes in Pro. Order Plans											1	,408**	,108	,073	,098	,088	,197	,226*	,310**	,142
12-Pre-invest. Cash Flow												1	,247*	,238*	,151	,068	,104	,063	,141	,085
13-Perc. of 3 Years Old or Younger Prod. in Tot. Sales													1	,828**	-,10	-,073	,205	-,024	,004	,199*
14-Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio														1	,065	-,081	,156	-,008	-,068	,148
15-Perc. of Defects in Total Pro. Volume															1	,037	,052	,182	,113	,056
16-Perc. of Ave.Tot. Stocks in Annual Sales																1	,180	,108	,199*	,183
17-Perc. of R&D Expenditure in Total Sales																	1	,072	,143	,273**
18-Perc. of Pro. Work Involved in Qual. Activties																		1	,175	,368**
19-Delivery on Time																			1	,117
20-Perc. Train. Exp. in GrossTot. Wage and Salary																				1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.67: Correlation analysis between supplier relations factors and performance indicators (current)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1-Supplier Knowledge Accumulation	1	,460**	,469**	,010	,145	-,050	,052	,102	,077	-,037	,038	-,073	,178	-,024	,084
2-Information Sharing		1	,602**	,266**	,077	,204*	,205*	,206*	,202*	,162	,214*	-,126	,086	,189	,206*
3-Supplier Quality Mgmt			1	,270**	,241**	,190*	,106	,249**	,294**	,103	,126	-,199*	,097	,023	,078
4-Customer Satisfaction				1	,285**	,317**	,280**	,300**	,403**	,275**	,113	-,176	,027	,140	,268**
5-Employee Satisfaction					1	,291**	,273**	,378**	,394**	,240*	,274**	-,172	,035	,144	,264**
6-Technological Level						1	,387**	,287**	,263**	,476**	,427**	-,289**	,221*	,186	,115
7- Level of Meeting Unexp.Incr. in Pro. or Order Plans							1	,601**	,326**	,394**	,382**	-,299**	,218*	,064	,236*
8-Level of Adaptation to Unexp. Due Date Changes in Pro. Order Plans								1	,340**	,292**	,288**	-,224*	,133	,071	,117
9-Pre-invest. Cash Flow									1	,271**	,337**	-,163	,073	,125	,282**
10-Perc. of 3 Years Old or Younger Prod. in Tot. Sales										1	,653** ,000	-,102 ,317	,072 ,506	,137 ,179	,259* ,011
11-Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio											1	-,098	,132	,216*	,260*
12-Perc. of Defects in Total Pro. Volume												1	-,161	,190	,042
13-Perc. of R&D Expenditure in Total Sales													1	,190	,173
14-Perc. of Incoming Material Quality Control Pers. in Pro. Workers														1	,326**
15-Perc. Train. Exp. in GrossTot. Wage and Salary															1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

. Correlation is significant at the 0.1 level (2-tailed).

Table 5.68: Correlation analysis between supplier relations factors and performance indicators (change in the last 3 years)

5.8.3 T-tests

Correlation analyses are followed by t-tests, which are applied on factors obtained from the factor analysis.

Supplier Knowledge Accumulation		N	Mean	Sig.
Employee Satisfaction	>= 4,00	76	3,50	,001
	< 4,00	43	3,02	
Ave. Time of Production Process Change	>= 4,00	73	3,36	,048
	< 4,00	41	3,07	
Perc. of Ave. Total Stocks in Annual Sales	>= 4,00	63	3,27	,000
	< 4,00	40	2,38	
Perc. of Ave.Total incoming Mat. Stocks in Annual Sales	>= 4,00	62	2,69	,007
	< 4,00	40	2,00	

Table 5.69: Significant t-test results for supplier knowledge accumulation factor and current performance

Companies that rate supplier knowledge accumulation questions greater than or equal to 4 (agree) have significantly better results in employee satisfaction, percentage of average total stocks in annual sales, percentage of average incoming material stocks in annual sales and average time of production process change.

Information Sharing		N	Mean	Sig.
Employee Satisfaction	>= 4,00	59	3,49	,021
	< 4,00	60	3,17	
Ave. Time of Production Process Change	>= 4,00	58	3,38	,075
	< 4,00	56	3,13	
Productivity	>= 4,00	58	3,84	,036
	< 4,00	59	3,53	
Time to Market	>= 4,00	56	3,79	,007
	< 4,00	57	3,33	
Technological Level	>= 4,00	58	3,86	,072
	< 4,00	59	3,56	
Level of Meeting Unexp.Incr. in Pro. or Order Plans	>= 4,00	58	3,84	,107
	< 4,00	59	3,58	
Level of Adaptation to Unexp. Due Dates in Pro. Order Plans	>= 4,00	58	3,86	,002
	< 4,00	59	3,36	
Pre-invest. Cash Flow	>= 4,00	54	3,57	,013
	< 4,00	55	3,05	
Perc. of 3 Years Old or Younger Prod. in Tot. Sales	>= 4,00	50	3,56	,095
	< 4,00	59	3,15	
Perc. of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio	>= 4,00	52	3,62	,065
	< 4,00	57	3,26	
Perc. of Defects in Total Pro. Volume	>= 4,00	52	3,67	,065
	< 4,00	56	3,21	
Perc. of Pro. Work Involved in Qual. Activities	>= 4,00	51	2,96	,032
	< 4,00	52	2,38	

Table 5.70: Significant t-test results for information sharing factor and current performance

Information Sharing		N	Mean	Sig.
Level of Meeting Unexp. Incr. in Pro. or Order Plans Tr.	>= 4,00	58	3,81	,040
	< 4,00	59	3,56	
Level of Adaptation to Unexp. Due Dates Changes in Pro. or Order Plans Trend	>= 4,00	58	3,76	,045
	< 4,00	59	3,51	
Perc. of Incoming Mat. Qual. Con. Pers. in Pro. Work. Trend	>= 4,00	53	3,23	,026
	< 4,00	51	2,92	

Table 5.71: Significant t-test results for information sharing factor and change of firm performance in the last 3 years.

As it shown in ***Table 5.70***, information sharing factor makes a significant difference in most of the firm performance indicators. We can conclude that information sharing is a very important Business Excellence component for firm performance. In addition to this, information sharing has made a significant improvement on flexibility, on percentage of incoming material quality control personnel in production workers and on percentage of training expenditure in the last 3 years (***Table 5.71***).

Supplier Quality Management		N	Mean	Sig.
Customer Satisfaction	>= 4,00	52	4,21	,000
	< 4,00	65	3,72	
Employee Satisfaction	>= 4,00	53	3,58	,001
	< 4,00	66	3,12	
Productivity	>= 4,00	52	3,92	,004
	< 4,00	65	3,49	
Technological Level	>= 4,00	52	3,88	,062
	< 4,00	65	3,57	
Level of Meeting Unexp.Incr. in Pro. or Order Plans	>= 4,00	52	3,88	,049
	< 4,00	65	3,57	
Level of Adapt. to Unexp. Due Date: Changes	>= 4,00	52	3,83	,015
	< 4,00	65	3,43	
Pre-invest. Cash Flow	>= 4,00	49	3,67	,002
	< 4,00	60	3,02	
Perc. of Defects in Tot.Pro. Volume	>= 4,00	47	3,74	,028
	< 4,00	61	3,20	

Table 5.72: Significant t-test results for supplier quality management factor and current performance

Supplier Quality Management		N	Mean	Sig.
Customer Satisfaction Trend	>= 4,00	52	3,96	,072
	< 4,00	64	3,61	,093
Employee Satisfaction Trend	>= 4,00	54	3,54	,090
	< 4,00	65	3,18	,085
Technological Level Trend		53	3,92	,100
	< 4,00	64	3,69	,089
Level of Adap. to Unexp Due Date Changes	>= 4,00	53	3,79	,073
	< 4,00	64	3,50	,094
Pre-invest. Cash Flow Trend	>= 4,00	51	3,47	,110
	< 4,00	60	3,10	,108
Perc. of 3 Years Old or Younger. Prod. in Tot.Sales Tr	>= 4,00	47	3,79	,114
	< 4,00	61	3,54	,129

Table 5.73: Significant t-test results for supplier quality management factor and change of firm performance in the last 3 years.

In ***Table 5.72***, t-test results of supplier quality management factor are displayed. This factor makes a significant difference on many of the firm performance indicators. In addition to this, supplier quality management has made a significant affect on improvement of customer satisfaction, employee satisfaction, technological level, level of adapting to unexpected due date changes in production or order plans, pre-investment cash flow and percentage of 3 years old and younger products in the last 3 years as it is displayed in ***Table 5.73***.

5.9 Customer Focus

The relationship between customer focus and general firm performance indicators is described in this section.

5.9.1 Factor Analysis and Reliability Analysis

Factor analysis procedure is performed and the factor structure of customer focus questions are summarized in one group which is displayed in ***Table 5.74*** together with the factor loadings.

Reliability analyses are applied after factor analysis, which can be seen in ***Table 5.75.*** It is consistent and reliable because α value is greater than 0.70.

Questions		Factor 1
Customer Focus	We have an efficient problem solving process for customer complaints	,798
	We believe that our relations with customers will strengthen in due time.	,764
	We measure customer satisfaction regularly and systematically	,760
	We make use of the complaints to initiate process improvements	,724
	We consider customer expectations, ideas, and suggestions during our new product and service design processes	,722
	Customer requirements are communicated throughout the organization and every employee is made to understand them	,719
	We know our customers' current and future requirements	,556

Total Variance Explained %52,421

Table 5.74: Factor structure of customer focus

Factor	**Number of Questions**	**α Value**
Customer Focus	7	0,805

Table 5.75: Results of reliability analysis for customer focus factor

5.9.2 Correlation Analysis

Correlations between leadership and customer focus factors and firm performance indicators are shown in ***Table 5.76*** and ***Table 5.77***. Customer focus factor makes a significant difference on most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, technological level, productivity, level of adaptation to unexpected due date changes in production or order plans, level of meeting unexpected increases in order or production plan, pre-investment cash flow, percentage of training expenditure in gross total wage and salary and delivery on time

On the other hand, customer focus factor makes a significant difference on employee satisfaction trend, level of adaptation to unexpected due date changes in production or order plans trend, level of meeting unexpected increases in order or production plan trend, pre-investment cash flow trend, percentage of defects in total production volume trend.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1-Customer Focus	1	,539**	,259**	,451**	,132	,205*	,099	,187*	,267**	,335**	,343**	,131	,161	,186	,173
2-Leadership		1	,260**	,551**	,241*	,306**	,228*	,338**	,356**	,372**	,393**	,177	,423**	,137	,268**
3-Customer Satisfaction			1	,481**	,129	,498**	,428**	,320**	,400**	,476**	,367**	,229*	,096	,114	,088
4-Employee Satisfaction				1	,351**	,367**	,322**	,355**	,309**	,379**	,389**	,232*	,254*	,135	,197*
5-Ave. Time of Production Process Change					1	,259**	,037	,147	,060	,116	,276**	-,03	,077	-,087	-,036
6-Productivity						1	,523**	,557**	,501**	,475**	,411**	,180	,142	,124	,001
7-Time to Market							1	,485**	,404**	,427**	,354**	,101	,195	,122	-,006
8-Technological Level								1	,458**	,383**	,327**	,181	,125	,215*	-,001
9- Level of Meeting Unexp.Incr. in Pro. or Order Plans									1	,764**	,323**	,056	,212*	,390**	,027
10-Level of Adaptation to Unexp. Due Date Changes in Pro. Order Plans										1	,408**	,098	,226*	,310**	,142
11-Pre-invest. Cash Flow											1	,151	,063	,141	,085
12-Perc. of Defects in Total Pro. Volume												1	,182	,113	,056
13-Perc. of Pro. Work Involved in Quality Activities													1	,175	,368**
14-Delivery on Time														1	,117
15-Train. Exp. in GrossTot. Wage and Salary															1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).
Correlation is significant at the 0.1 level (2-tailed).

Table 5.76: Correlation analysis between customer focus, leadership factors and performance indicators (current)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1-Customer Focus	1	,539**	,098	,228*	,070	,087	,237**	,256**	,271**	,142	,109	-,197*	,119	,156
2-Leadership		1	,247**	,440**	,163	,230*	,181	,251**	,428**	,166	,183	-,070	,270**	,285**
3-Customer Satisfaction			1	,285**	,414**	,317**	,280**	,300**	,403**	,275**	,113	-,176	,256*	,268**
4-Employee Satisfaction				1	,337**	,291**	,273**	,378**	,394**	,240*	,274**	-,172	,226*	,264**
5-Time to Market					,321**	,318**	,410**	,297**	,147	,429**	,283**	-,220*	,319**	,173
6-Technological Level					1	,337**	,370**	,350**	,286**	,364**	,211*	-,150	,155	,238*
7- Level of Meeting Unexp.Incr. in Pro. or Order Plans						1	,4**	,287**	,263**	,476**	,427**	-,289**	,266**	,115
8-Level of Adaptation to Unexp. Due Date Changes in Pro. or Order Plans							1	,601**	,326**	,394**	,382**	-,299**	,349**	,236*
9--Pre-investment Cash Flow								1	,340**	,292**	,288**	-,224*	,187	,117
10-Perc. of 3 Years Old or Younger Prod. in Tot. Sales									1	,271**	,337**	-,163	,059	,282**
11-Perc. of 3 Years Old or Younger Prod. in Existing Prod. Portfolio										1	,653**	-,102	,298**	,12*
12-Perc. of Defects in Total Pro. Volume											1	-,098	,272**	,260*
13-Delivery on Time												1	-,049	,042
14-Perc. of Train. Exp. in GrossTot. Wage and Salary													1	,453**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

.Correlation is significant at the 0.1 level (2-tailed).

Table 5.77: Correlation analysis between customer focus, leadership factors and performance indicators (change in the last 3 years)

5.9.3 T-tests

Customer Focus		N	Mean	Sig.
Customer Satisfaction	>= 4,00	87	4,03	,016
	< 4,00	30	3,67	
Employee Satisfaction	>= 4,00	89	3,51	,000
	< 4,00	30	2,80	
Ave. Time of Pro. Process Change	>= 4,00	84	3,33	,038
	< 4,00	30	3,03	
Technological Level	>= 4,00	87	3,79	,090
	< 4,00	30	3,47	
Level of Meeting Unexp. Incr. in Pro. or Order Plans	>= 4,00	87	3,84	,007
	< 4,00	30	3,33	
Level of Adaptation to Unexp Date Changes	>= 4,00	87	3,79	,000
	< 4,00	30	3,07	
Pre-invest. Cash Flow	>= 4,00	80	3,45	,029
	< 4,00	29	2,93	
Perc. of Pro. Work Inv. in Qual. Activities	>= 4,00	76	2,88	,008
	< 4,00	27	2,07	
Delivery on Time	>= 4,00	79	4,04	,043
	< 4,00	28	3,54	
Train. Exp. in GrossTot. Wage and Salary	>= 4,00	79	2,25	,057
	< 4,00	28	1,82	

Table 5.78: Significant t-test results for customer focus factor and current performance

Customer Focus		N	Mean	Sig.
Employee Satisfaction Trend	>= 4,00	89	3,43	,018
	< 4,00	30	3,10	
Level of Adaptation to Unexp.Due Dates Changes Trend	>= 4,00	87	3,70	,061
	< 4,00	30	3,43	
Perc. of Pro. Work Inv. in Qual. Activities Trend	>= 4,00	74	3,43	,062
	< 4,00	27	3,07	

Table 5.79: Significant t-test results for customer focus factor and change of firm performance in the last 3 years.

The t-test results indicate that customer focus factor makes a significant difference inmost of the performance indicators as is shown in ***Table 5.78***. Therefore, customer focus is an important Business Excellence component for obtaining successful performance results. In addition to this, customer focus has made a significant positive difference on the improvement trends of employee satisfaction, adaptation level to unexpected due date changes in production or order plans and percentage of production workers involved in quality activities in the last 3 years (***Table 5.79)***

5.10 Leadership

5.10.1 Factor Analysis and Reliability Analysis

In order to describe the relationship between leadership factor and general firm performance indicators factor analysis procedure is performed and the factor structure of

leadership questions is concluded in one group, which can be seen in ***Table 5.80*** where the numbers represent the factor loadings.

After factor analysis reliability analyses are applied for leadership factor which can be seen in ***Table 5.81.*** It is consistent and reliable because α value is greater than 0.70.

Questions		Factor 1
Leadership	Top management executes effective plans and policies for securing continuous development of communication among the individuals and among functions within the company	,862
	A unity of goals is achieved among the employees in the company	,861
	Top management uses team spirit and motivation approaches in an effective way in order to reach best practices	,854
	Top management adopts a management style based on interactive continuous improvement rather than one exercised through momentary	,852
	The top management of the company has adopted the culture of trust, active participation and self devotion in seeking business excellence	,847
	Top management supports continuous change effectively for achieving the business excellence objective and motivates the employees accordingly	,829
	Top management exerts effort effectively to establish corporate governance in the company	,803
	Environmental protection issues are managed by top management in a proactive manner	,766

Total Variance Explained % 69,707

Table 5.80: Factor structure of leadership

Factor	Number of Questions	α Value
Leadership	8	0,937

Table 5.81: Results of reliability analysis for leadership factor

5.10.2 Correlation Analysis

Leadership factor is a very important factor because it is effective on most of the performance indicators. It is positively correlated to customer satisfaction, employee satisfaction, technological level, level of adaptation to unexpected due date changes in production or order plans, level of meeting unexpected increases in order or production plan, pre-investment cash flow, percentage of incoming material quality control workers in production workers, percentage of training expenditure in gross total wage and salary, average time of production process change and time to market, percentage of defects in production workers and percentage of workers involved in quality activities ***(Table 5.76).***

On the other hand, leadership factor is positively correlated to customer satisfaction trend, employee satisfaction trend, technological level trend, level of adaptation to unexpected due date changes in production or order plans trend, level of meeting unexpected increases in order or production plan trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend, pre-investment cash flow trend, percentage of training expenditure in gross total wage and salary trend, percentage of workers involved in quality activities trend and time to market trend ***(Table 5.77).***

5.10.3 T-tests

As it shown in ***Table 5.82,*** leadership factor makes a significant difference on most of the performance indicators and especially leadership has been a very important factor for

Leadership		N	Mean	Sig.
Customer Satisfaction	>= 4,00	70	4,06	,031
	< 4,00	46	3,76	
Employee Satisfaction	>= 4,00	72	3,58	,000
	< 4,00	46	2,91	
Ave. Time of Pro. Process Change	>= 4,00	70	3,40	,003
	< 4,00	43	3,00	
Productivity	>= 4,00	71	3,89	,001
	< 4,00	45	3,36	
Time to Market	>= 4,00	69	3,71	,020
	< 4,00	43	3,30	
Technological Level	>= 4,00	71	3,90	,002
	< 4,00	45	3,38	
Level of Meeting Unexp.Incr. in Pro. or Order Plans	>= 4,00	71	3,89	,006
	< 4,00	45	3,40	
Level of Adaptation to Unexp Due Dates Changes	>= 4,00	71	3,80	,003
	< 4,00	45	3,27	
Pre-invest. Cash Flow	>= 4,00	63	3,63	,000
	< 4,00	45	2,82	
Perc. of Pro. Work Inv. in Qual. Activities	>= 4,00	62	3,15	,000
	< 4,00	40	1,98	

Table 5.82: Significant t-test results for leadership factor and current performance

Leadership		N	Mean	Sig.
Customer Satisfaction Trend	>= 4,00	71	3,87	,046
	< 4,00	44	3,61	
Employee Satisfaction Trend	>= 4,00	73	3,53	,000
	< 4,00	45	3,04	
Productivity Trend	>= 4,00	72	3,92	,027
	< 4,00	44	3,66	
Technological Level Trend	>= 4,00	72	3,94	,004
	< 4,00	44	3,55	
Level of Adaptation to Unexp. Due Dates Changes Trend	>= 4,00	72	3,76	,006
	< 4,00	44	3,41	
Pre-invest. Cash Flow Trend	>= 4,00	66	3,47	,001
	< 4,00	44	2,95	
Perc. of 3 Years Old or Young. Prod. in Tot. Sales Trend	>= 4,00	65	3,80	,041
	< 4,00	42	3,43	
Perc. of 3 Years Old or Young. Prod. in Exis. Prod. Portfolio Tr.	>= 4,00	67	3,90	,041
	< 4,00	41	3,56	
Perc. of Defects in Total Pro. Volume Trend	>= 4,00	63	2,27	,070
	< 4,00	43	2,60	
Perc. of Pro. Work invovled in Qual. Activities Trend	>= 4,00	61	3,59	,001
	< 4,00	39	2,97	
Delivery on Time Trend	>= 4,00	63	3,75	,073
	< 4,00	40	3,45	
Perc Train. Exp. in GrossTot. Wage and Salary Trend	>= 4,00	62	3,26	,020
	< 4,00	40	2,88	

Table 5.83: Significant t-test results for leadership factor and change of firm performance in the last 3 years.

improvement of the firm performance in the last 3 years according to t-test results in ***Table 5.83.***

6 EFFECTS OF GENERAL FIRM PERFORMANCE INDICATORS ON FINANCIAL PERFORMANCE

In this chapter, we will analyze the relation between general performance indicators and financial performance by utilizing correlation analysis to test the one-to-one relationships and T-tests. We have computed complex variables from data including total sales per employee, export per employee, added value per employee, export trend, total sales trend, added value trend, added value /total sales and export / total sales. We didn't use absolute values of total sales, export and added values because firm size will affect those values and cause us to obtain incorrect results.

6.1 Correlation Analysis

In ***Table 6.1***, correlations between financial performance indicators and general performance indicators are displayed. Added value per employee has a significant correlation with time of production process change, productivity, technological level, percentage of 3 years or younger products in total sales, percentage of 3 years or younger products in existing product portfolio, percentage of R&D expenditure in total sales and percentage of production workers involved in quality circles.

Export in total sales is significantly correlated to time to market, percentage of training expenditure in total personnel wage and salary. Finally, added value in total sales has significant correlation with productivity.

According to ***Table 6.2*** total sales trend is significantly correlated to employee satisfaction trend, time to market trend, technological level trend, pre-investment cash flow trend, percentage of 3 years or younger products in total sales trend, percentage of 3 years or younger products in existing product portfolio trend, percentage of average total stocks in annual sales trend, percentage of incoming material stocks in annual sales trend, percentage of workers involved in quality activities trend, percentage of quality control personnel in production workers trend, percentage of incoming material quality control personnel in production workers trend, percentage of training expenditure in total personnel wage and salary trend.

	1	2	3	4	5	6	7	8	9	10	11	12
1-Added Value per Employee	1	-,15	,33	,355	,336	-,180	,324	-,402**	-,290	-,382	,341	-,04
2-Export / Total Sales		1	,14	-,046	,060	,249	,091	,179	,051	,048	,074	,294
3-Added Value / Total Sales			1	,179	,318	,168	,261	,023	,033	-,034	,148	,036
4-Time of Production Process Change				1	,259**	,037	,147	-,078	-,015	-,101	,077	-,04
5-Productivity					1	,523**	,557**	,126	,105	,127	,142	,001
6-Time to Market						1	,485**	,326**	,234	,133	,195	-,01
7-Technological Level							1	,008	,052	,065	,125	,00
8-% of 3 Years old or Younger Prod. in Tot. Sales								1	,828** ,000	,205 ,051	-,02 ,816	,199 ,047
9-% of 3 Years or Younger Products in Exis. Prod. Portfolio									1	,156 ,138	-,01 ,935	,148 ,140
10-%of R&D Exp. in Total Sales										1	,072	,273**
11-% of Pro. Work Invol. Qual. Activities											1	,368**
12-% of Train. Exp. in Wage and Salary												1

**. Correlation is significant at the 0.01 level (2-tailed). *.Correlation is significant at the 0.05 level (2-tailed). .Correlation is significant at the 0.1 level (2-tailed).

Table 6.1: Correlation analysis between financial indicators and performance indicators (Current)

	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1-Total Sales Trend	,258	,079	,307	,213	,241	,278	,285	-,077	,331**	,474**	,354**	,333**	,329	,264
2-Export Trend	,057	,145	,126	,124	,216	,310	,217	-,035	-,011	,153	,021	,242	,053	,013
3-Added Value Trend	,094	,075	,198	,063	,012	-,067	-,020	-,277	-,172	,245	-,122	-,065	-,145	-,1
4-Total Sales per Employee	-,093	-,217	-,127	,031	,101	,070	,108	,158	-,062	-,065	,169	-,102	-,125	-,1
5-Employee Satisfaction	1	,169	,337**	,291**	,394**	,240	,274**	-,172	-,102	,138	,226	,142	,144	,264**
6-Time of Pro. Process Changes		1	,476**	,134	,037	,232	,026	-,116	,071	,004	,171	,128	,165	,057
7-Time to Market			1	,337**	,286**	,364**	,211	-,150	,016	,006	,155	,175	,175	,238
8-Technological Level				1	,263**	,476**	,427**	-,289**	,017	,006	,266**	,010	,186	,115
9-Pre-invest. Cash Flow					1	,271**	,337**	-,163	,061	,095	,059	,100	,125	,282**
10-% of 3 Years Old or Younger Prod. in Total Sales						1	,653**	-,102	,017	-,132	,298**	-,039	,137	,259
11-% of 3 Years Old or Younger Prod. in Exis. Prod. Portfolio							1	-,098	-,018	,101	,272**	,045	,216	,260
12-% of Defects in Tot. Pro. Volume								1	,084	-,019	-,049	,165	,190	,042
13-% of Ave.Total Stocks in Annual Sales									1	,755**	-,045	,095	,218	,086
14-%. of Ave.Total Incoming Material Stocks in Annual Sales										1	-,106	,259	,258	,037
15-%. of Pro. Work Involved in Qual. Activity											1	,103	,256	,453**
16-% of Qual. Con. Pers. in Pro. Workers												1	,602**	,204
17-% of Ave. Tot. Incoming Mat. Qual. Con. Pers. in Pro. Work.													1	,326**
18-% of Train. Exp. in Wage and Salary														1

**. Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed) .Correlation is significant at the 0.1 level (2-tailed).

Table 6.2: Correlation analysis between financial indicators and performance indicators (change in the last 3 years)

6.2 T-tests

After correlation analyses, t-tests are applied in order to discover the effects of performance indicators on financial results.

Employee Satisfaction		N	Mean	Sig
Total Sales per Employee	>= 4	27	195301,1	,070
	< 4	37	104446,65	
Export per Employee	>= 4	22	57174,1268	,034
	< 4	33	25143,5329	

Table 6.3: Significant t-test results for employee satisfaction and financial performance

Employee satisfaction makes a significant positive difference on total sales per employee (p<0, 1) and export per employee (p<0,05). We can conclude that companies which provide high employee satisfaction gain significantly higher total sales per employee and higher export per employee (***Table 6.3).***

Time of Production Process Change Trend		N	Mean	Sig.
Total Sales per Employee	>= 4	24	84256,53	,027
	< 4	39	179106,3	

Table 6.4: Significant t-test results for time of production process change trend in the last 3 years and total sales per employee

According to ***Table 6.4,*** increase of time of production process change in the last 3 years provides significantly low total sales per employee.

Productivity		N	Mean	Sig.
Total Sales per Employee	>= 4	39	185751,9	,010
	< 4	25	75733,22	
Added Value per Employee	>= 4	31	52322,30	,061
	< 4	15	19100,06	

Table 6.5: Significant t-test results for productivity and financial performance

According to the results presented in ***Table 6.5,*** productivity makes a significant positive difference on total sales per employee (p<0,001) and added value per employee (p<0,05). We can conclude that productivity provides significantly high total sales per employee and high added value per employee.

Time to Market		N	Mean	Sig.
Total Sales per Employee	>= 4	37	94637,61	,049
	< 4	26	213602,6	
Export per Employee	>= 4	34	26556,40	,057
	< 4	21	56411,89	

Table 6.6: Significant t-test results for time to market and financial performance

As displayed in ***Table 6.6,*** time to market makes a significant affect on total sales per employee (p<0,05) and export per employee (p<0,1). Companies providing shorter time to market obtain significantly lower total sales per employee and export per employee.

Technological Level		N	Mean	Sig.
Total Sales per Employee	>= 4	45	168057,9	,078
	< 4	18	82925,19	
Export per Employee	>= 4	39	43945,70	,049
	< 4	16	23355,32	

Table 6.7: Significant t-test results for technological level and financial performance

According to ***Table 6.7,*** technological level has a significant positive affect on total sales per employee (p<0,1) and export per employee (p<0,05). We can say that companies, which have high technological level, have significantly high total sales per employee and high export per employee.

Pre-invest. Cash Flow Trend		N	Mean	Sig.
Total Sales per Employee	>= 3	55	139568,1	,000
	< 3	10	44727,58	
Total Sales Trend	>= 3	54	,2483	,054
	< 3	10	,0614	
Total Sales per Employee Trend	>= 3	53	,1568	,093
	< 3	10	,0267	
Export Trend	>= 3	41	,1924	,001
	< 3	8	-,0337	

Table 6.8: Significant t-test results for pre-investment cash flow trend in the last 3 years and financial performance

Companies, which rated their pre-investment cash flow as ≤3 (decreased or highly decreased), have obtained significantly lower total sales per employee (p<0,01), lower total sales trend (p<0,1), lower total sales per employee trend (p<0,1) and lower export trend (p<0,01) in the last 3 years (***Table 6.8***).

Perc. of 3 Years Old or Younger Prod. in Tot. Sales Tr.		N	Mean	Sig.
Total Sales Trend	>= 4	38	,2500	029
	< 4	19	,1182	
Export Trend	>= 4	31	,1981	096
	< 4	14	,0269	

Table 6.9: Significant t-test results for percentage of 3 years or younger products in total sales trend in the last 3 years and financial performance

As is shown in ***Table 6.9,*** companies, which rated their percentage of 3 years old or younger products in total sales as ≥4 (increased or highly increased), have obtained significantly higher total sales trend (p<0,05) and higher export trend (p<0,1) in the last 3 years.

Perc. of 3 Years old or Young. Prod. in Exis. Prod. Portfolio Trend		N	Mean	Sig.
Total Sales Trend	>= 4	43	,2627	,057
	< 4	18	,1092	

Table 6.10: Significant t-test results for percentage of 3 years or younger products in existing product portfolio trend in the last 3 years and financial performance

Companies, which rated their percentage of 3 years old or younger products in existing product portfolio as ≥4 (increased or highly increased), have obtained significantly higher total sales trend (p<0,1) in the last 3 years (***Table 6.10***).

Perc. of Defects in Total Pro.Volume		N	Mean	Sig.
Total Sales per Employee Trend	>= 5	22	,2048	,085
	< 5	40	,1014	
Added Value per Employee Trend	>= 5	17	,2818	,066
	< 5	25	,0535	

Table 6.11 Significant t-test results for percentage of defects in total production volume and financial performance

According to the results displayed in ***Table 6.11,*** the percentage of defects in total production volume makes a significant difference on total sales per employee trend (p<0,1), added value per employee trend (p<0,1). Hence, companies, which have lower than 0,1% of defects in total production volume, have significantly higher total sales per employee trend and higher added value per employee trend.

Percentage of Average Total Stocks in Annual Sales		N	Mean	Sig
Total Sales per Employee	>= 3	35	184211,6	,039
	< 3	26	87285,94	

Table 6.12: Significant t-test results for percentage of average total stocks in annual sales and financial performance

According to ***Table 6.12,*** the percentage of average total stocks in annual sales makes a significant difference on total sales per employee (p<0,05). Companies, which have higher than 10% of average total stocks in annual sales, have significantly lower total sales per employee.

Percentage of Average Total Incoming Mat. Stocks in Annual Sales		N	Mean	Sig.
Total Sales per Employee	>= 3	30	195563,3	,050
	< 3	32	90949,98	
Export per Employee	>= 3	23	53153,27	,083
	< 3	30	28017,73	

Table 6.13: Significant t-test results for percentage of average total average incoming material stocks in annual sales and financial performance

According to ***Table 6.13,*** the percentage of average total average incoming material stocks in annual sales makes a significant difference on total sales per employee (p<0,05) and export per employee (p<0,1). Hence, companies having higher than 3,5% of average total incoming material stocks in annual sales have significantly lower total sales per employee and lower export per employee.

Perc. of Quality Cost in Total Sales		N	Mean	Sig.
Added Value / Total Sales	>= 3	37	,2878	,016
	< 3	5	,0741	

Table 6.14: Significant t-test results for percentage of quality cost in total sales and financial performance

According to ***Table 6.14,*** the percentage of quality cost in total sales makes a significant difference on added value / total sales (p<0,05) Hence, companies having higher than 10% of quality cost in total sales have significantly lower added value / total sales.

Perc. of Quality Cost in Total Sales Trend		N	Mean	Sig.
Total Sales per Employee	>= 4	15	89176,96	,058
	< 4	43	165653,2	

Table 6.15: Significant t-test results for percentage of quality cost in total sales trend in the last 3 years and financial performance

Table 6.15 indicates that increase of percentage of quality cost in total sales causes significantly lower total sales per employee.

Perc. of Pro. Work. Involved in Qual. Activities		N	Mean	Sig.
Total Sales per Employee	>= 4	17	254494,7	,066
	< 4	43	100879,0	
Export per Employee	>= 4	15	63979,10	,088
	< 4	37	29281,40	

Table 6.16: Significant t-test results for percentage production workers involved in quality activities and financial performance

Perc. of Pro. Work Inv. in Qual. Activities Tr.		N	Mean	Sig.
Total Sales Trend	>= 4	24	,3266	,036
	< 4	36	,1508	

Table 6.17: Significant t-test results for percentage production workers involved in quality activities trend in the last 3 years and total sales trend

The results reported in ***Table 6.16*** imply that the percentage of production workers involved in quality activities affects significantly export per employee (p<0,1) and total sales per employee (p<0,1). It can be concluded that companies, for which the ratio of production workers involved in quality activities is higher than 20%, have significantly higher export per employee (p<0,1) and higher total sales per employee (p<0,1).

On the other hand, companies which have rated the percentage of production workers involved in quality activities as ≥4 (increased or highly increased), have obtained significantly higher total sales trend (p<0,05) in the last 3 years (***Table 6.17*****)**

Delivery on Time		N	Mean	Sig.
Export / Total Sales	>= 5	16	,5550	,041
	< 5	35	,2859	

Table 6.18: Significant t-test results for delivery on time and financial performance

According to ***Table 6.18***, percentage of delivery on time has significant positive affect on export / total sales. Companies that deliver on time higher than 90%, obtain significantly higher export / total sales.

Perc. of Incoming Mat. Quality Con. Pers. in Pro. Work.Trend		N	Mean	Sig.
Total Sales Trend	>= 4	9	,4260	,011
	< 4	51	,1688	

Table 6.19: Significant t-test results for percentage of incoming material quality control personnel in production workers trend in last 3 years and total sales trend

It can be observed from ***Table 6.19*** that companies for which the percentage of incoming material quality control personnel in production workers is ≥4 (increased or highly increased), have significantly higher total sales trend ($p<0,05$) in the last 3 years.

7 RESEARCH MODEL and PATH ANALYSIS

7.1 Research Model

In our research model, we analyze the relationship between Business Excellence determinants and performance indicators, which we have generated from literature (***Figure 7,1***). The first column in the model consists of determinants and the second column includes performance indicator groups. We have constructed these performance indicator factors by merging 21 performance sub-items in the questionnaire form into factors. We have utilized literature and our findings from t-tests and correlation analysis for selecting the similar performance indicators which are then merged into one factor. We didn't use factor analysis method for data reduction because our performance indicators are too many and various to be reduced by factor analysis.

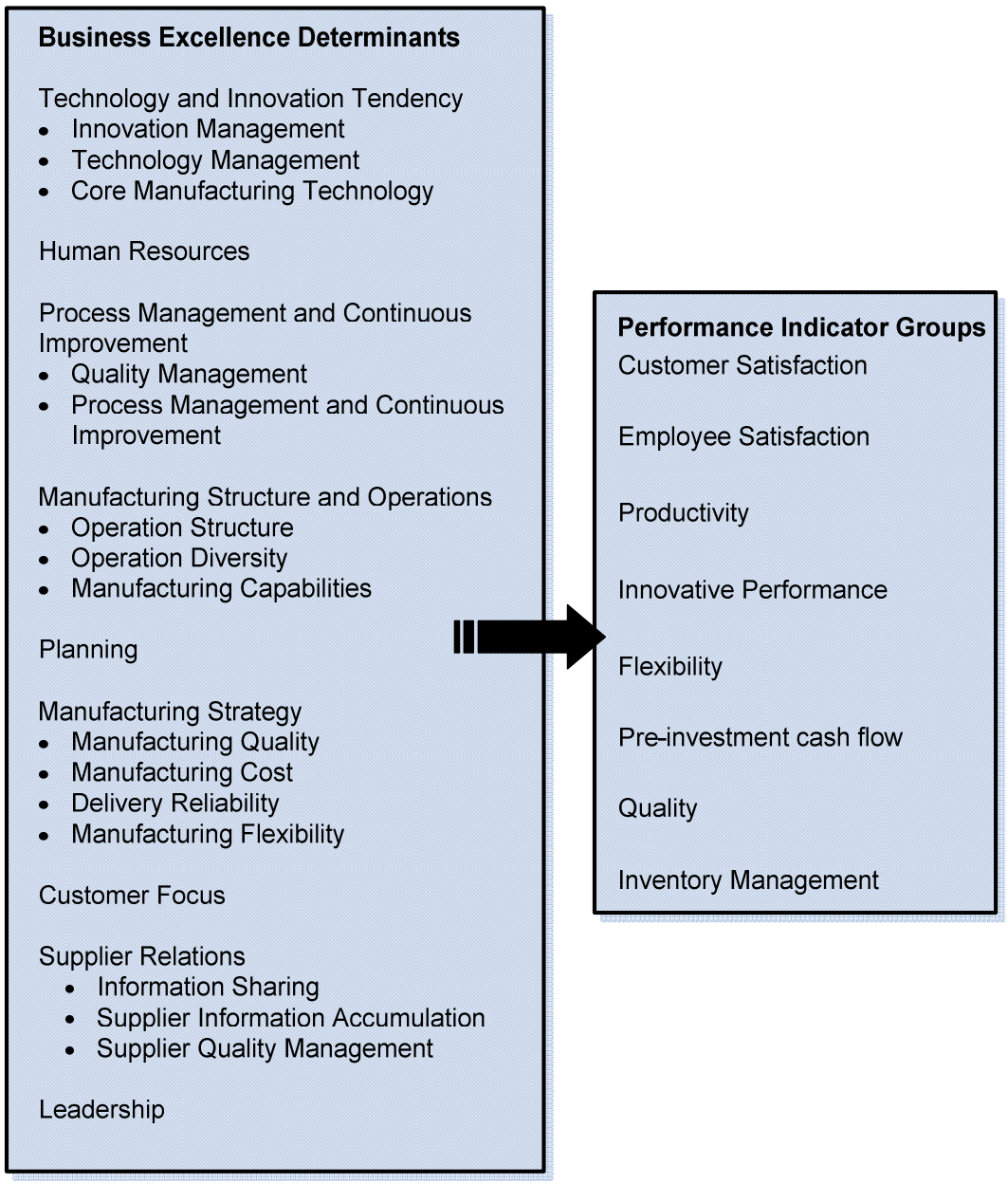

Figure 7.1: Research model

In this chapter, our main objective is to comprehend whether these performance indicator groups can be expressed by Business Excellence determinants. For that purpose, path analyses will be performed in the next section.

7.2 Path analysis

We applied structural equation modelling (SME) approach and conducted path analyses in order to reveal latent relationships between determinants of Business Excellence and firm performance indicators in our research model. Path analysis is a

useful statistical method to find out and describe hidden interactions between variables. It is a type of multiple regression analysis. In addition to being thought of as a form of multiple regressions focusing on causality, path analysis can be viewed as a special case of structural equation modeling.

SEM is a well-developed data analysis method, incorporating many traditional data analysis techniques as special cases. SEM allows researchers to frame increasingly precise questions about the phenomena in which they are interested. It is stated that SEM provides researchers with a method for both estimating structural relationships among unobservable constructs and assessing the adequacy with which those constructs have been measured. It is also indicated that the use of SEM entails a mode of thinking about theory construction, measurement problems, and data analysis that is helpful in building and testing the theory more precisely (Yeung et al, 2004).

The results of path analyses are evaluated by the goodness of fit indices. *χ2 / degree of freedom* is the minimum discrepancy divided by its degrees of freedom. This ratio shows the appropriateness of the model to the data. Wheaton et al. (1977) suggest that this relative chi-square begins to be reasonable, when it is approximately 5 or less. The comparative fit index (*CFI*; Bentler, 1990) is employed for checking the suitability of the model. It specifies a very good fit when values are close to 1. The Bentler-Bonett (1980) normed fit index (*NFI*), Bollen's (1986) relative fit index (*RFI*) and Bollen's (1989) incremental fit index (*IFI*) show a very good fit, when values are close to 1. The Tucker-Lewis coefficient (*TLI*), which is also known as the Bentler-Bonett non-normed fit index (*NNFI*), was investigated by Bentler and Bonett (1980) in the context of analysis of moment structures. The typical range for *TLI* lies between 0 and 1, but it is not limited to that range. *TLI* value close to 1 means a very good fit. Browne and Cudeck (1993) specified that a value of about 0.08 or less for the Root Mean Square Error of Approximation (*RMSEA)* would indicate a reasonable error of approximation. Every analyzed model presented in this chapter is between those reference values.

Barron and Kenny (1986) explained the mediating effect phenomenon. Mediating effect exists, when a relation between the variables is reduced or eliminated because of a mediator variable in the model. At this point, it is necessary to execute path analysis after multiple linear regression analysis in order to describe the direction of mediating effects. Hence, several models are constructed and tested by employing AMOS v 4.0 in this study.

As explained earlier, we have six groups of Business Excellence determinants; namely, (i) technology and innovation tendency; (ii) human resources, planning, leadership; (iii) process management and CI, customer focus; (iv) manufacturing structure and operations; (v) manufacturing strategy; and (vi) supplier relations. We analysed their effects on the performance items which are obtained by merging 21 performance sub-items in the questionnaire form into factors. The resulting factors are innovative performance, quality, flexibility, productivity, inventory management, customer satisfaction, employee satisfaction, pre-investment cash flow and a separate trend factor for each factor cited which are summarized in ***Table 7.1.*** Our performance indicators data is not appropriate for factor analysis. Therefore we didn't obtain our factors by factor analysis.

Factors	**Performance Indicators**
Innovative Performance	Time to market Technological level
Quality	Percentage of defects in total production volume Percentage of quality cost in total sales Percentage of production workers involved in quality activities
Flexibility	Level of meeting unexpected increases in production or order plan Adaptation level to unexpected due date changes Average time of production process change
Productivity	Productivity
Inventory Management	Percentage of average total stocks in annual sales
Customer Satisfaction	Customer satisfaction Percentage of delivery on time
Employee Satisfaction	Employee satisfaction Percentage of training expenditure in gross total wage and salary
Pre-investment Cash Flow	Pre-investment cash flow

Table 7.1: Summary of performance indicators

7.2.1 Technology and Innovation Tendency

This group consists of three factors: core manufacturing technology, technology management and innovation management. For testing the effects of these factors to firm performance, multiple linear regression method is used. While simple linear regression analysis provides information on the direction and the power of one-to-one relationship, multiple linear regression analysis helps to find out the effects of two or more variables

over another dependent variable (Hair et al., 2003). Regression analysis is conducted employing SPSS v.13, and then path analyses are performed.

Several regression models investigating the effects of technology and innovation tendency factors on firm performance factors are constructed and analyzed and only significant results obtained are presented in ***Table 7.2***. The p values in the tables show whether the models are significant or not at α=99% (p<0.01), α=95% (p<0.05) and α=90% (p<0.1) level. R^2 is a statistic about the goodness of fit of a model, which is a measure of how well the dependent variable is approximated by independent variables. In other words, R^2 represents the proportion of the variance of the dependent variable accounted for by the independent variables (Bagozzi, 1994).

	Innovative Performance		Productivity		Flexibility		Pre-investment Cash Flow		Pre-investment Cash Flow Trend		Customer Satisfaction		Employee Satisfaction		Employee Satisfaction Trend		Quality	
	R^2=,304	P=,000	R^2=252	P=,000	R^2=,196	P=,000	R^2=,230	P=,000	R^2=,169	P=,000	R^2=,088	P=,014	R^2=,117	P=,002	R^2=,098	P=,008	R^2=,101	P=,009
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Core Man. Technology	,428	,000	,358	,000	,367	,000	,234	,001	,119	,210	,275	,005	,108	,260	,142	,143	,275	,006
Technology Mgmt.	,169	,102	,166	,126	,106	,346	,141	,209	,250	,031	,048	,682	,242	,038	,003	,981	,045	,708
Innovation Mgmt.	,067	,507	,093	,379	,039	,772	,140	,205	,141	,208	,000	,997	,063	,579	,235	,041	,050	,671

Table 7.2 Regression models of the effects of innovation and technology tendency factors on firm performance indicators

Innovative performance model is statistically very significant (p<0,01) and 30,4% of innovative performance variability is accounted for by innovation and technology management factors (R^2=0,304). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only core manufacturing technology (β=0,428; p=0,00) makes a significant difference on innovative performance. Shortly, although the regression model is significant, multiple linear regression analysis displays only dominant factors' effects over innovative performance, which is called mediating effect. Therefore, a path analysis model for innovative performance is formed by AMOS v 4.0 in order to find out and describe hidden interactions between variables. Path analysis of innovative performance model is displayed in ***Figure 7.2***. Here, technology management and core manufacturing technology factors have a direct effect on innovative performance; technology management factor also supports core manufacturing technology factor, i.e. it has also an indirect effect on innovative performance, which passes through core manufacturing technology factor. On the other

hand, innovation management factor's effect on innovative performance is realized through technology management factor and hence it has an indirect effect on innovative performance.

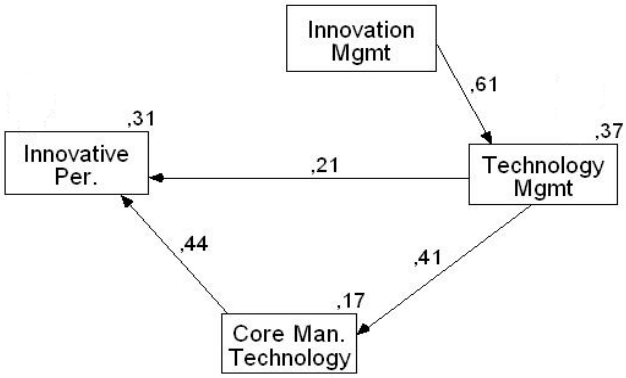

Figure 7.2: Path analysis of technology and innovation tendency factors and innovative performance

Productivity model is statistically very significant ($p<0,01$) and 25,2% of productivity variability is accounted for by innovation and technology management factors ($R^2=0,252$). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only core manufacturing technology factor ($\beta=0,358$; $p=0,00$) makes a significant difference on productivity. For a deeper analysis path analysis is performed, result of which is shown in ***Figure 7.3***.

Path analysis results indicate that technology management and core manufacturing technology factors have a direct effect on productivity. Technology management has also an indirect effect on productivity via core manufacturing technology. Innovation management, on the other hand, supports technology management, therefore it also has an indirect effect on productivity.

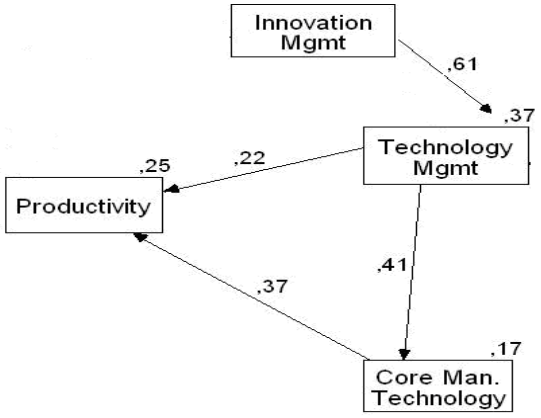

Figure 7.3: Path analysis of technology and innovation tendency and productivity

Flexibility model is statistically very significant (p<0,01) and 19% of flexibility variability is accounted for by innovation and technology management factors (R^2=0,190). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only core manufacturing technology (β=0.367; p=0,00) makes a significant difference on flexibility. In order to analyze the hidden interactions, path analysis is performed.

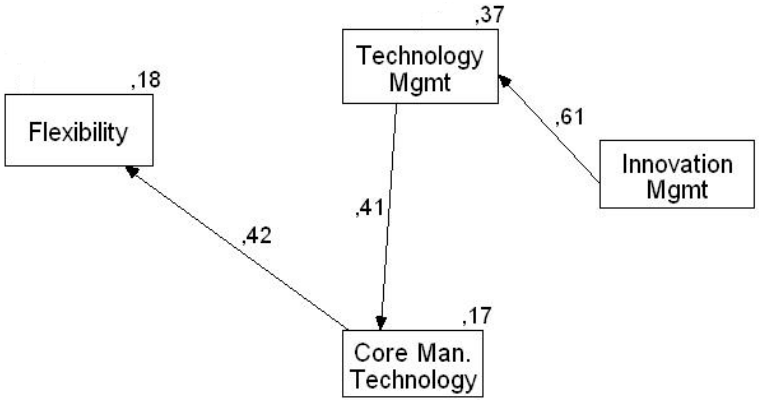

Figure 7.4: Path analysis of technology and innovation tendency and flexibility

Figure 7.4. indicates that core manufacturing technology factor has a direct effect on flexibility. On the other hand, innovation management factor affects technology management factor and technology management factor affects core manufacturing technology factor. Hence, they have indirect effects on flexibility.

Pre-investment cash flow model is statistically very significant (p<0.01) and 23% of pre-investment cash flow variability is accounted for by innovation and technology management factors (R^2=0,230). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only core manufacturing technology (β=0,234; p=0,001) makes a significant difference on pre-investment cash flow. In order to explore the relations deeply, path analysis is performed.

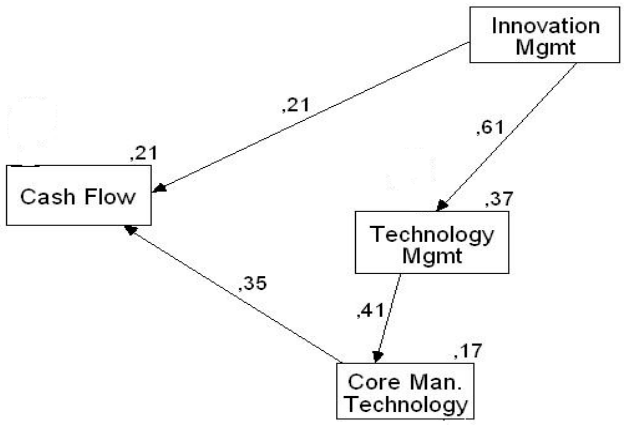

Figure 7.5: Path analysis of technology and innovation tendency and cash flow

According to ***Figure 7.5***, core manufacturing technology and innovation management factors have direct effect on pre-investment cash flow. Innovation management also has an effect on technology management and technology management's effect on cash flow comes through core manufacturing technology.

Pre-investment cash flow trend model is statistically very significant ($p<0.01$) and 16,9% of pre-investment cash flow trend variability is accounted for by innovation and technology management factors (R^2=0,169). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only technology management (β=0,250; p=0,031) makes a significant difference on pre-investment cash flow trend. Regression analysis is followed by path analysis, the result of which is given in ***Figure 7.6.*** Here, technology management factor is the only factor that has direct effect on pre-investment cash flow trend. Innovation management factor affects indirectly the cash flow trend via technology management factor, which also supports core manufacturing technology factor but core manufacturing technology factor does not exercise a significant difference on pre-investment cash flow.

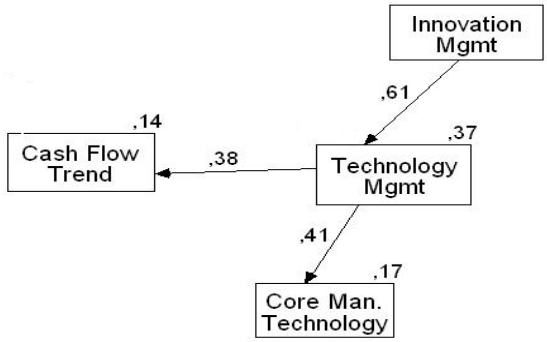

Figure 7.6: Path analysis of technology and innovation tendency and cash flow trend

Customer satisfaction model is statistically significant ($p<0,05$) and 8,8% of customer satisfaction variability is accounted for by innovation and technology management factors (R^2=0,088). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only core manufacturing technology (β=0,275; p=0,005) makes a significant difference on customer satisfaction. Regression analysis is followed by path analysis, which is given in ***Figure 7.7.*** Here, innovation management supports technology management and technology management affects core manufacturing technology. Core manufacturing technology factor, on the other hand, is the only factor that has a direct effect on customer satisfaction. We can

conclude that core manufacturing technology factor is the most important factor for customer satisfaction in this case.

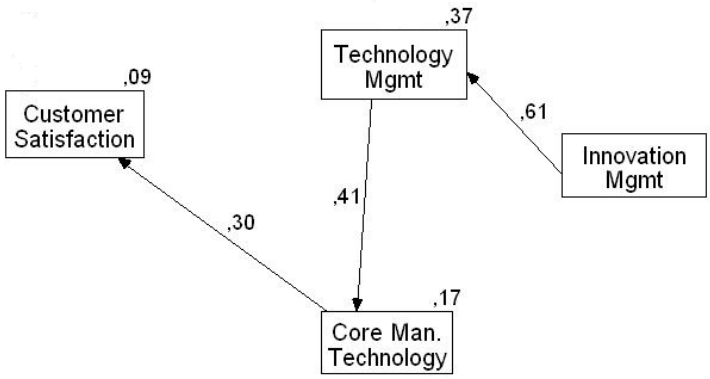

Figure 7.7: Path analysis of technology and innovation tendency factors and customer satisfaction

Employee satisfaction model is statistically very significant ($p<0,01$) and 11,7% of employee satisfaction variability is accounted for by innovation and technology management factors ($R^2=0,117$). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only technology management ($\beta=0,242$; $p=0,038$) makes a significant difference on employee satisfaction. In the next step, path analysis is performed, which is displayed in ***Figure 7.8.*** According to path analysis, innovation management factor affects core manufacturing technology and technology management factors. Hence, it does not have a direct effect on employee satisfaction. Similarly, core manufacturing technology factor affects employee satisfaction indirectly via technology management factor, which has a direct effect. We can say that technology management factor constitutes an important factor for employee satisfaction.

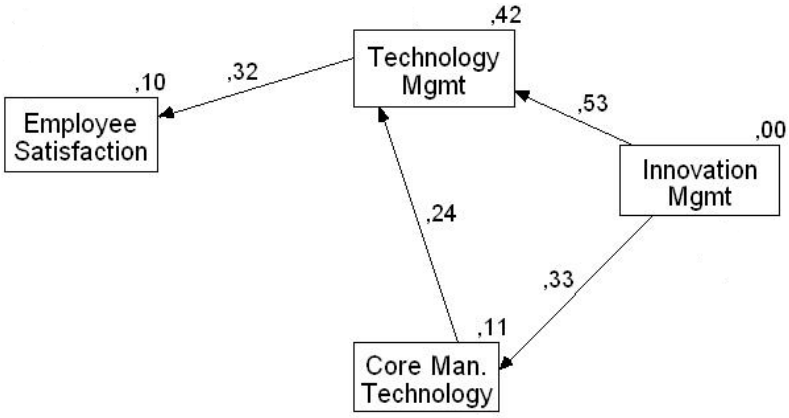

Figure 7.8: Path analysis of technology and innovation tendency and employee satisfaction

Employee satisfaction trend model is statistically very significant (p<0,01) and 9,8% of employee satisfaction trend variability is accounted for by innovation and technology management factors (R^2=0,098). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only innovation management (β=0,241; p=0,035) makes a significant difference on employee satisfaction trend. In the following step, path analysis is performed to discover hidden relations, which is displayed in Figure 7.9. Here, technology management factor has an indirect effect on employee satisfaction trend that passes through innovation management, which has a significant direct effect on employee satisfaction trend. However, core manufacturing technology factor does not significantly affect employee satisfaction trend.

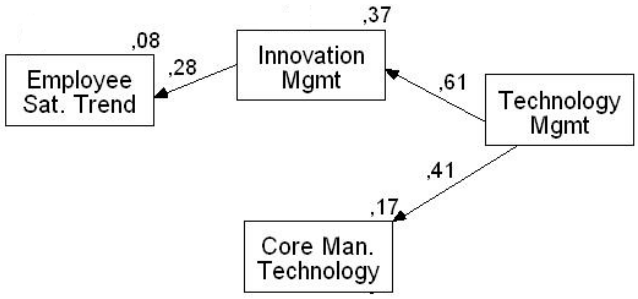

Figure 7.9: Path analysis of technology and innovation tendency factors and employee satisfaction trend

Quality model is statistically very significant (p<0,01) and 10,1% of quality variability is accounted for by innovation and technology management factors (R^2=0,101). However, when the technology and innovation tendency factors are analyzed using multiple linear regression, only core manufacturing technology (β=0,275; p=0,006) makes a significant difference on quality. In the following step, path analysis is performed to discover hidden relations which are displayed in ***Figure 7.10.*** According to path analysis results, innovation management supports technology management; technology management affects core manufacturing technology and core manufacturing technology is the only factor that has a direct effect on quality. We can conclude that core manufacturing technology is the most important factor for quality.

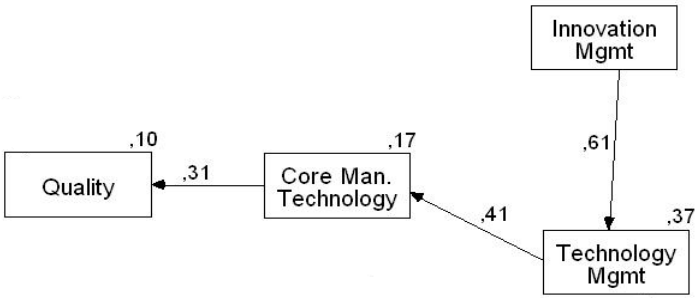

Figure 7.10: Path analysis of technology and innovation tendency factors and quality

7.2.2 Quality Management, Process Management and Continuous Improvement, and Customer Focus

This group includes three factors; namely, quality management, process management and CI, and customer focus. In order to analyze effects of these factors to firm performance, multiple linear regression method is used. Significant regression models that investigate the effects of quality management, process management and CI and customer focus on firm performance are presented in ***Table 7.3.***

	Innovative Performance		Productivity		Flexibility		Flexibility Trend		Quality	
	R^2=,085	P=,018	R^2=094	P=,011	R^2=,162	P=,000	R^2=,138	P=,001	R^2=,072	P=,043
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Quality Management	,223	,068	,138	,248	,127	,270	,199	,087	,114	,370
Process Mgmt. and Continuous Improvement	,098	,438	,171	,174	,174	,153	-,043	,723	,168	,202
Customer Focus	-,009	,935	,040	,718	,176	,102	,263	,016	,016	,891

Table 7.3 Regression model of the effects of quality management, process management and CI and customer focus factors on firm performance indicators

Innovative performance model is statistically significant (p<0,05) and 8,5% of innovative performance variability is accounted for by process management and CI, customer focus factors (R^2=0,085). However, when the quality management, process management and CI and customer focus factors are analyzed using multiple linear regression, only quality management (β=0,223; p=,068) makes a significant difference on innovative performance. For a deeper analysis of relations path analysis is performed, results of which are shown in ***Figure 7.11.*** Here, quality management has a direct effect

on innovative performance. Customer focus, process management and CI support quality management. Also, process management and CI has an indirect effect on innovative performance through quality management.

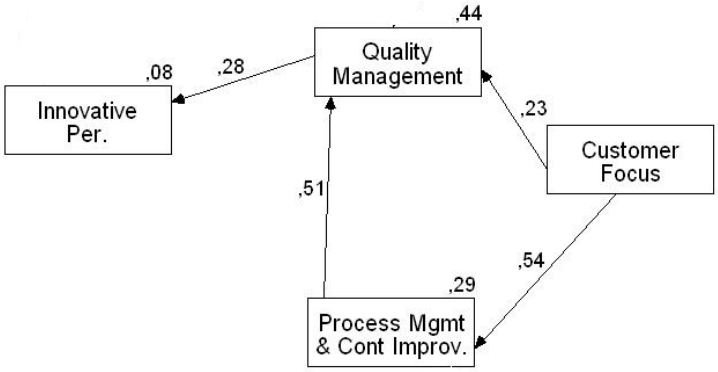

Figure 7.11: Path analysis of process management and CI, customer focus factors and innovative performance

Productivity model is statistically significant ($p<0,05$) and 9,4% of productivity variability is accounted for by process management and CI, customer focus factors ($R^2=0,094$). However, when the factors are analyzed using multiple linear regressions, none of them has significant effect on productivity. In order to reveal hidden relations, path analysis is performed, results of which are shown in ***Figure 7.12.*** Here, process management and CI has a direct effect on productivity. Customer focus and quality management support process management and CI; customer focus also supports quality management.

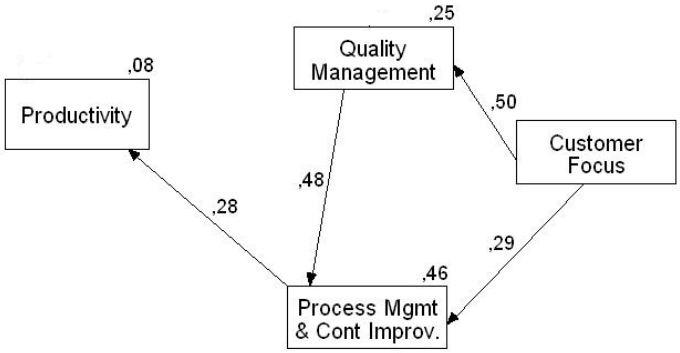

Figure 7.12: Path analysis of process management and CI, customer focus factors and productivity

Flexibility model is statistically very significant ($p<0,01$) and 16,2% of flexibility variability is accounted for by process management and CI, and customer focus factors ($R^2=0,162$). However, when the quality management, process management and CI and customer focus factors are analyzed using multiple linear regressions, none of them has

significant effect on flexibility. In order to discover hidden interactions, path analysis is performed, results of which are shown in ***Figure 7.13***

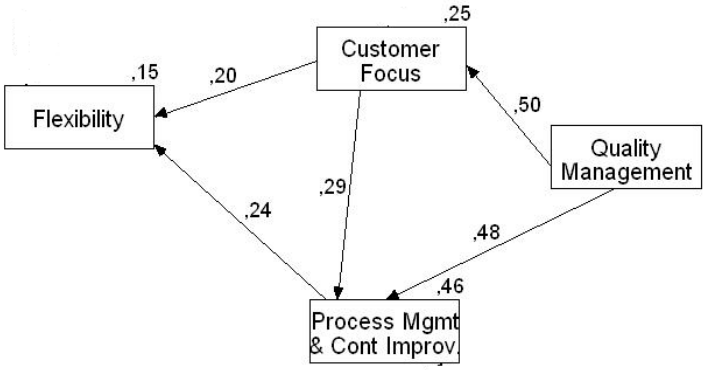

Figure 7.13: Path analysis of process management and CI, customer focus factors and flexibility

Here, flexibility is affected by customer focus, process management and CI factors directly. On the other hand, quality management factor supports both customer focus and process management and CI directly.

Flexibility trend model is statistically very significant ($p<0,01$) and 13,8% of flexibility trend variability is accounted for by process management and CI, and customer focus factors ($R^2=0,138$). However, when factors are analyzed using multiple linear regressions, quality management ($\beta=0,199$; $p=,087$) and customer focus ($\beta=0,263$; $p=,016$) have significant positive effect on flexibility trend. In order to discover hidden interactions path analysis is performed, results of which are shown in ***Figure 7.14.*** Here, customer focus is the only factor with a direct effect on flexibility trend. Other factors have indirect effect on flexibility trend through customer focus.

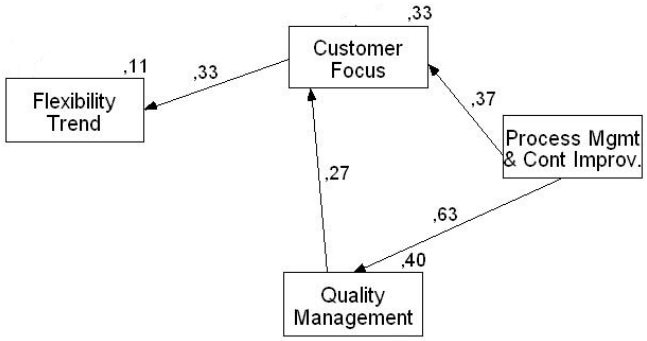

Figure 7.14: Path analysis of process management and CI, customer focus factors and flexibility trend

Quality model is statistically significant ($p<0.05$) and 7,2% of quality variability is accounted for by process management and CI, and customer focus factors ($R^2=0,072$). However, when the factors are analyzed in the multiple linear regressions, none of them

has significant effect on quality. In the following step, path analysis is performed to discover hidden relations, results of which are shown in in ***Figure 7.15.*** Here, process management and CI makes a significant difference on quality but customer focus and quality management have an indirect effect on quality realized through process management and CI factor.

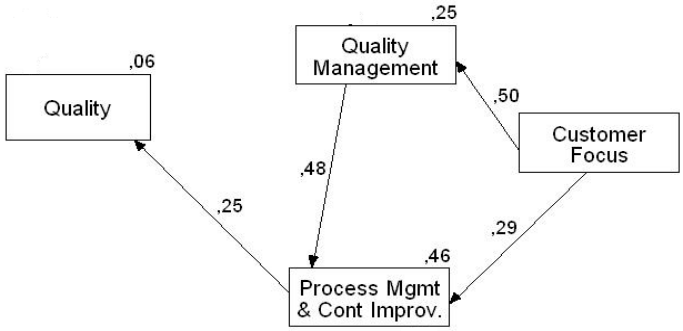

Figure 7.15: Path analysis of process management and CI, customer focus factors and employee quality

The continuation of the regression models of the effects of quality management, process management and CI and customer focus factors on firm performance indicators is given in Table 7.4.

	Pre-investment Cash Flow		Pre-investment Cash Flow Trend		Customer Satisfaction		Employee Satisfaction		Employee Satisfaction Trend	
	R^2=,139	P=,001	R^2=,098	P=,012	R^2=,101	P=,006	R^2=,190	P=,000	R^2=,089	P=,013
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Quality Management	,100	,422	,089	,472	,053	,651	,306	,007	,247	,037
Process Mgmt. and Continuous Improvement	,098	,449	,120	,352	,211	,088	,039	,738	-,056	,651
Customer Focus	,236	,040	,159	,163	,103	,341	,160	,120	,135	,237

Table 7.4 Regression model of the effects of quality management, process management and CI and customer focus factors on firm performance indicators

Pre-investment cash flow model is statistically very significant ($p<0,01$) and 13,9% of cash flow variability is accounted for by process management and CI, and customer focus factors (R^2=0,139). However, when the quality management, process management and CI and customer focus factors are analyzed using multiple linear regression, only customer focus (β=0,236; p=,040) makes a significant difference on pre-investment cash flow. In order to explore the relations deeply, path analysis is

performed, results of which are shown in ***Figure 7.16.*** Customer focus is the only factor that makes a significant difference on pre-investment cash flow but quality management and process management and CI have indirect effect on pre-investment cash flow via customer focus.

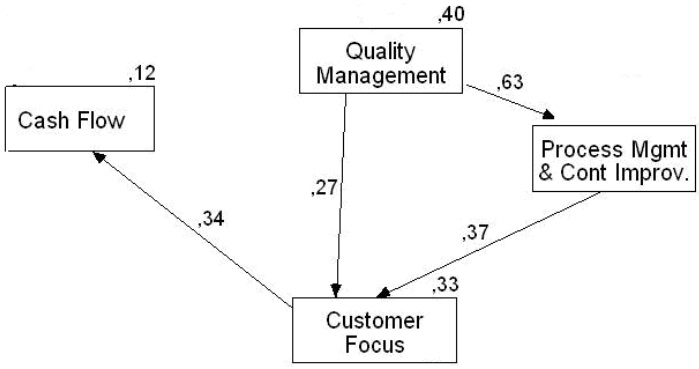

Figure 7.16: Path analysis of process management and CI, customer focus, quality management factors, and pre-investment cash flow

Pre-investment cash flow trend model is statistically very significant ($p<0,05$) and 9,8% of pre-investment cash flow trend variability is accounted for by process management and CI, and customer focus factors ($R^2=0,098$). However, when the factors are analyzed using multiple linear regressions, none of them makes a significant difference on pre-investment cash flow trend. Regression analysis is followed by path analysis, results of which are given in ***Figure 7.17***. Similar to pre-investment cash flow model in Figure 7.16, customer focus makes a significant difference on pre-investment cash flow trend but quality management, process management and CI have indirect effect on pre-investment cash flow trend.

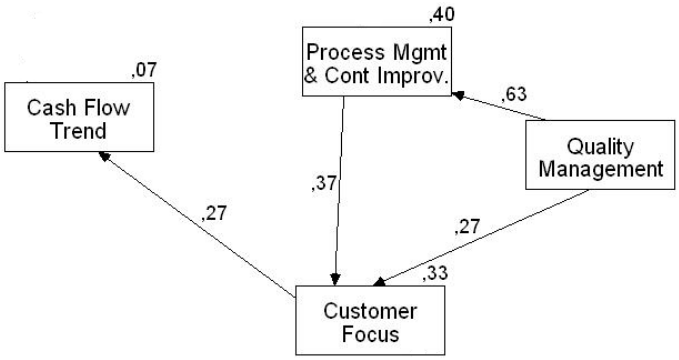

Figure 7.17: Path analysis of process management and CI, customer focus quality management factors, and cash flow trend

Customer satisfaction model is statistically significant ($p<0,01$) and 10,1% of innovative customer satisfaction is accounted for by process management and continuous, and customer focus factors ($R^2=0,101$). However, when the process

management and CI and customer factors are analyzed using multiple linear regression, only process management and CI (β=0,211; p=,088) makes a significant difference on customer satisfaction. Regression analysis is followed by path analysis, results of which are presented in ***Figure 7.18.*** According to path analysis results, customer satisfaction is directly affected by process management and CI. Quality management and customer focus make a significant difference on process management and CI and hence, an indirect effect on customer satisfaction.

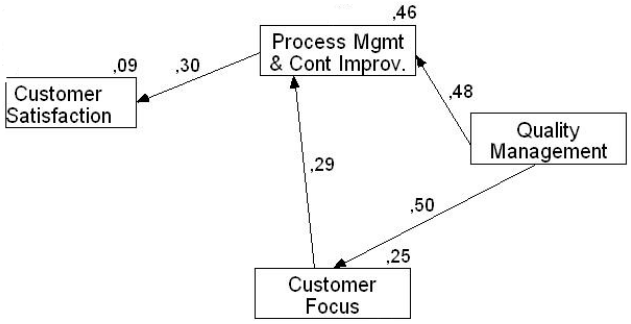

Figure 7.18: Path analysis of process management and CI, customer focus, quality management factors and customer satisfaction

Employee satisfaction model is statistically significant (p<0,01) and 19% of employee satisfaction variability is accounted for by process management and CI, and customer focus factors (R^2=0,190). However, when the factors are analyzed using multiple linear regression, only quality management (β=0,305; p=,007) makes a significant difference on employee satisfaction. In the next step, path analysis is performed, results of which are displayed in ***Figure 7.19.*** Both quality management and customer focus have a significant effect on employee satisfaction. Process management and CI supports them. Customer focus also has an indirect effect on employee satisfaction through quality management.

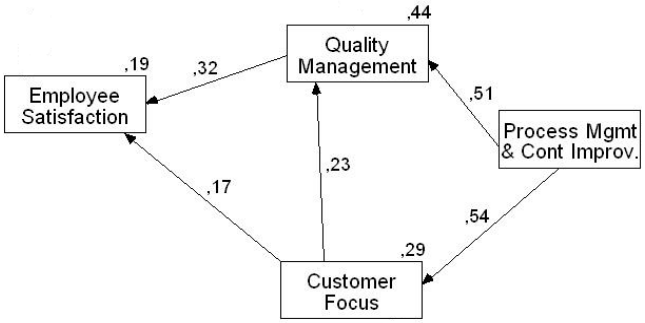

Figure 7.19: Path analysis of process management and CI, customer focus, quality management factors and employee satisfaction

Employee satisfaction trend model is statistically very significant ($p<0.01$) and 8,9% of employee satisfaction trend variability is accounted for by process management and CI, and customer focus factors (R^2=0,089). However, when the factors are analyzed using multiple linear regression, only quality management (β=0,247; p=,037) makes a significant difference on employee satisfaction trend. In the following step, path analysis is performed to discover hidden relations, results of which are displayed in ***Figure 7.20.*** Quality management makes a significant difference on employee satisfaction trend. Both process management and CI, customer focus supports quality management.

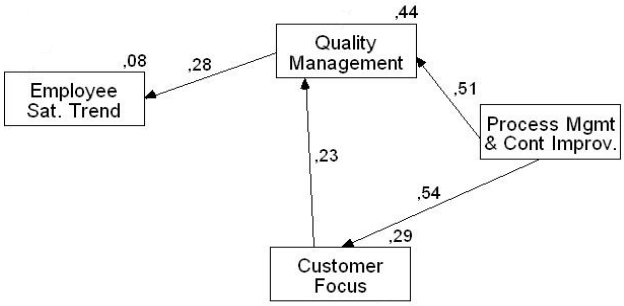

Figure 7.20: Path analysis of process management and CI, customer focus factors and employee satisfaction trend

7.2.3 Human Resources, Planning, and Leadership

The factors human resources, planning and leadership are considered jointly to explore their effects on firm performance. In order to analyze effects of these factors on firm performance, multiple linear regression method is used. Significant regression models are presented in ***Table 7.4*** and ***Table 7.5***.

	Innovative Performance		Productivity		Quality		Pre-investment Cash Flow		Pre-investment Cash Flow Trend	
	R^2=,170	P=,000	R^2=177	P=,000	R^2=,117	P=,004	R^2=,240	P=,000	R^2=,241	P=,000
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Human Resources	,211	,184	,178	,637	,066	,700	,513	,002	,413	,009
Planning	,198	,116	,144	,011	,040	,765	-,097	,444	-,274	,029
Leadership	,045	,738	,159	,630	,261	,069	,054	,689	,274	,037

Table 7.5 Regression models of effects of human resources, planning, and leadership factors on firm performance indicators

Innovative performance model is statistically significant (p<0,01) and 17% of innovative performance variability is accounted for by human resources, planning, and leadership factors (R^2=0,170). However, when the factors are analyzed using multiple linear regressions, none of them has significant effect on innovative performance. For a deeper research of relations, path analysis is performed, results of which are shown in ***Figure 7.21***. In this case, human resources has a direct effect on innovative performance. Planning factor has an indirect effect on innovative performance via human resources. Leadership factor supports both human resources and planning.

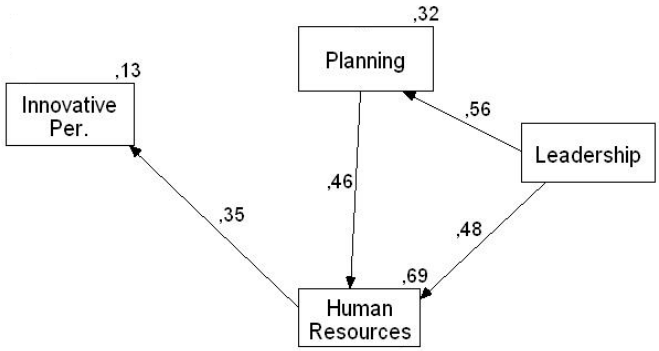

Figure 7.21: Path analysis of human resources, planning, and leadership factors and innovative performance

Productivity model is statistically significant (p<0,01) and 17,7% of productivity variability is accounted for by human resources, planning, and leadership factors (R^2=0,177). However, when the factors are analyzed using multiple linear regressions, only planning (β=0,144; p=,011) makes a significant difference on productivity. In order to reveal hidden relations, path analysis is performed, results of which are shown in ***Figure 7.22***. According to path analysis, leadership factor affects human resources factor; human resources factor affects planning factor and finally planning factor has a direct effect on productivity. We can conclude that in this model planning factor is the most important factor for productivity.

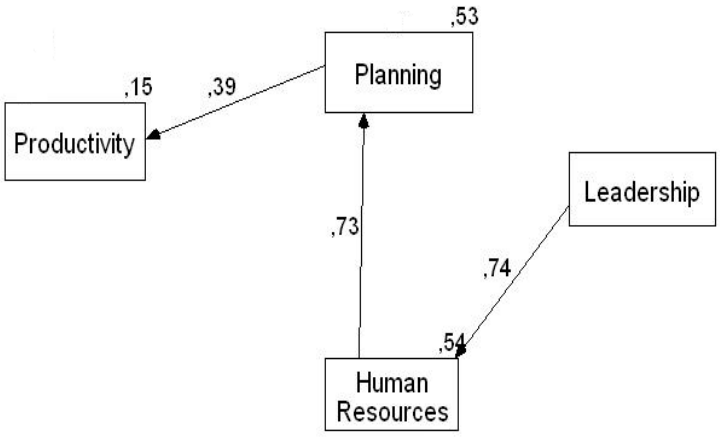

Figure 7.22: Path analysis of human resources, planning, and leadership factors and productivity

Quality model is statistically very significant (p<0,01) and 11,7% of quality variability is accounted for by human resources, planning, and leadership factors (R^2=0,117). However, when the human resources, planning and leadership factors are analyzed in the multiple linear regressions, none of them has s significant effect on quality. In order to discover hidden interactions path analysis is performed which is shown in ***Figure 7.23***. According to analysis, planning affects human resources; human resources affect leadership and it has a direct effect on quality. Here, we can summarize that leadership is the most effective factor for quality

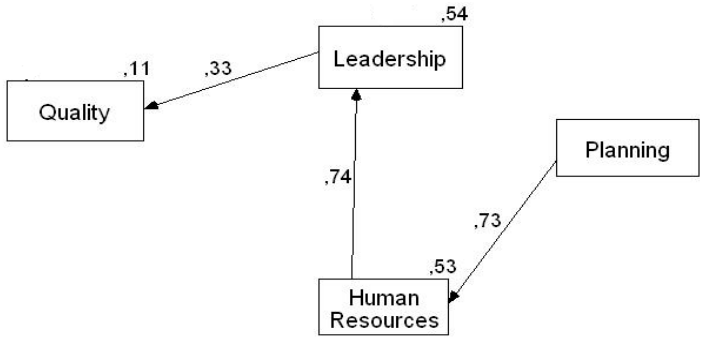

Figure 7.23: Path analysis of human resources, planning, and leadership factors and quality

Pre-investment cash flow model is statistically very significant (p<0,01) and 24% of pre-investment cash flow variability is accounted for by human resources, planning, and leadership factors (R^2=0,240). However, when the factors are analyzed using multiple linear regression, only human resources (β=0,513; p=,002) makes a significant difference on pre-investment cash flow because of mediating effect. In order to explore the relations deeply, path analysis is performed, results of which are shown in ***Figure 7.24***. Human resources factor is the most important factor, it has a direct effect on cash

flow. Planning factor supports human resources; leadership supports both human resources and planning factors.

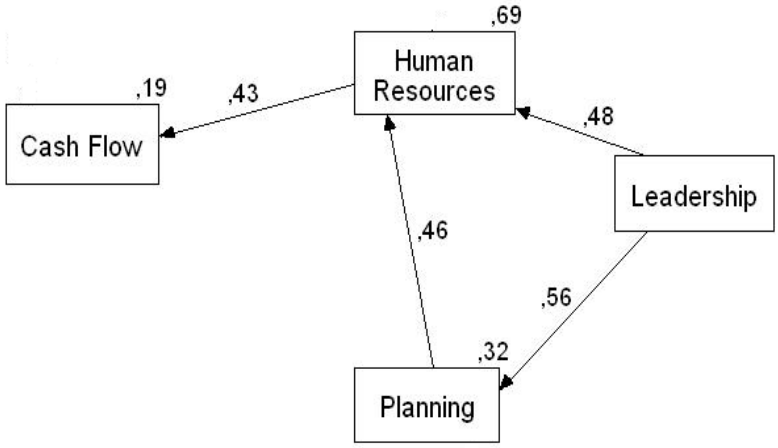

Figure 7.24: Path analysis of human resources, planning, and leadership factors and pre-investment cash flow

Pre-investment cash flow trend model is statistically very significant ($p<0,01$) and 24,1% of pre-investment cash flow trend variability is accounted for by human resources, planning, and leadership factors ($R^2=0,241$). However, when factors are analyzed using multiple linear regressions, human resources ($\beta=0,413$; $p=,009$), planning ($\beta= - 0,274$; $p=,029$) and leadership ($\beta=0,274$; $p=,037$) have significant effect on pre-investment cash flow trend. Regression analysis is followed by path analysis, results of which are given in ***Figure 7.25***. Here, planning factor affects human resources; human resources affect leadership and it has a direct effect on pre-investment cash flow trend. We can say that leadership factor is the most important factor for cash flow trend.

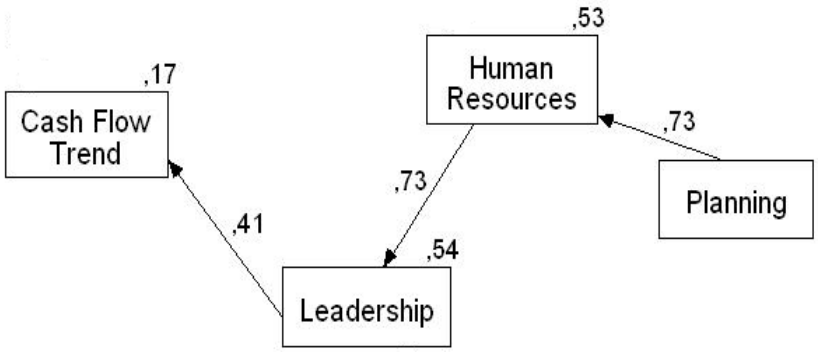

Figure 7.25: Path analysis of human resources, planning, and leadership factors and pre-investment cash flow trend

	Flexibility		Flexibility Trend		Customer Satisfaction		Customer Satisfaction Trend		Employee Satisfaction		Employee Satisfaction Trend	
	R^2=,285	P=,000	R^2=,087	P=,016	R^2=,095	P=,009	R^2=,068	P=,046	R^2=,272	P=,000	R^2=,215	P=,000
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Human Resources	,380	,010	,300	,068	,195	,227	,140	,100	321	,028	,245	,103
Planning	,118	,312	-,054	,675	,160	,213	,112	,046	,010	,934	-,205	,088
Leadership	,079	,523	,042	,763	-,029	,830	,123	,394	,228	,064	,366	,005

Table 7.6 Regression models of effects of human resources, planning, and leadership factors on firm performance indicators

A second set of regression models of effects of human resources, planning, and leadership factors on firm performance indicators are given in ***Table 7.6***.

Flexibility model is statistically very significant (p<0,01) and 28,5% of flexibility variability is accounted for by human resources, planning, and leadership factors (R^2=0,285). However, when the factors are analyzed using multiple linear regressions, human resources (β=0,380; p=,010) has a significant effect on flexibility. In order to discover hidden interactions path analysis is performed, results of which are shown in ***Figure 7.26***. Here, human resources factor is the most effective factor for flexibility. Planning supports human resources; leadership affects both human resources and planning factors so they don't affect flexibility directly.

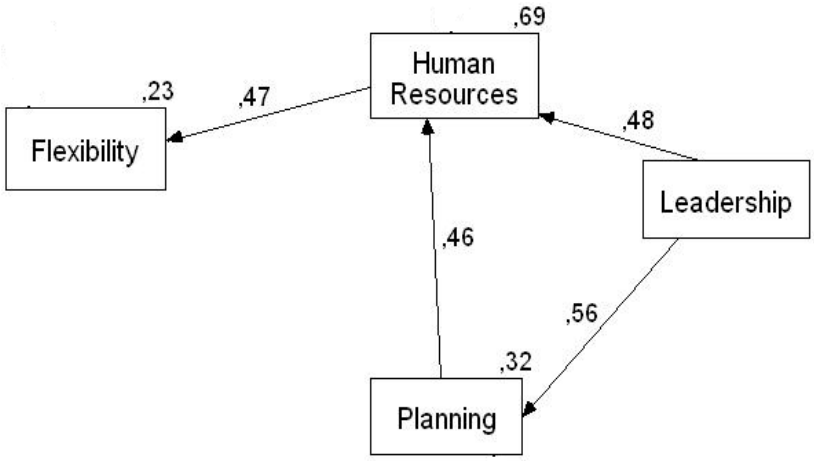

Figure 7.26: Path analysis of human resources, planning, and leadership factors and flexibility

Flexibility trend model is statistically significant (p<0,05) and 8,7% of flexibility trend variability is accounted for by human resources, planning, and leadership factors (R^2=0,087). However, when factors are analyzed using multiple linear regressions,

human resources (β=0,300; p=,068) have significant effect on flexibility trend. In order to discover hidden interactions path analysis is performed, results of which are shown in ***Figure 7.27***. Similar to flexibility model, human resources factor is the most effective factor for flexibility trend. Leadership and planning factors support human resources so they don't affect flexibility trend directly.

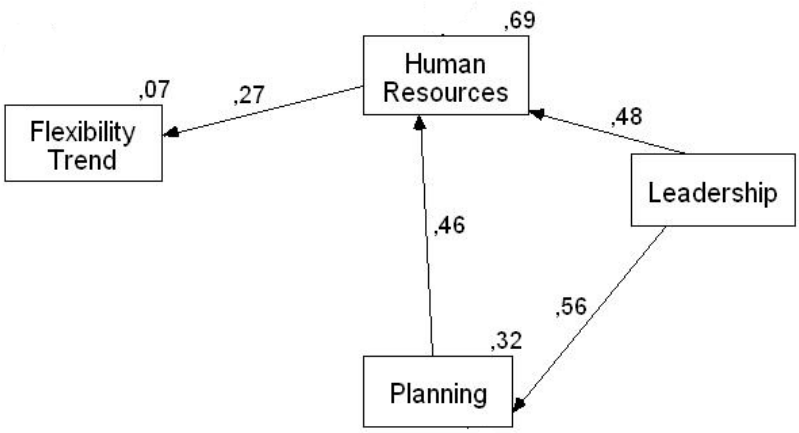

Figure 7.27: Path analysis of human resources, planning, and leadership factors and flexibility trend

Customer satisfaction model is statistically very significant (p<0,01) and 9,5% of customer satisfaction variability is accounted for by human resources, planning, and leadership factors (R^2=0,095). However, when human resources, planning and leadership factors are analyzed using multiple linear regressions, none of them has significant effect on customer satisfaction. Regression analysis is followed by path analysis, results of which are presented in ***Figure 7.28***. Human resources is the most effective factor for customer satisfaction. Leadership and planning factors support human resources factor so they don't affect customer satisfaction directly.

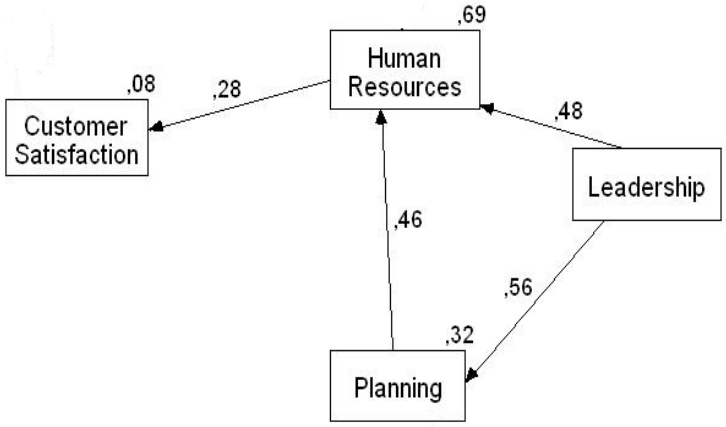

Figure 7.28: Path analysis of human resources, planning, and leadership factors and customer satisfaction

Customer satisfaction trend model is statistically significant (p<0,05) and 6,8% of customer satisfaction variability is accounted for by human resources, planning, and leadership factors (R^2=0,068). However, when the factors are analyzed using multiple linear regressions, only planning (β=0,112; p=,046) makes a significant difference on customer satisfaction trend. In the following step, path analysis is performed to discover hidden relations, results of which are displayed in ***Figure 7.29.*** Human resources is the most effective factor for customer satisfaction trend. Leadership affects customer satisfaction trend via human resources and planning. Planning also affects customer satisfaction trend

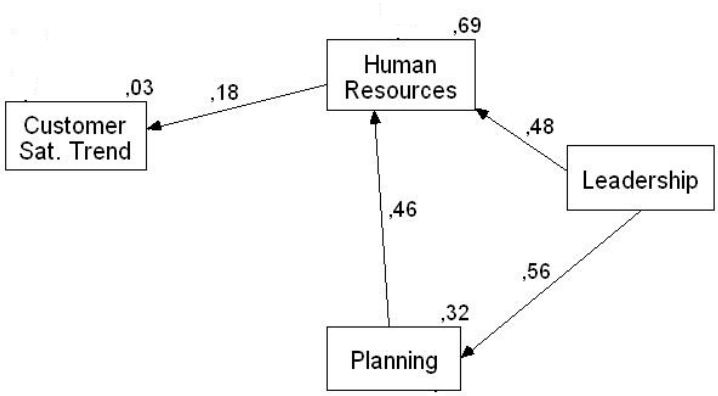

Figure 7.29: Path analysis of human resources, planning, and leadership factors and customer satisfaction trend

Employee satisfaction model is statistically very significant (p<0.01) and 27,2% of employee satisfaction variability is accounted for by human resources, planning, and leadership factors (R^2=0,272). However, when the factors are analyzed in the multiple linear regression, human resources (β=0,321; p=,028) and leadership (β=0,228; p=,064) have significant positive effect on employee satisfaction. In the next step, path analysis is performed, results of which are displayed in ***Figure 7.30***. Leadership and human resources are the most important factors for employee satisfaction. Planning does not have a direct effect on employee satisfaction it supports human resources. Human resources both effect leadership and employee satisfaction.

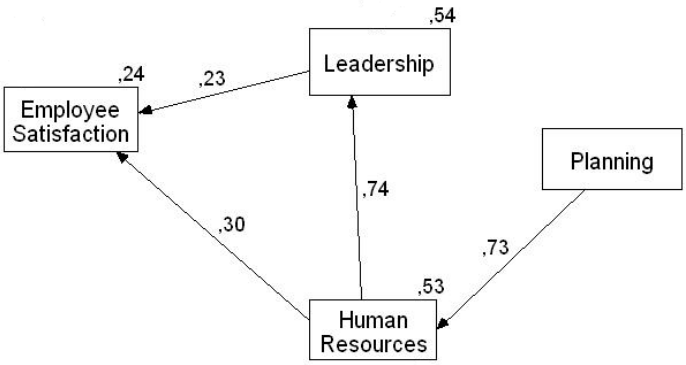

Figure 7.30: Path analysis of human resources, planning, and leadership factors and employee satisfaction

Employee satisfaction trend model is statistically very significant (p<0,01) and 21,5% of employee satisfaction trend variability is accounted for by human resources, planning, and leadership factors (R^2=0,215). However, when the factors are analyzed in the multiple linear regression, planning (β= -0,205; p=,088) and leadership (β=0,366; p=,005) have significant effect on employee satisfaction trend. In the following step, path analysis is performed to discover hidden relations, results of which are displayed in ***Figure 7.31***. Here, leadership factor is the most important factor for employee satisfaction trend. Planning factor does not have a direct affect on employee satisfaction trend. It supports human resources and human resources affect leadership.

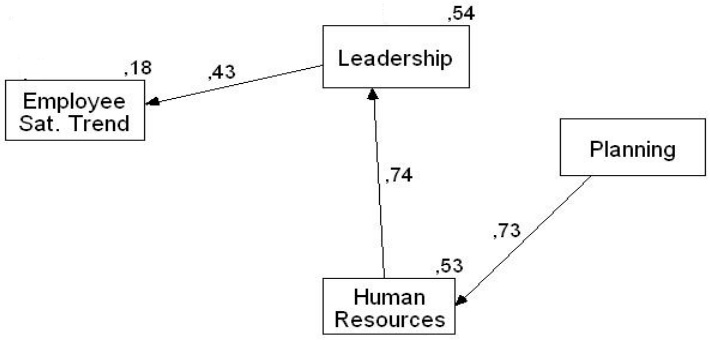

Figure 7.31 Path analysis of human resources, planning, and leadership factors and employee satisfaction trend

7.2.4 Quality Management, Planning, and Leadership

Here, we have selected quality management, planning and leadership factors for checking ***inventory management model***. This model is statistically significant (p<0,05) and 8,4% of inventory management variability is accounted for by quality management, planning, and leadership factors' variability (R^2=0,084). However, when the factors are analyzed in the multiple linear regression, only quality management (β= -0,374; p=,007)

and planning (β= 0,279; p=,045) have effect on inventory management (***Table 7.7***) In the following step, path analysis is performed to discover hidden relations which is displayed in ***Figure 7.32.*** According to path analysis, quality management has a negative effect on inventory management. This relation may be interpreted that producing more qualified products causes high level of stocks in the firm. On the other hand, planning makes a significant positive difference on inventory management. Additionally, leadership supports both quality management and planning in a positive way.

	Inventory Management	
	R^2=,084	P=,034
	Standart Beta	P Value
Quality Management	-,374	,007
Leadership	,123	,356
Planning	,270	,045

Table 7.7: Regression analysis of inventory management model

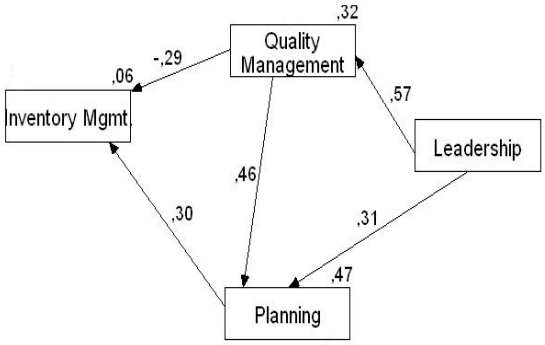

Figure 7.32: Path analysis of inventory management model

7.2.5 Manufacturing Structure and Operations

This group consists of three factors namely operation structure, operation diversity and manufacturing capabilities. For testing the effects of these factors on firm performance, multiple linear regression method is used which is presented in ***Table 7.8.***

	Innovative Performance		Productivity		Quality		Flexibility		Pre-investment Cash Flow		Pre-investment Cash Flow Trend		Customer Satisfaction		Employee Satisfaction		Employee Satisfaction Trend	
	R^2=,170	P=,000	R^2=166	P=,000	R^2=,070	P=,045	R^2=,132	P=,001	R^2=,097	P=,013	R^2=,120	P=,003	R^2=,100	P=,006	R^2=,117	P=,002	R^2=,092	P=,011
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Operation Diversity	,023	,814	,070	,473	-,211	,048	,046	,645	,173	,108	,088	,410	-,193	,057	-,151	,132	-,145	,164
Operation Structure	,268	,014	,294	,007	,012	,920	,241	,031	,150	,206	,165	,154	,105	,345	,215	,052	,146	,194
Manufacturing Capability	,179	,118	,113	,323	,286	,023	,136	,246	,061	,628	,163	,186	,288	,015	,216	,064	,241	,044

Table 7.8: Regression models of effects of manufacturing structure and operations factors on firm performance indicators

Innovative performance model is statistically very significant (p<0,01) and 17% of innovative performance variability is accounted for by manufacturing structure and

operations factors (R^2=0,170). However, when the factors are analyzed using the multiple linear regressions, only operation structure (β= 0,268; p=,014) has significant effect on innovative performance. For a deeper research of relations, path analysis is performed, results of which are shown in ***Figure 7.33***. Here, operation structure is the most important factor for innovative performance, operation diversity supports manufacturing capabilities; manufacturing capabilities supports operation structure.

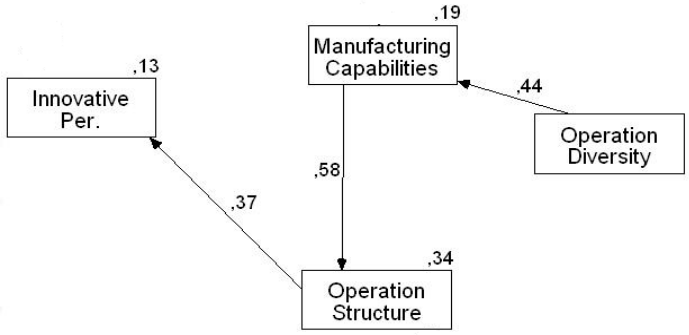

Figure 7.33: Path analysis of manufacturing structure and operations factors and innovative performance

Productivity model is statistically very significant (p<0,01) and 16,6% of productivity variability is accounted for by manufacturing structure and operations factors (R^2=0,166). However, when the factors are analyzed using multiple linear regressions, only operation structure (β=0,294; p=,007) makes a significant difference on productivity. In order to reveal hidden relations, path analysis is performed, results of which are shown in ***Figure 7.34***. In this model, operation structure is the vital factor for productivity, operation diversity supports manufacturing capabilities; manufacturing capabilities supports operation structure.

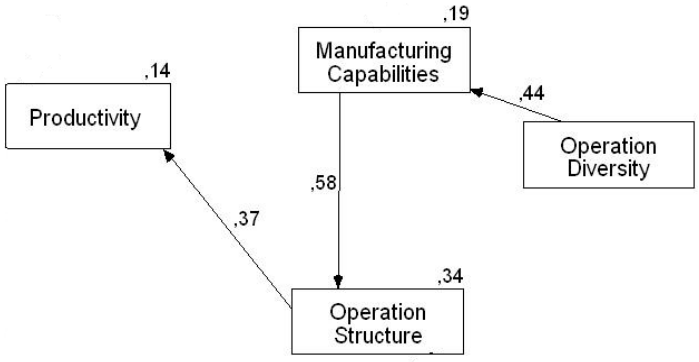

Figure 7.34: Path analysis of manufacturing structure and operations factors and productivity

Quality model is statistically significant (p<0,05) and 7% of quality variability is accounted for by manufacturing structure and operations factors (R^2=0,070). However,

when the manufacturing structure and operations factors are analyzed using multiple linear regressions, operation diversity (β=-0,211; p=,048) and manufacturing capabilities (β= 0,286; p=,023) has significant effect on quality. In order to discover hidden interactions path analysis is performed results of which are shown in ***Figure 7.35***. Unsurprisingly, operation diversity has a negative effect on quality because focusing on producing high number of different products affects quality in a negative way; it is better to focus on core manufacturing technology for the firm. On the other hand, manufacturing capabilities makes a significant positive difference on both quality and operation diversity and additionally operation structure's effect on quality comes through manufacturing capabilities.

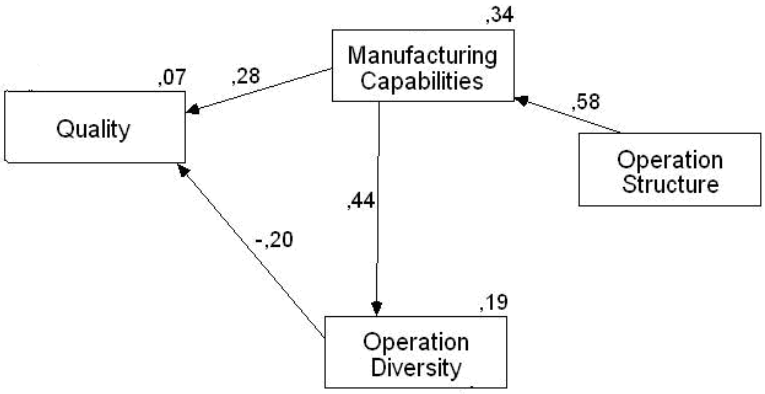

Figure 7.35: Path analysis of manufacturing structure and operations factors and quality

Flexibility model is statistically very significant (p<0,01) and 13,2% of flexibility variability is accounted for by manufacturing structure and operations factors (R^2=0,132). However, when manufacturing structure and operations factors are analyzed using multiple linear regression, only operation structure (β= 0,241; p=,031) has significant effect on flexibility. In order to investigate the relations in a more detailed way, path analysis is performed According to ***Figure 7.36***, operation structure is the most important factor for flexibility; manufacturing capabilities supports operation structure and finally operation diversity affects manufacturing capabilities.

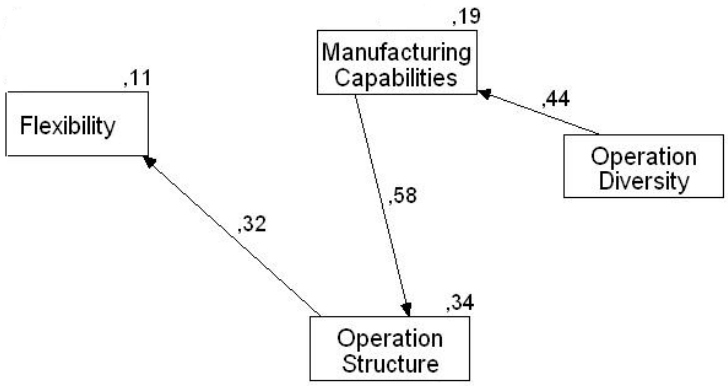

Figure 7.36: Path analysis of manufacturing structure and operations factors and flexibility

Pre-investment cash flow model is statistically significant (p<0,05) and 9,7% of pre-investment cash flow variability is accounted for by manufacturing structure and operations factors (R^2=0,097). However, when the factors are analyzed using multiple linear regressions, none of them has significant effect on pre-investment cash flow because of mediating effect. In order to explore the relations deeply, path analysis is performed. In ***Figure 7.37***, operation diversity has a direct effect on pre-investment cash flow; manufacturing capabilities supports operation diversity and operation structure supports manufacturing capabilities.

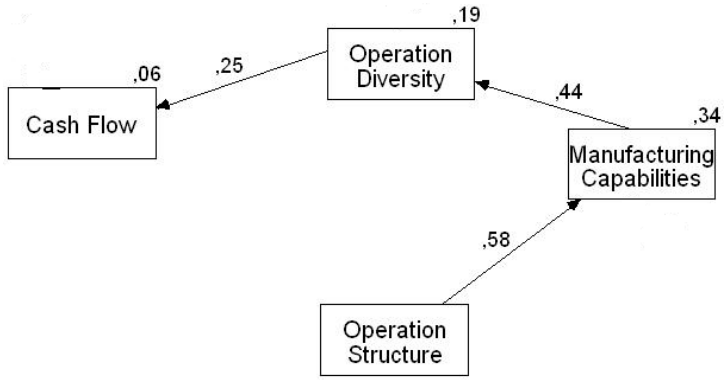

Figure 7.37: Path analysis of manufacturing structure and operations factors and pre-investment cash flow

Pre-investment cash flow trend model is statistically very significant (p<0,01) and 12% of pre-investment cash flow trend variability is accounted for by manufacturing structure and operations factors (R^2=0,120). However, when manufacturing structure and operations factors are analyzed using multiple linear regressions, none of them has significant effect on pre-investment cash flow trend. Regression analysis is followed by path analysis. In ***Figure 7.38***, manufacturing capabilities is the most important factor for cash flow trend; operation structure supports

manufacturing capabilities. Operation diversity is effective on both manufacturing capabilities and operation structure.

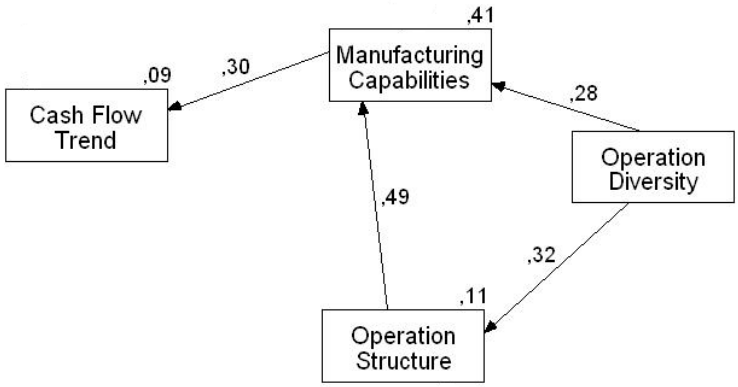

Figure 7.38: Path analysis of manufacturing structure and operations factors and pre-investment cash flow trend

Customer satisfaction model is statistically very significant (p<0,01) and 10% of customer satisfaction variability is accounted for by manufacturing structure and operations factors (R^2=0,100). However, when the factors are analyzed using multiple linear regression, only operation diversity (β=-0,193; p=,057) and manufacturing capabilities (β=0,288; p=,015) has significant effect on customer satisfaction. In the following step, path analysis is performed to discover relations. In ***Figure 7.39***, manufacturing capabilities is the most important factor for customer satisfaction; operation structure supports both manufacturing capabilities and operation diversity. Operation diversity supports manufacturing capabilities.

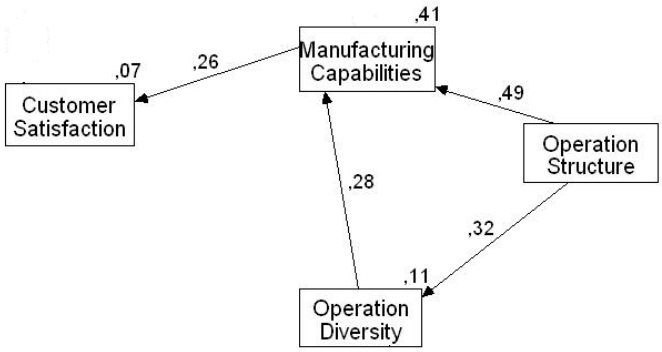

Figure 7.39: Path analysis of manufacturing structure and operations factors and customer satisfaction

Employee satisfaction model is statistically very significant (p<0,01) and 11,7% of employee satisfaction variability is accounted for by manufacturing structure and operations factors (R^2=0,117). However, when manufacturing structure and operations factors are analyzed using multiple linear regression, operation structure (β=0,215;

p=,052) and manufacturing capabilities (β=0,216; p=,064) have significant positive effect on employee satisfaction. In the next step, path analysis is performed**.** In ***Figure 7.40***, operation structure has the most important effect on employee satisfaction; operation diversity supports manufacturing capabilities and manufacturing capabilities supports operation structure.

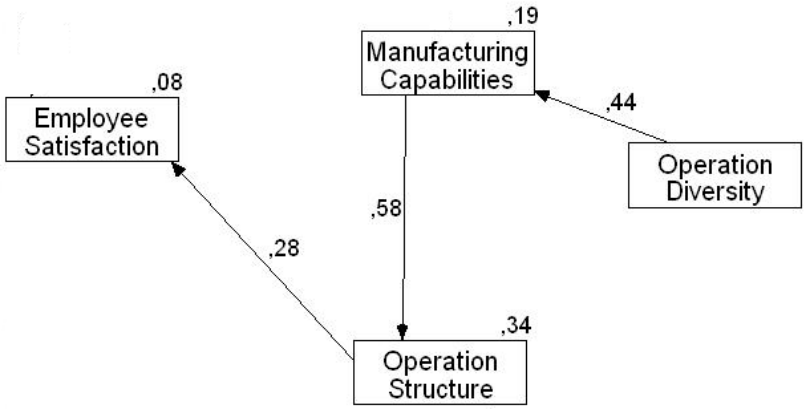

Figure 7.40: Path analysis of manufacturing structure and operations factors and employee satisfaction

Employee satisfaction trend model is statistically significant (p<0,05) and 9,2% of employee satisfaction trend variability is accounted for by manufacturing structure and operations factors (R^2=0,092). However, when the factors are analyzed using multiple linear regression, manufacturing capabilities (β=0,241; p=,044) has significant effect on employee satisfaction trend. In the following step, path analysis is performed to discover hidden relations, results of which are given in ***Figure 7.41***. Here, manufacturing capabilities is the vital factor for employee satisfaction trend; operation diversity supports both manufacturing capabilities and operation structure. Operation structure affects manufacturing capabilities.

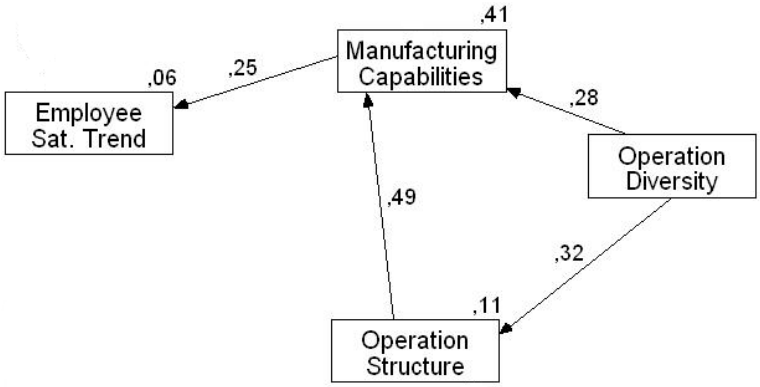

Figure 7.41: Path analysis of manufacturing structure and operations factors and employee satisfaction trend

7.2.6 Manufacturing Strategy

Manufacturing strategy covers manufacturing cost, manufacturing quality, manufacturing flexibility and delivery reliability and speed factors. For testing the effects of these factors on firm performance, multiple linear regression method is used. Significant regression models that investigate the effects are presented in ***Table 7.9.***

	Productivity		Productivity Trend		Flexibility		Flexibility Trend		Pre-investment Cash Flow		Pre-investment Cash Flow Trend	
	R^2=,091	P=,031	R^2=,099	P=,020	R^2=,132	P=,003	R^2=,161	P=,001	R^2=,089	P=,046	R^2=,104	P=,021
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Delivery Reliability	-,044	,726	-,327	,009	,068	,581	,202	,095	,044	,738	,028	,828
Manufacturing Flexibility	,147	,230	,095	,433	,328	,007	,070	,548	,018	,886	,015	,908
Manufacturing Cost	-,057	,629	,275	,020	-,082	,477	,267	,020	,224	,070	,200	,098
Manufacturing Quality	,272	,015	,096	,384	,065	,546	-,131	,218	,061	,593	,140	,214

Table 7.9: Regression models of effects of manufacturing strategy factors on firm performance indicators

Productivity model is statistically significant (p<0,05) and 9,1% of productivity variability is accounted for by manufacturing strategy (R^2=0,091). However, when the factors are analyzed using multiple linear regressions, only manufacturing quality factor (β=0,272; p=,015) makes a significant difference on productivity. In order to reveal hidden relations, path analysis is performed, results of which are given in ***Figure 7.42***.

Here, manufacturing quality factor has the most important effect on productivity. Other performance factors have indirect effect on productivity.

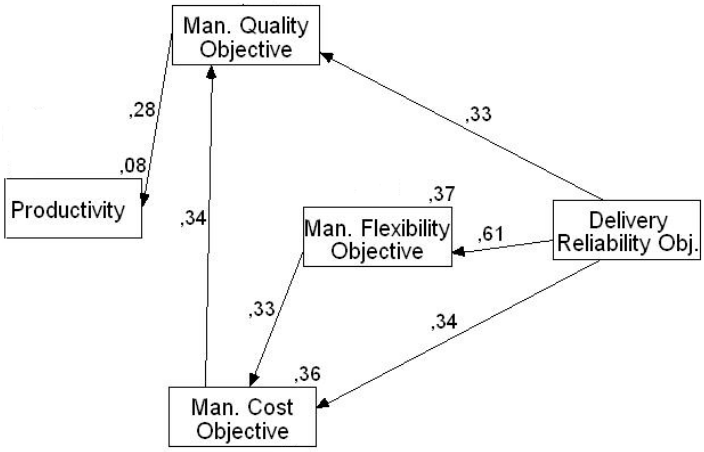

Figure 7.42: Path analysis of manufacturing strategy factors and productivity

Productivity trend model is statistically significant (p<0,5) and 16,6% of productivity trend variability is accounted for by manufacturing strategy (R^2=0,166). However, when the factors are analyzed using multiple linear regressions, delivery reliability (β=-0,327; p=,009) and manufacturing cost objective (β=0,275; p=,020) have significant effect on productivity trend. In order to reveal hidden relations, path analysis is performed, results of which are given in ***Figure 7.43***. Here, manufacturing cost objective and delivery reliability objective are the most important factors for productivity trend. Manufacturing flexibility objective and manufacturing quality objective supports them; they not have a direct affect.

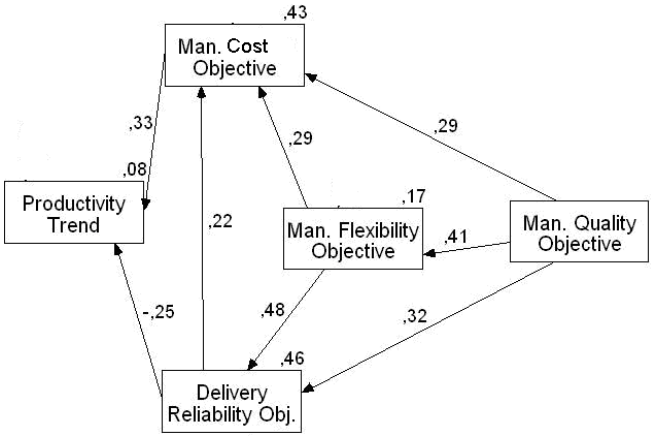

Figure 7.43: Path analysis of manufacturing strategy factors and productivity trend

Flexibility model is statistically very significant (p<0,01) and 13,2% of flexibility variability is accounted for by manufacturing strategy (R^2=0,132). However, when the

factors are analyzed using multiple linear regressions, only manufacturing flexibility (β= 0,328; p=,007) has significant effect on flexibility. In order to investigate the relations in a more detailed way, path analysis is performed, results of which are given in ***Figure 7.44***. According to path analysis, manufacturing flexibility objective has the most important effect on flexibility. Manufacturing cost and delivery reliability supports manufacturing flexibility and finally, manufacturing quality factor supports manufacturing cost and delivery reliability factors.

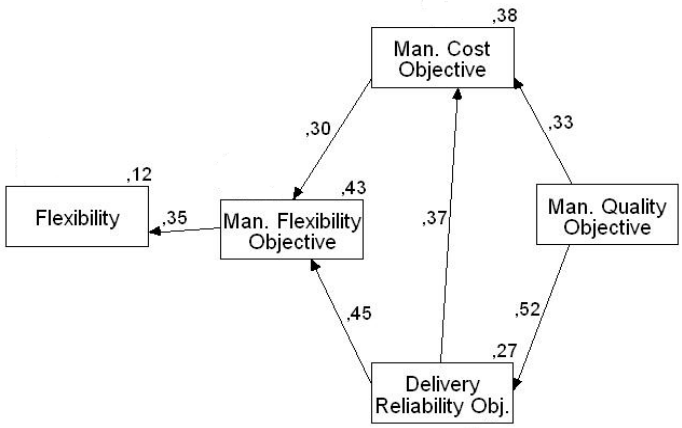

Figure 7.44: Path analysis of manufacturing strategy factors and flexibility

Flexibility trend model is statistically very significant (p<0,01) and 16,1% of flexibility trend variability is accounted for by manufacturing strategy (R^2=0,161). However, when the factors are analyzed using multiple linear regressions, delivery reliability (β=0,202; p=,095) and manufacturing cost objective (β=0,267; p=,020) have significant positive effect on flexibility. In order to investigate relations in a more detailed way, path analysis is performed, results of which are given in ***Figure 7.45***. According to analysis, manufacturing cost objective has the most important effect on flexibility trend; delivery reliability, manufacturing quality and manufacturing flexibility have an indirect effect on flexibility trend via manufacturing cost factor.

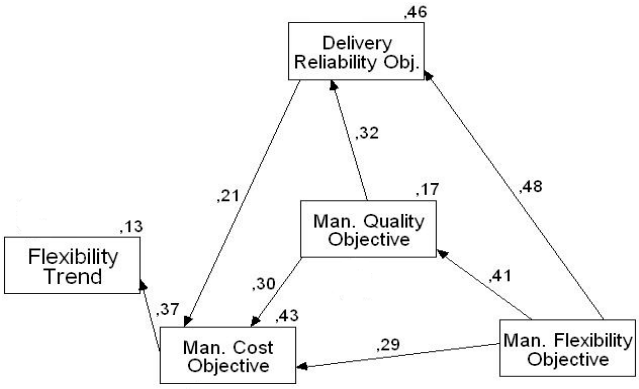

Figure 7.45: Path analysis of manufacturing strategy factors and flexibility trend

Pre-investment cash flow model is statistically significant (p<0,05) and of pre-investment cash flow variability is accounted for by manufacturing strategy 8,9% (R^2=0,089). However, when the factors are analyzed using multiple linear regressions, only manufacturing cost objective (β=0,224; p=,070) makes a significant difference on pre-investment cash flow because of mediating effect. In order to explore the relations deeply, path analysis is performed, results of which are given in ***Figure 7.46***. Manufacturing cost objective is the most effective factor for pre-investment cash flow. Other performance objectives support manufacturing cost; they don't affect pre-investment cash flow directly.

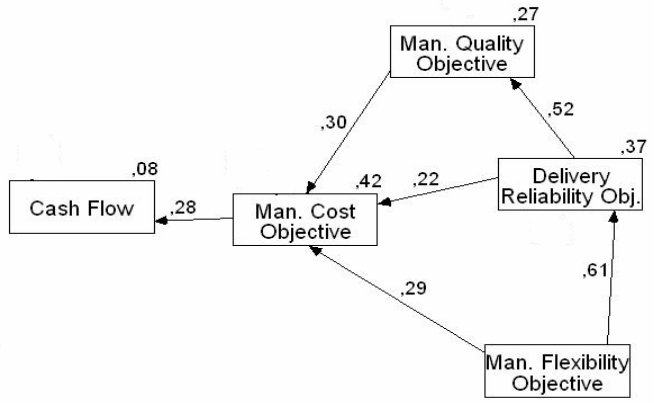

Figure 7.46: Path analysis of manufacturing strategy factors and cash flow

Pre-investment cash flow trend model is statistically significant (p<0,05) and 10,4% of pre-investment cash flow trend variability is accounted for by manufacturing strategy (R^2=0,104). However, when factors are analyzed using multiple linear regressions, manufacturing cost objective (β=0,200; p=,098) has significant effect on pre-investment cash flow trend. Regression analysis is followed by path analysis, results of which are given in ***Figure 7.47***. Similar to previous cash flow model, manufacturing

cost objective is the most effective factor for pre-investment cash flow trend. Other performance factors support manufacturing cost factor.

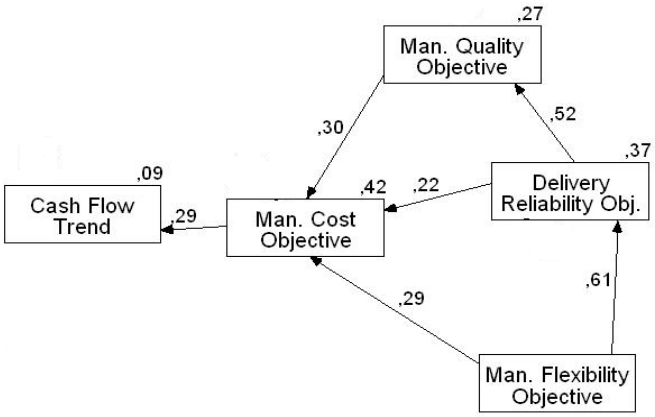

Figure 7.47: Path analysis of manufacturing strategy factors and cash flow trend

7.2.7 Supplier Relations

Supplier relations include three factors: supplier information accumulation, information sharing and supplier quality management. In order to analyze effects of these factors on firm performance, multiple linear regression method is used. Significant regression models that investigate the effects of supplier relations are presented in ***Table 7.10.***

	Innovative Performance		Productivity		Quality		Flexibility		Pre-investment Cash Flow		Pre-investment Cash Flow Trend		Employee Satisfaction		Inventory Management	
	R^2=,071	P=,039	R^2=,093	P=,011	R^2=,095	P=,012	R^2=,129	P=,001	R^2=,180	P=,000	R^2=,096	P=,013	R^2=,142	P=,000	R^2=,067	P=,074
	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value	Standart Beta	P Value
Supplier Inf. Accum.	-,027	,798	,094	,377	-,072	,502	,048	,644	-,116	,274	-,113	,307	,143	,160	,279	,018
Information Sharing	,181	,130	-,067	,571	,203	,099	,254	,029	,095	,422	,053	,663	,183	,107	-,178	,174
Supplier Quality Mgmt.	,129	,291	,288	,018	,171	,169	,107	,364	,408	,001	,318	,013	,130	,261	,045	,736

Table 7.10: Regression models of effects of supplier relations factors on firm performance indicators

Innovative performance model is statistically significant ($p<0,05$) and 7,1% of innovative performance variability is accounted for by supplier relations (R^2=0,071). However, when the factors are analyzed using multiple linear regressions, none of the factors makes a significant difference on innovative performance. For a deeper research of relations path analysis is performed, results of which are given in ***Figure 7.48***. Information sharing with supplier factor is the most effective factor for innovative

performance, supplier quality management factor supports information sharing; supplier information accumulation factor supports both information sharing and supplier quality management factors.

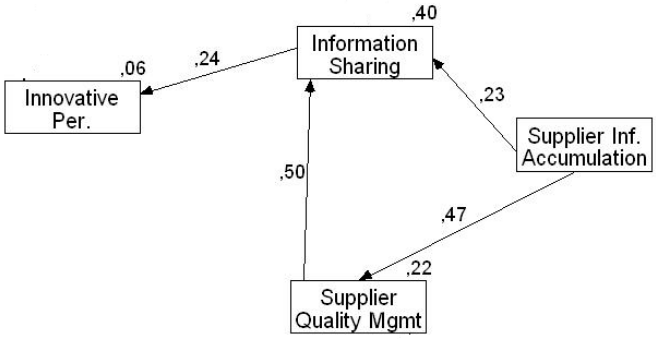

Figure 7.48: Path analysis of supplier relations and innovative performance

Productivity model is statistically significant (p<0,05) and 9,3% of productivity variability is accounted for by supplier relations (R^2=0,093). However, when the factors are analyzed using multiple linear regressions, only supplier quality management (β=0,288; p=,018) makes a significant difference on productivity. In order to reveal hidden relations, path analysis is performed, results of which are given in ***Figure 7.49***. Supplier quality management is the most effective factor for productivity. On the other hand, information sharing supports supplier information accumulation and supplier quality management. Supplier information accumulation's effect on productivity comes through supplier quality management.

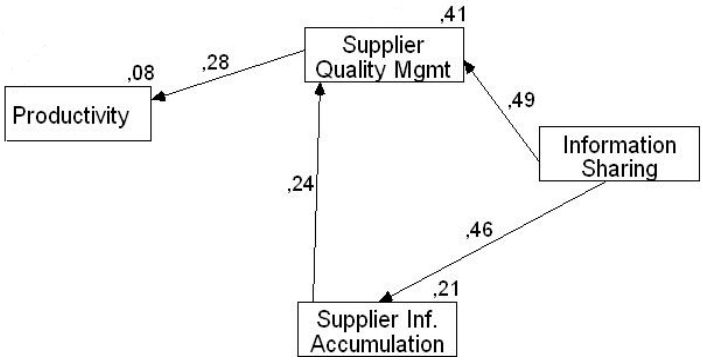

Figure 7.49: Path analysis of supplier relations factors and productivity

Quality model is statistically significant (p<0,05) and 9,5 % of quality variability is accounted for by supplier relations (R^2=0,095). However, when supplier relations are analyzed in the multiple linear regressions, only information sharing (β= 0,203; p=,099) makes a significant difference on quality. In the next step, path analysis is performed which is displayed in ***Figure 7.50***. Information sharing with supplier is the most

effective factor for quality. On the other hand, supplier quality management supports information sharing; supplier information accumulation supports both information sharing and supplier quality management.

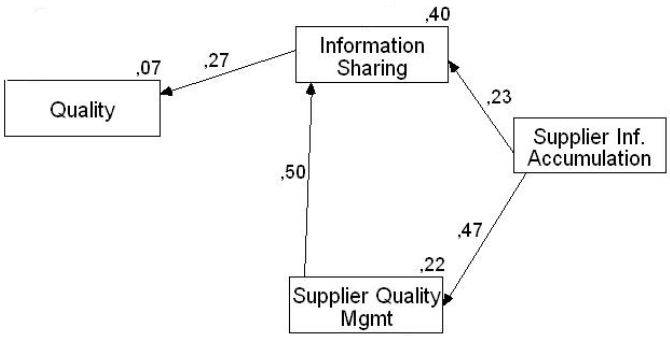

Figure 7.50: Path analysis of supplier relations factors and quality

Flexibility model is statistically very significant (p<0,01) and 12,9% of flexibility variability is accounted for by supplier relations (R^2=0,129). However, when the supplier relations factors are analyzed using multiple linear regressions, only information sharing (β= 0,254; p=,029) has significant effect on flexibility. In order to research relations in a more detailed way, path analysis is performed, results of which are given in ***Figure 7.51***. Information sharing with supplier has the most important effect on flexibility. On the other hand, supplier quality management supports information sharing; supplier information accumulation supports both information sharing and supplier quality management.

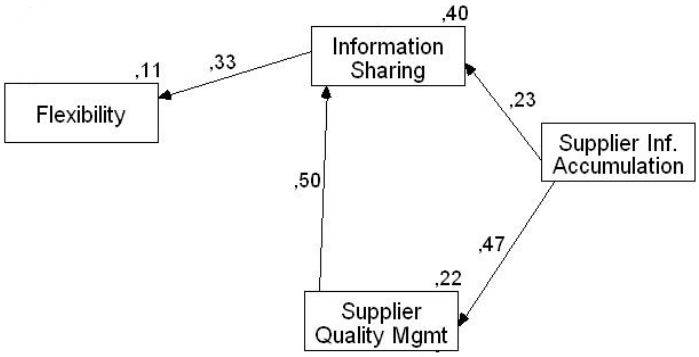

Figure 7.51: Path analysis of supplier relations factors and flexibility

Pre-investment cash flow model is statistically very significant (p<0,01) and 18% of pre-investment cash flow variability is accounted for by supplier relations (R^2=0,180). However, when the factors are analyzed using multiple linear regressions, only supplier quality management (β= 0,408; p=,001) has significant effect on pre-investment cash flow because of mediating effect. In order to explore the relations deeply path analysis

is performed, results of which are given in ***Figure 7.52***. Supplier quality management affects pre-investment cash flow directly. On the other hand, supplier information accumulation supports supplier quality management; supplier information sharing supports both supplier information accumulation and supplier quality management.

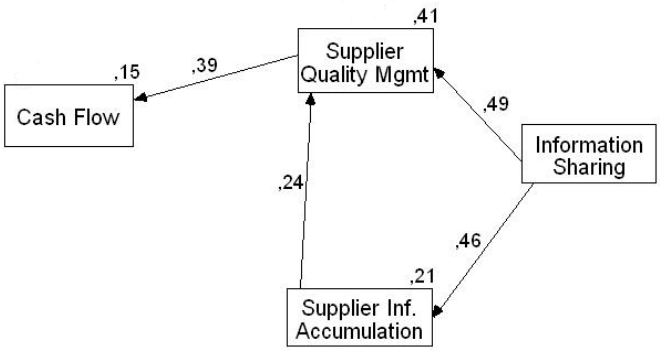

Figure 7.52: Path analysis of supplier relations factors and cash flow

Pre-investment cash flow trend model is statistically significant ($p<0,05$) and 9,6% of pre-investment cash flow trend variability is accounted for by supplier relations ($R^2=0,096$). However, when supplier relations factors are analyzed using multiple linear regressions, only supplier quality management ($\beta= 0,318$; $p=,013$) has significant effect on pre-investment cash flow trend. Regression analysis is followed by path analysis, results of which are given in ***Figure 7.53***. Supplier quality management has direct effect on pre-investment cash flow trend. On the other hand, supplier information accumulation supports supplier quality management; supplier information sharing supports both supplier information accumulation and supplier quality management. It does not have a direct effect on pre-investment cash flow trend.

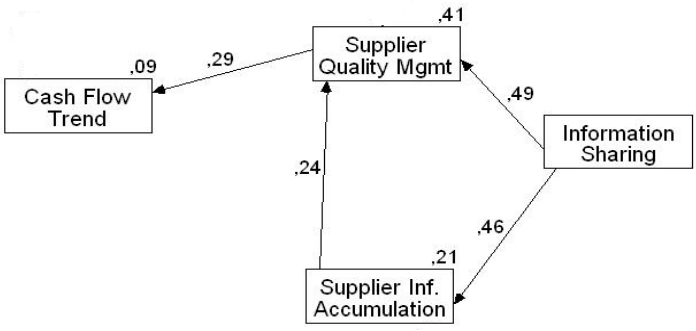

Figure 7.53: Path analysis of supplier relations factors and cash flow trend

Employee satisfaction model is statistically very significant ($p<0,01$) and 14,2% of employee satisfaction variability is accounted for by supplier relations ($R^2=0,142$). However, when supplier relations are analyzed using multiple linear regressions, none

of them have significant positive effect on employee satisfaction. In the next step, path analysis is performed, results of which are given in ***Figure 7.54***. Information sharing has a direct effect on employee satisfaction. On the other hand, supplier information accumulation supports information sharing; supplier quality management supports both supplier information sharing and supplier information accumulation. It does not have a direct effect on pre-investment cash flow

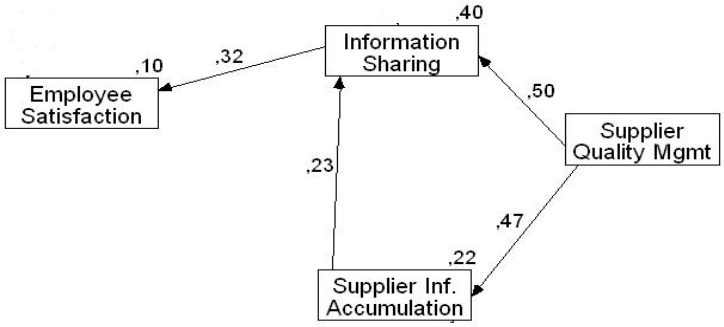

Figure 7.54: Path analysis of supplier relations factors and employee satisfaction

Inventory management model is statistically significant ($p<0,05$) and 6,7% of inventory management variability is accounted for by supplier relations ($R^2=0,067$). However, when supplier relations are analyzed in the multiple linear regressions, only supplier information accumulation ($\beta= 0,279$; $p=,018$) makes a significant difference on inventory management. In the next step, path analysis is performed which is displayed in ***Figure 7.55***. Supplier information accumulation is the most effective factor for inventory management. On the other hand, information sharing affects supplier information accumulation; supplier quality management supports both supplier information sharing and supplier information accumulation factors. It does not have a direct effect on inventory management.

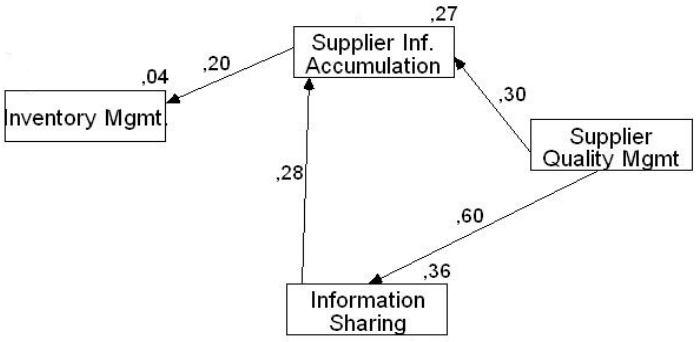

Figure 7.55: Path analysis of supplier relations factors and inventory management

In this chapter, path analysis of relationship between Business Excellence determinants and performance indicators are performed. ***Table 7.11*** summarizes expressed indicators. According to results, all of the current performance indicators are expressed by Business Excellence determinants included in our research model presented earlier in this chapter.

	Innovative Performance	Productivity	Quality	Flexibility	Customer Satisfaction	Employee Satisfaction	Pre-investment Cash Flow	Inventory Management
	Innovative Performance Trend	Productivity Trend	Quality Trend	Flexibility Trend	Customer Satisfaction Trend	Employee Satisfaction Trend	Pre-investment Cash Flow Trend	Inventory Management Trend
Technology and Innovation Tendency	x	x	x	x	x	x	x	
						x	x	
Manufacturing Structure and Operations	x	x		x	x	x	x	
						x	x	
Human Resources, Planning, Leadership	x	x	x	x	x	x	x	x*
				x	x	x	x	
Process Mgmt and Continuous Improvement, Customer Focus	x	x	x	x	x	x	x	
				x		x	x	
Manufacturing Performance Objectives		x		x			x	
		x		x			x	
Supplier Relations	x	x	x	x		x	x	x
							x	

* For testing inventory management model quality management factor is used instead of human resources

Table 7.11: Summary of path analyses

8 SECTOR ANALYSIS

In this section we will analyze firm performance by making comparisons among different sectors. For obtaining a consistent sample for the analysis, target sample number and distribution of firms into business sectors must be homogeneous enough to obtain an appropriate representation (Nardi, 2003). In order to have representative results we have eliminated some sectors in our sample and selected the following three sectors for comparison: automotive, chemical, and metal and machinery.

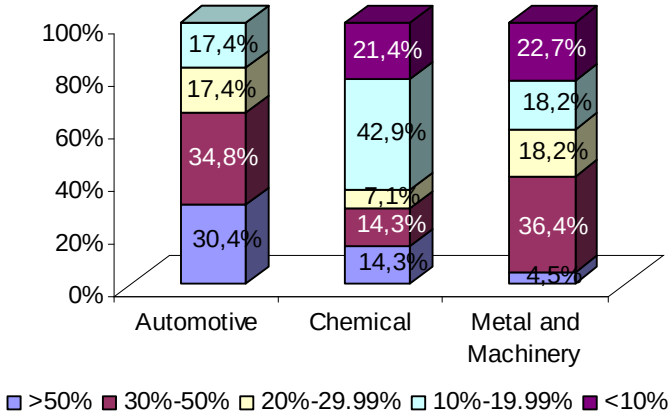

Figure 8.1: Percentage of 3years old or younger products in total sales

According to the bar chart presented in ***Figure 8.1,*** 65% of firms in the automotive sector receive 30% or more of their revenue from 3 years or younger products. Also, percentage of firms receiving 30% or more of their revenue from 3 years or younger products is 29 % in the chemical industry and 41% in the metal and machinery industry.

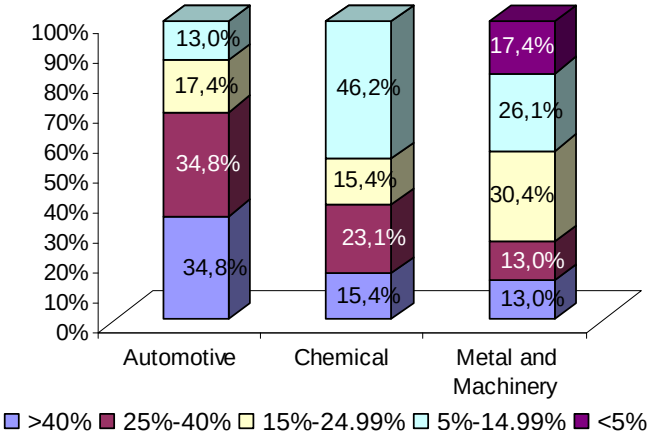

Figure 8.2: Percentage of 3 years old or younger products in the existing product portfolio

In the automotive sector, in 70% of firms 3 years or younger products constitute 25% or more of the existing product portfolio, whereas the percentage of 3 years or younger products within the existing product portfolio is found to be in the same range in 39% of firms in the chemical industry and in 26% of firms in the metal and machinery industry.

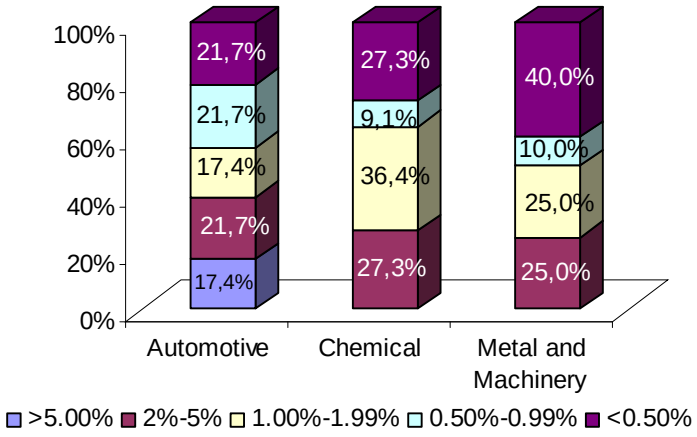

Figure 8.3: Percentage of R&D expenditure in total sales

The percentage of R&D expenditures in total sales is less than 1% for 43% of firms in the automotive sector, in 36% of firms in the chemical industry, and in 50% of firms in the metal and machinery sector. It is interesting to note that firms with the percentage of R&D expenditures in total sales greater than 5% exist only in automotive sector reaching 17% of the firms in the sample. The percentage of firms allocating 2% or more of their total sales to R&D is 39% in the automotive sector, 27% in the chemical industry, and 25% in the metal and machinery sector. We can conclude that the automotive sector allocates relatively greater resource for R&D activities.

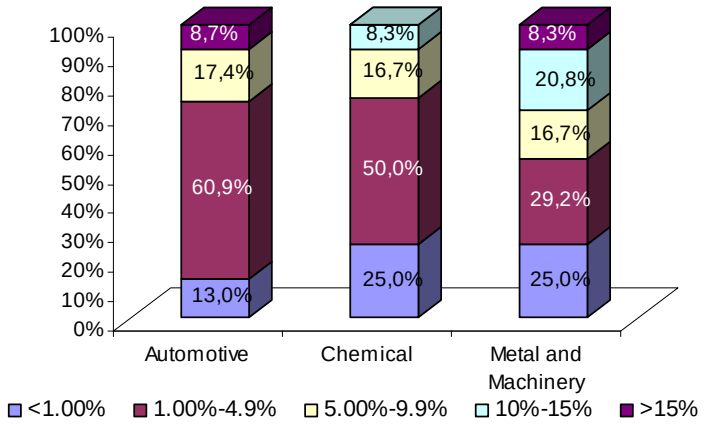

Figure 8.4: Percentage of quality cost in total sales

In 74% of firms in the automotive sector, 75 % the firms in the chemical sector, and 54% of the firms in the metal and machinery sector the percentage of quality cost is less than 5% in total sales. We can conclude that quality cost is lesser in chemical sector.

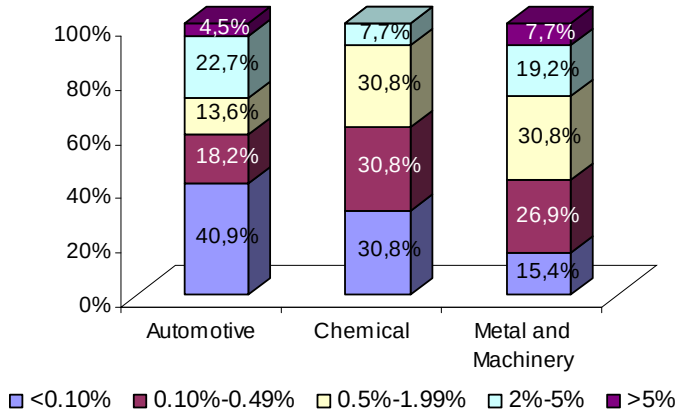

Figure 8.5: Percentage of defective products in total production volume

As shown in ***Figure 8.5,*** the percentage of firms with a percentage of defects less than 5% is 59% in the automotive sector, 62% in the chemical sector, and 42% in the metal and machinery sector. At the other extreme, the percentage of firms with a percentage of defects equal to or greater than 2% is 27% in the automotive sector, 8% in the chemical sector, and 27% in the metal and machinery sector. Among the sectors considered here, the metal and machinery sector is the one that produces highest level of defective products. On the other hand, chemical sector appears to provide the lowest level of defective products. This result is in accordance with the percentage of quality cost in total sales data in ***Figure 8.4.*** This is an indication of the consistency of these two sets of data.

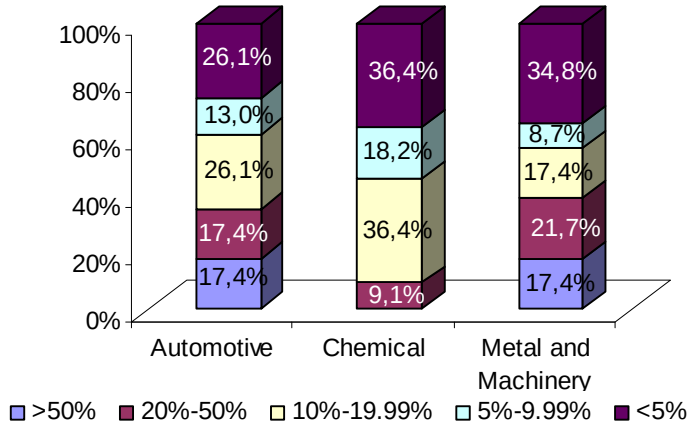

Figure 8.6: Percentage of production workers involved in quality activities in total production workers

The percentage of production workers involved in quality activities in total production workers is less than 10% for 39% of firms in the automotive sector, 55 % of firms in the chemical sector and 44% of firms in the metal and machinery sector (***Figure 8.6***). On the other hand, this percentage is equal to or more than 20% for 35% of firms in the automotive sector, 46 % of firms in the chemical sector and 39% of firms in the metal and machinery sector.

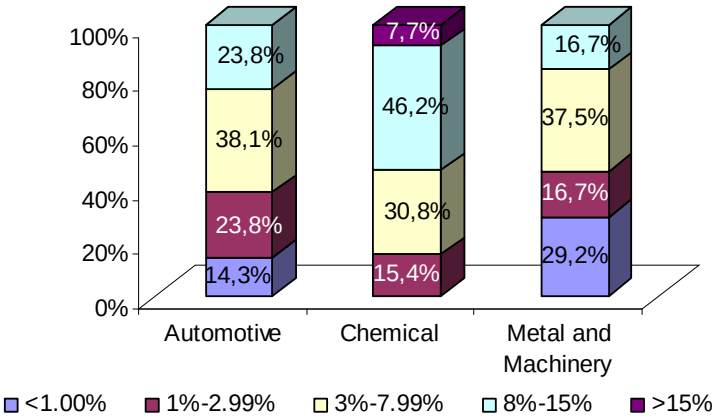

Figure 8.7: Percentage of quality control personnel in total production workers

The percentage of quality control personnel in total production workers less than 1% in 14% of firms in the automotive sector, 15%of firms in the chemical sector, and 29% of metal and machinery sector (***Figure 8.7***), At the other extreme, 54% of firms in chemical sector have more than 8% of quality control personnel in total production workers, which is far greater percentage of firms than the corresponding values for the other two sectors.

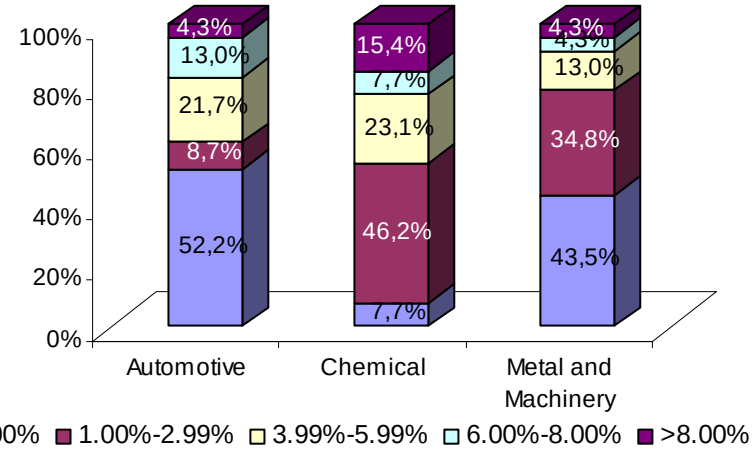

Figure 8.8: Percentage of incoming material quality control personnel in total production workers

In 52% of automotive sector, percentage of incoming material quality control personnel in total production workers is less than 1%.

On the other hand, only in 8% of chemical sector percentage of input material quality control personnel in total production workers is workers is less than 1% (***Figure 8.8***).

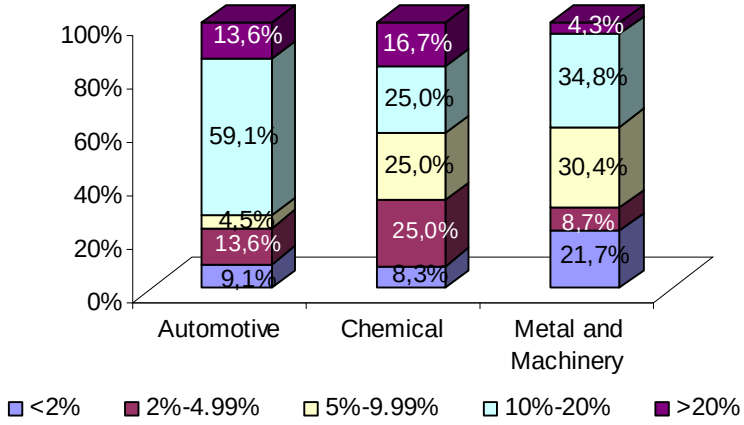

Figure 8.9: Percentage of average annual level of total stocks in annual total sales

According to ***Figure 8.9*** 72 % of the automotive sector has more than 10% of average annual level of total stocks in annual total sales.

Additionally, 39 % of metal and machinery sector has average level of total stocks in annual total sales more than 10 percentages. We can conclude that average annual stock level in total sales is greater in automotive sector.

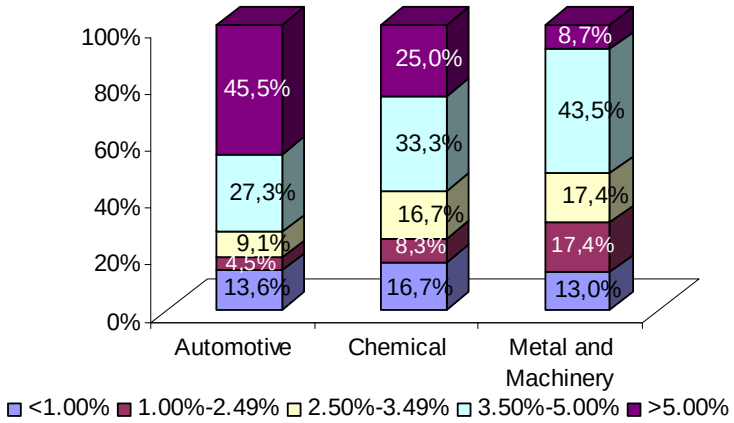

Figure 8.10: Percentage of average annual level of incoming material stocks in annual total sales.

Percentage of average annual level of incoming material stocks in annual total sales is more than 5% in only 9% of metal and machinery sector but it is more than 5% in 46% of automotive sector (***Figure 8.10***). Therefore, automotive sector has the greatest percentage of average annual level of incoming material stocks in annual total sales among the sectors considered here.

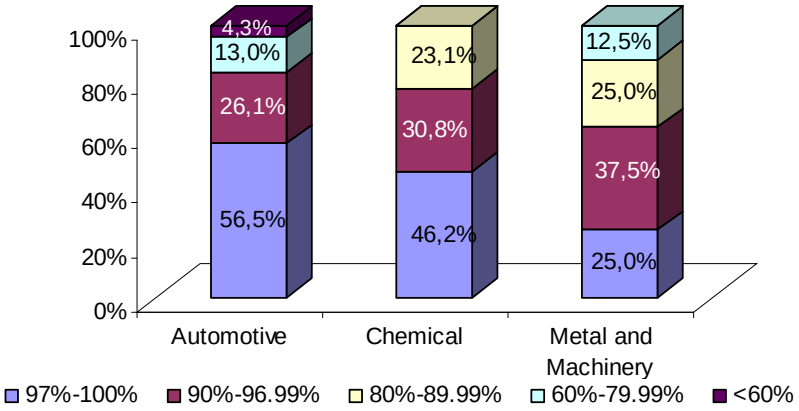

Figure 8.11: Percentage of on time delivery

It is shown in ***Figure 8.11***, that 57% of firms in the automotive sector make their deliveries on time in the range of 97-100%. On the other hand, in the chemical sector 46% of the firms and in the metal and machinery sector only 25% of the firms achieve the same range. Additionally, in the chemical sector on time delivery percentage is greater than 80% for all firms in the sample. According to Ulusoy's (2003) research about delivery performance in Turkey, cement is the most successful sector. Appliances p&c suppliers, automotive and electronics sectors follow cement in that order.

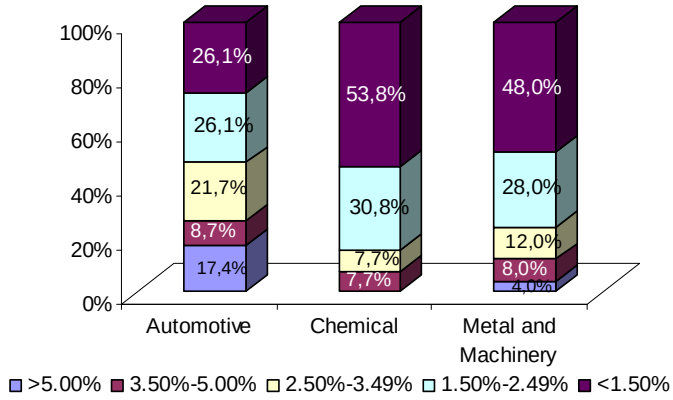

Figure 8.12: Percentage of employee training expenditures in gross total personal wage and salary.

Based on the results displayed in ***Figure 8.12***, one can state that the firms in the automotive sector allocate the biggest resources for employee training relative to their gross total personal wage and salary expenditures.

9 SUMMARY AND IMPLICATIONS

In this thesis, we performed a wide ranging research in the Turkish manufacturing industry on Business Excellence covering both its determinants and its effects on firm performance. The main objective is to discover the process through which Business Excellence affects firm performance. The research is based on the results obtained from a survey including various subjects from firm strategies to operational details. Firms completed the survey through a website, where they signed up using a username and password assigned to them. The questionnaires were asked to be filled in by the upper level managers. In several rounds lasting 6 months, 140 manufacturing firms participated in our empirical study.

After the data collection phase, the data has been transferred to SPSS v.13 software and arranged for upcoming statistical analyses. Factor analyses, T-tests, correlation analyses and regression analyses are performed in order to test our research model (***Figure 7.1***), which displays the relationships between Business Excellence determinants and firm performance indicators. The relation between performance indicators and financial performance is also explored and the results obtained are summarized in the section on managerial implications. Additionally, path analyses are conducted employing AMOS v.4.0 software revealing several latent relationships between the variables. As a result, we validated our research model, since the determinants of Business Excellence are shown to be directly linked to increased firm performance and performance indicators can be expressed by the Business Excellence determinants.

In the remainder of this Chapter, we will try to summarize the main managerial insights gained. According to our research, 83% of the companies in our sample provide a high level of customer satisfaction. 74% of them indicate that their innovative performance is ahead of their competitors. Similarly, 62% of the firms evaluate their productivity better than their competitors in the market. 55% of the firms claim to own a high level of flexible production system and 45% of the firms provide high production quality. On the other hand, only 25% of the companies provide a high employee satisfaction level and 30% of them provide less employee satisfaction than their

competitors. Finally, 52% of the companies report to have positive pre-investment cash flow.

In family businesses, average time of production process change and time to market are significantly longer; technological level is significantly lower and finally, percentage of total average incoming material inventory in annual sales is relatively lower. Also family businesses provide relatively lower level of employee satisfaction than other firms. We can summarize that family businesses in our sample provide less successful performance than others.

We have also investigated the effects of foreign capital on firm performance. Foreign capitalized firms provide higher customer satisfaction, higher productivity, higher technological level, bigger pre-investment cash flow and higher percentage of production workers involved in quality activities. Also, percentage of quality expenditure is significantly lower in these firms. We can conclude that foreign capitalized firms achieve better results in many of the performance indicators.

When we analyze the effects of firm age on performance, we have determined that percentage of 3 years old or younger products in existing product portfolio is significantly lower in older companies. We can conclude that younger firms are more innovative than old ones. On the other hand, older firms have significantly better on time delivery performance.

When we investigate the effects of firm size on performance we can conclude that firm size is an important determinant because large firms demonstrate better results in many of the performance indicators. They provide higher customer satisfaction and higher productivity than middle and small sized firms. Average time of production process change, time to market, technological level and also pre-investment cash flow are also better in large companies.

We have also analyzed the effects of Business Excellence determinants on firm performance indicators. Human resources, quality management, leadership and technology and innovation management factors have significant positive effect on current firm performance and improvement of the performance in the last 3 years.

Especially innovation management factor has a significant positive effect on improvement of firm performance indicators in the last 3 years compared to technology management and core manufacturing technology factors. Also, planning factor and

manufacturing quality factor have been a very important determinants for improvement of firm performance in the last 3 years.

Information sharing with suppliers factor has a very important effect on firm's current performance. It is more effective than supplier knowledge accumulation factor.

Companies working with suppliers, which have high level of knowledge accumulation, keep significantly lower percentage of average total stocks in annual sales and lower level of incoming material stocks in annual sales. But supplier knowledge accumulation does not have a significant effect on new product or service development.

Companies providing on time delivery higher than 97% obtain higher employee satisfaction, higher pre-investment cash flow and lower percentage of defects in total production volume in the last 3 years.

We have also analyzed the relationship between firm performance indicators and financial results. Companies providing high employee satisfaction gain significantly higher total sales per employee and higher export per employee.

High level of productivity implies a significantly higher total sales per employee, higher export per employee and higher added value per employee. This indeed is another demonstration that subjective evaluations coincide with quantitative observations. Also, high technological level provides significantly higher total sales per employee and higher export per employee.

Companies with average total stocks in annual sales larger than 10% have significantly lower total sales per employee. On the other hand, companies having lower than 0,1% of defects in total production volume, have significantly higher total sales per employee trend and higher added value per employee trend.

The main conclusion of this study is that given proper environment is provided by top management leadership to promote Business Excellence determinants, their improvement will lead to better operational performance and consequently to better financial performance.

REFERENCES

Adbanjo, D., (2001). “TQM and Business Excellence: is there really conflict?”, *Measuring Business Excellence*, Vol. 5, No. 3, pp. 37-40.

Adams, R., Bessant, J., Phelps, R., (2006). “Innovation management measurement: a review”, *International Journal of Management Reviews*, Vol. 8, No. 1, pp. 21–47.

Ahire, S.L., Golhar, D.Y, Waller, M.A (1996), "Development and validation of TQM implementation constructs", *Decision Sciences*, Vol. 27 No.1, pp.23-56

Allen, S., Cooper, R. (1999), *Partnering interim report*, University of Salford, Salford.

Anonymous, (2004). “Successful cost reduction methodologies: World leading manufacturers highlight tools and techniques for achieving major cost reduction”, *Strategic Direction*, Vol. 20, No. 4.

Arogyaswamy, B., Emler, W., (2004). “Technology absorption in emerging nations: an ınstitutional approach”, *Journal of East-West Business*, Vol. 10, No. 4, pp. 79-104.

Attewell, P., (1987). “Big brother and the sweatshop: computer surveillance in the automated office”. *Sociological Theory*, Vol. 5, pp. 87–99.

Bagozzi, R.P., Baumgartner, H. (1994), "*Principles of Marketing Research*, Blackwell, Malden, MA.

Baram M., Schoebel, M., (2007). “Safety culture and behavioral change”, *Safety Science*, Vol. 45, pp. 631–636.

Barringer and Ass. (1995). www.barringer1.com/anvil_files/Anvil01_files/anvil01.pdf

Baron R., and Kenny D., (1986). “The moderator-mediator variable distinction in social psychological research”, *Journal of Personality and Social Pyschology*, Vol. 51, pp. 1173-1182.

Baruch, Y. and Rosenstein, E., (1992). “Career planning and managing in high tech organizations”, *International Journal of Human Resource Management*, Vol. 3 No. 3, pp. 477-96.

Bauer, H.H., Grether, M., Leach, M., (2002). "Building customer relations over the internet", *Industrial Marketing Management*, Vol. 31 No.2, pp.155-63.

Bentler, P.M. and Bonett, D.G., (1980). “Significance tests and goodness of fit in the analysis of covariance structures”, *Psychological Bulletin*, Vol. 88, pp. 588–606.

Bentler, P.M. (1990). “Comparative fit indexes in structural models”, *Psychological Bulletin*, Vol. 107, pp. 238–246.

Bessant, J., Caffym, S., Harding, R. and Webb, S., (1994). “Rediscovering continuous improvement”, *Technovation*, Vol. 14, No. 1, pp. 17-29.

Bhuiyan, N. and Bagehel, A., (2005). “An overview of continuous improvement: from the past to the present”, *Management Decision*, Vol. 43, No. 5, pp. 761-71.

Blackburn, J., (1991). *Time Based Competition*, Richard D. Irwin, Homewood, Illinois.

Blackburn, R. and Rosen, B., (1993). “Total quality and human resources management: lessons learned from Baldrige award-winning companies”, *Academy of Management Executive*, Vol. 17, No. 3, pp. 49-66.

Bollen, K.A., (1989). *Structural equations with latent variables*, John Wiley & Sons, New York, NY.

Boyer, K. and Pagell, M. (2000), "Measurement issues in empirical research: improving measures of operations strategy and advanced manufacturing technology", *Journal of Operations Management*. Vol. 18, No. 3, pp. 361-374.

Brodbeck, P., W., (2002). "Complexity theory and organization procedure design", *Business Process Management Journal*, Vol.8, No. 4.

.Brown S., Squire, B., Blackmon, K., (2007). "The contribution of manufacturing strategy involvement and alignment to world-class manufacturing performance", *International Journal of Operations & Production Management*, Vol. 27, No. 3, pp. 282-302.

Brown, S. L. and Eisenhardt, K. M., (1998). *Competing on the Edge*, Harvard Business School Press, Boston, MA.

Browne, M.W. and Cudeck, R. (1993). "Alternative ways of assessing model fit in Bollen", *Testing Structural Equation Models.* Newbury Park, California: Sage, 136–162.

Camp, R.C. (1995), *Business process benchmarking: finding and implementing best practices*, ASQC Quality Press, Milwaukee, WI.

Cardinali, R., *(*1995). "Flexible manufacturing systems: a primer on enhancing productivity while controlling cost", *Logistics Information Management*, Vol. 38, No. 6, pp. 38-42.

Chen, T.Y., Chang, P.L. and Yeh, C.W. (2004), "A study of career needs, career development programs, job satisfaction and the turnover intensity of R & D personnel", *Career Development International*, Vol. 9 No. 4, pp. 424-37.

Chiaburu, D.S. and Tekleab, A.G. (2005), "Individual and contextual influences on multiple dimensions of training effectiveness", *Journal of European Industrial Training*, Vol. 29,

Cigolini, R., Grillo, G., (2006). "How to involve operations managers in the strategic planning process" *Problems and Perspectives in Management*, Vol. 1.

Cincom, (2008). http://www.cincom.com/us/eng/index.jsp?loc=usa

Clampitt, P. and Downs, C. (1993), "Employee perceptions of the relationship between communication and productivity: a field study", *Journal of Business Communication*, Vol. 30, pp. 5-28.

Cook, L., (2002). "Exploring the linkage between quality system, service quality and performance excellence: service providers' perspectives", *Quality Management Journal*, Vol. 9 No. 3.

Cooper, R. and Kaplan, R.S., (1991). "Profit priorities from activity-based costing", *Harvard Business Review*, pp. 130-7.

Cronbach, L.J. and Shavelson, R.J., (2004). "My current thoughts on coefficient alpha and successor procedures". *Educational and Pyschological Measurement Review*, Vol. 24, No. 3, pp. 522-537.

CSP, (2008). *Cambridge Strategy Publications*, www.cambridgestrategy.com

Cumming B., (1998). "Innovation overview and future challenges", *European Journal of Innovation Management*, Vol. 1, No. 11, pp. 21–29.

CYH, (2008). Children, youth and women's health service, www.cyh.com/HealthTopics/

Dahlgaard, J.J. and Dahlgaard-Park S.M., (2007). "Excellence, 25 years evolution". *The Journal of Management History*, Vol. 13, No. 4, pp. 371-393.

Dahlgaard, J., Kristensen, K., Kanji, G., (1998). *Fundamentals of Total Quality Management*, Chapman and Hall, UK.

Daigle, K., Powell, R., (1996). "Manufacturing scrap reduction team", *IEEE / SEMl Advanced Semiconductor Manufacturing Conference.*

Daniels, F. R., (1996), "Benchmarking", *Work Study*, Vol. 45, No. 3, pp. 18-20.

David, F.R., (1989). "How companies define their mission", *Range Planning*, Vol. 22, No.1, pp.90-7.

Davis, T.R.V., (1991). “Internal service operations: strategies for increasing their effectiveness and controlling their cost”, *Organizational Dynamics,* Vol. 20, No. 2, pp.5-23.

Dean, E. R., Sherwood, M. K., (1994). “Manufacturing Costs, Productivity, and Competitiveness”, *Monthly Labor Review*, Vol. 117, No. 10, pp.3-16.

Deming Institute, (2008). www.deming.org/demingprize/demingprize.html.

Dess, G.G., Robinson, R.B., (1984). “Measuring organizational performance in the absence of objective measures: The case of the privately held firm and the large conglomerate business unit”. *Strategic Management Journal*, Vol. 10, pp. 265-273.

Dhafr, N., Ahmad, M., Burgess, B., Canagassababady, S., (2006). “Improvement of quality performance in manufacturing organizations by minimization of production defects”, *Robotics and Computer-Integrated Manufacturing*, Vol. 22, pp. 536–542.

Dixon, J.R., (1992). “Measuring Manufacturing Flexibility: An Empirical Investigation”. *European Journal of Operational Research,* Vol. 60, pp. 131–143.

Dornier, P., P. Ernst, M. Fender, and P. Kouvelis (1998), *Global operations and logistics: text and cases*, John Wiley & Sons, New York, NY.

DTI, (1996). *Innovation the Best Practice,* The Executive Summary.

Earl, D., (2007). *What Is Internal Customer Service?* www.donnaearltraining.com/ Articles/InternalCustomerService

ECforBE, (2008). European Centre for Business Excellence, www.ecforbe.com

Edwards, T., Battisti, G., Neely, A., (2004). “Value creation and the UK economy: a review of strategic options”, *International Journal of Management Reviews,*Vol. 5/6 No. 3/4, pp. 191-213.

EFQM, (2000). *The EFQM Excellence Model In Action Handbook*, EFQM, Brussels

EFQM, (2005). *Introducing Excellence Han Book*, EFQM, Brussels

EFQM, (2008). *European foundation of quality management,* www.efqm.org

Elçi, Ş., (2006). *İnovasyon: Kalkınmanın ve Rekabetin Anahtarı,* Referans Gazetesi.

Englyst L., (2007). “Strategic roles of manufacturing”, *Journal of Manufacturing Technology Management*, Vol. 18, No. 8, pp. 933-948.

Erffmeyer, C. and Johnson, D.A., (2001). “An exploratory study of sales force automation practices: expectations and realities”, *Journal of Personal Selling & Sales Management,* Vol. 21, pp. 216-42.

Evangelista R., Sirilli G., (1998). “Innovation in service sector”, *Technological Forecasting and Social Change*, Vol. 58, pp. *251-269*

Eversheim, W., Klocke, F., Pfeifer T., Weck, M., (1997). *Manufacturing Excellence In Global Markets,* Chapman and Hall, Germany.

Excellence in Business Network, (2008). www.excellenceinbusiness.net/index.html.

Farner, S., Luthans F., Sommer, S., (2001). “An empirical assessment of internal customer service”, *Managing Service Quality*, Vol.11, No.5, pp.350-358.

Faruk, A., Lamming, R., Cousins, P. and Bowen, F., (2002). “Analyzing, mapping and managing environmental impacts along supply chains”, *Journal of Industrial Ecology,* Vol. 5, No. 2, pp. 13-36.

Fernández-González, A. J., Prado Prado, C. J., (2007). "Measurement and analysis of customer satisfaction: company practices in Spain and Portugal", *International Journal of Productivity and Performance Management,* Vol.56, No. 5/6, pp. 500-517.

Fernandez, P., McCarthy, P.F., Rakotobe-Joel, T., (2001). “An evolutionary approach to benchmarking”, *Benchmarking: An International Journal*, Vol. 8 No. 4, pp. 281-305.

Field, J., Meile, L., (2008). “Supplier relations and supply chain performance in financial services processes”, *International Journal of Operations & Production Management*, Vol. 28 No. 2, pp. 185-206.

Fine, C.H., Hax, A.C.., (1985). “Manufacturing strategy: a methodology and an illustration”, *Interfaces*, 15, No. 6, pp. 28-46.

Fisher, J., Maines, L., Peffer, S. Sprinkle, G., (2005). “An experimental investigation of employer discretion in employee performance evaluation and compensation”, *The Accounting Review*, Vol. 80, No. 2, pp. 563–583.

Flynn BB, Schroeder RG, Sakakibara S., (1995). “The impact of quality management practices on performance and competitive advantage”, *Decision Sciences*, Vol.26, No.5, pp.659-691.

Fritz, W., (1989). "Determinants of product innovation activities", European Journal of Marketing, Vol. 23,No. 10, pp. 32-43.

Fryer K., J., Antony, J., Douglas, A., (2007). "Critical success factors of continuous improvement in the public sector: A literature review and some key findings", *The TQM Magazine*, Vol.19, No. 5.

Giannakis, M., (2008). “Facilitating learning and knowledge transfer through supplier development supply chain management”, *An International Journal* Vol. 13 No.1 62–72.

Gillan, S.L., Starks, L.T., (1998). “A survey of shareholder activism: motivation and empirical evidence”, *Contemporary Finance Digest*, Vol. 2, No. 3, pp. 10-34.

Gilly, M.C., Hansen, R.W., (1992). “Consumer complaint handling as a strategic marketing tool”, *The Journal of Product and Brand Management*, Vol.1, No.3, pp.5–16.

Gollan, P., (1998). “Finding the keys to flexibility”, HR Monthly, February, pp. 10-11.

Gonzalez, M., Eckelman, C. (1994), “The application of system dynamics to the kitchen cabinet industry through the use of dynamic simulation software”, Proceedings of CIFAC ’94, Atlanta.

Gonzalez M., Quesada G, (2004). ”Determining the importance of the supplier selection process in manufacturing: a case study”, *International Journal of Physical Distribution & Logistics Management*, Vol. 34, No. 6, pp. 492-504.

Gosavi, A., (2006). “A risk-sensitive approach to total productive maintenance”, *Automatica*, Vol. 42, No. 8, pp. 1321-30.

Günday, G., (2007). *Innovation models and implementations at firm level in manufacturing industry*, Department of Industrial Engineering, Sabancı University, M. Sc. Thesis.

Güngor, A., Gupta, S.M., (1999). “Issues in environmentally conscious manufacturing and product recovery: a survey”, *Computers and Industrial Engineering*, Vol. 36, pp. 811-53.

Grünberg, T.A., (2007). *Method to support performance improvement in industrial operations*, Department of Production Engineering, Royal Institute of Technology, PhD. Thesis.

Guha, S., Grover, V., Kettinger, W. J., Teng, J. T. C., (1997). "Business process change and organizational performance: Exploring an antecedent model." *Journal of Management* Information Systems, Vol. 14, No. 1, pp. 119-56.

Hafeez, K., Essmail, A., (2007). "Evaluating organization core competences and associated personal competencies using analytical hierarchy process", *Management Research News,* Vol.30, No. 8.

Hagedoorn, J., (1993). "Understanding the rationale of strategic technology partnering: inter-organizational modes of co-operation and sectoral differences", *Strategic Management Journal,* No. 14, pp. 371-86.

Hagedoorn, J., Cloodt, M. (2003). "Measuring innovative performance: is there an advantage in using multiple indicators", *Research Policy*, Vol. 32, pp. 1365–1379.

Hair, J.F.Jr., Bush, R.P., Ortinau, D.J., (2003). *Marketing research within a changing information environment*. McGraw-Hill/Irwin: New York.

Hamel, G. and Prahalad, C., (1990). ''The core competence of the corporation'', *Harvard Business Review*, pp. 79-91.

Hammer, M., (2001). "The super efficient company", *Harvard Business Review*, Vol. 79 No. 8, pp. 82-91.

Hammermesh, R.G., Anderson, M.J. and Harris, J.E., (1978). "Strategies for low market share businesses," *Harvard Business Review*, No. 56, May-June, p. 98.

Handfield, R.B., Krause, D.R., Scannell, T.V. and Monczka, R.M. (2000), "Avoid the pitfalls in supplier development", *Sloan Management Review*, Vol. 41 No. 2, p. 37.

Hanson, G. (1986), *Determinants of firm performance: an integration of economic and organizational factors*, Unpublished doctoral dissertation, University of Michigan Business School, Dearborn.

Hanson, P., Voss, C.,(1995). "Benchmarking best practice in European manufacturing sites", *Business Process Re-engineering and Management Journal,* Vol.1, No.1, pp. 60-74.

Hart, C. and Schlesinger, L., (1991). ''Total quality management and the HR professional: applying the Baldrige framework to human resources'', *Human Resources Management*, Vol. 30 No. 4, pp. 433-54.

Hayes, R.H. and Pisano, G.P., (1994). "Beyond world-class: the new manufacturing strategy", *Harvard Business Review*, January-February, pp. 77-86..

Hayes, R.H., Upton, D.M., (1998)."Operations-based strategy", *California Management Review*, 40, No. 4, pp. 8-25.

Hendircks K., Singhal,V. R., (1996). "Quality Awards and the market value of the firm: Emprical investigation", *Management Science,* Vol. 42, No. 3, pp. 415-433.

Hermel P., Pujol, J., (2003). "An evolution of excellence: some main trends". *The TQM Magazine*, Vol. 15, No. 4, pp. 230-243

Hewlett, C. A., (1999). "Strategic planning for real estate companies", *Journal of Property Management*, Vol. 64, No.1, p. 264.

Higgs, M., Rowland D., (2000). "Building change leadership capability." *Henley Working Paper Series*, Vol. 4, No. 22.

Hill, T., (1995). *Manufacturing strategy: text and cases*, MacMillan, London

Hill, T.J. (1985), *Manufacturing Strategy*, Macmillan, Basingstoke.

Hindle, J., (1997). Process improvement and information management, *Health Manpower Management*, Vol. 23, No. 5, pp. 184-186.

Ho, C., (1996). "Information technology implementation strategies for manufacturing organizations a strategic alignment approach" *International Journal of Operations and Production Management,* Vol. 16, No. 7, pp. 77-100.

Hobbs, J., (1996). "A transaction cost approach to supply chain management", *Supply Chain Management*, Vol. 1, No. 2, pp. 15–27.

Hooley, G.J., Saunders, J. (1993). *Competitive positioning: the key to marketing strategy*, Prentice-Hall, New York.

Hout, T. M., (1990). *Competing against time, The Free Press*.

Hrvillage, 2008. http://www.hrvillage.com/human-resources/employee-productivity.htm

Hyer, N.L., Wemmerlov, U., 1984. "Group technology and productivity", *Harvard Business Review*, 140–149.

Innes, J., Mitchell, F., (1990). *Activity-based costing: a review with case studies*, Chartered Institute of Management Accountants.

Iverson, R.D., (1996). "Employee acceptance of organizational change: the role of organizational commitment", *The International Journal of Human Resource Management,* Vol. 7 No. 1, pp. 122-4

Isen, A. M., (2004). "Some perspectives on positive feelings and emotions: Positive affect facilitates thinking and problem solving", The Amsterdam Symposium (pp.263-281). NY:Cambridge.

Jalham, I. S., Abdelkader, W. T., (2006). "Improvement of organizational efficiency and effectiveness by developing a manufacturing strategy decision support system" *Business Process Management Journal,* Vol. 12, No. 5, pp. 588-607.

Juergensen, T. (2000), *Continuous improvement: mindsets, capability, process, tools and results,* The Juergensen Consulting Group, Inc., Indianapolis.

KALDER, (2008). www.kalder.org/genel/odul/bilgilendirme.pdf.

Kanter, R., (1988). "Three tiers for innovation research", *Communication Research,* Vol. 15, pp. 509-23.

Kaplan, R. S., Norton. D. P., (2001). *The strategy-focused organization: how balanced scorecard companies thrive in the new business environment,* Harvard Business School Press, Boston,

Karatepe, O. M., (2006). "Customer complaints and organizational responses: the effects of complainants' perceptions of justice on satisfaction and loyalty", *Hospitality Management,* Vol. 25, pp.69–90.

Kauffman, R. G., (2004). *Cost savings in the supply chain*, Report.

Kazazi, A., (1993). "Effectiveness of just-in-time manufacturing systems", PhD thesis, University of Bradford,

Kazazi, A., (1994). "A method for assessing jit effectiveness", *Industrial Management and Data Systems,* Vol. 94, No.7, pp.14-17.

Keasey, K., Thompson, S., Wright, M., (1997). *Introduction: the corporate governance problem –competing diagnoses and solutions*, in Keasey, K., Thompson, S. and Wright, M. (Eds), Corporate Governance: Economic and Financial Issues, Oxford University Press, pp. 1-17, Oxford.

Kent, D (1991), "Joint venture vs non-joint ventures: an empirical investigation", *Strategic Management Journal*, No.12, pp.383-93.

Kim I., Tang, C., (1997). "Lead time and response time in a pull production control system", *European Journal of Operational Research,* Vol. 101, pp. 474-485.

Kobayashi T., (2003). "How to reduce manufacturing and management costs of tractors and agricultural equipment", *The CIGR Journal of Scientific Research and Development,* Vol. 5.

Koste, L. L., Malhotra, M. K., (1999). "A theoretical framework for analyzing the dimensions of manufacturing flexibility", *Journal of Operations Management* Vol. 18, No. 1, pp. 75-93.

Krajewski, L.J., Ritzman, L.P., (1996). *Operations management: strategy and analysis*, 4th edn. Addison-Wesley, pp. 60 and 277.

Krause, D.R., (1995). *Interorganizational cooperation in supplier development: influencing factors*, PhD thesis, Arizona State University, Tempe, AZ.

Kristensen, K., Juhl, H.J., Eskildsen, J., (2001). "Benchmarking excellence", *Measuring Business Excellence.* Vol. 5, No. 1.

Kyro, P., (2004). "Benchmarking as an action research process", *Benchmarking: An International Journal*, Vol.11, No.1

La Londe, B., (2002). "Who can you trust these days?", *Supply Chain Management Review*, May/June, p. 11.

Leavy, B. (1994), "Two strategic perspectives on the buyer-supplier relationship", *Production and Inventory Management Journal*, 2nd Quarter, pp. 47-51.

Lee, H.L., Padmanabhan, V., Whang, S. (1997), "Information distortion in a supply chain, the bullwhip effect", *Management Science*, Vol. 43, No.4, pp.546-58.

Lee, R.G., Dale, B.G., (1998). "Policy deployment: an examination of the theory", *International Journal of Quality and Reliability Management*, Vol. 15, No. 5, pp. 520-540.

Lemmink J., Kaper, H., (1994). "Competitive reactions to product quality improvements in industrial markets", *European Journal of Marketing*, Vol. 28, No.12, pp. 50-68.

Li, G., Yan, H., Wang, S.Y., Xia, Y.S. (2005), "Comparative analysis on value of information sharing in supply chains", *Supply Chain Management: An International Journal*, Vol. 10, No.1, pp.34-46.

Li, L., Lee Y., (1994). "Pricing and delivery-time performance in a competitive environment", *Management Science*, Vol. 40, No. 5, pp. 633-646.

Liker, J.K., Choi, T.Y., (2004). "Building deep supplier relationships", *Harvard Business Review*, Vol. 82 No. 12, pp. 104-113.

Loch, C., Heyden, L., Wassenhove, L., Huchzermeier, A., Escalle, C., (2003). *Industrial Excellence*, Springer Publications.

Longenecker C.O., Simonetti J.A., (2001). *Getting results: Five absolutes for high performance,* Jossey- Bass, San Francisco.

Luthans, F., Stajkovic, A.D., (1999). "Reinforce for performance: the need to go beyond pay and even rewards", *Academy Management Executive*, Vol.13, No. 2, pp.49-57.

Mansfield, E. R., Helms B. P. (1982), "Detecting Multicollinearity", *The American Statistician*, Vol. 36, No. 3, pp. 158-160.

Marquardt, D. W., (1970). "Generalized Inverses, Ridge Regression and Biased Linear Estimation", *Technometrics.*Vol.12, pp. 591-612.

Mapes, J., New C., Szwejczewski, M., (1997). "Performance trade-offs in manufacturing plants", *International Journal of Operations and Production Management*, Vol. 17, No. 10, pp. 1020-1033.

Matopoulos, A., Vlachopoulou, D., Manthou,. Manos, V. B., (2004). "Conceptual framework for supply chain collaboration: empirical evidence from the agri-food industry", *Supply Chain Management: An International Journal*, Vol.12, No. 3, pp.177-186.

Morgan, M., Hall, D.T. and Martier, A., (1979). "Career Development Strategies in Business",*Personnel*, Vol. 34, , pp. 56-76.

Motwani, J., Frahm, M., Kathawala, Y., (1994). "The key to quality improvement", *Training for Quality*, Vol. 2 No. 2, pp. 7-12.

Nabitz U., Quagila, G., Wangen, P., (1999). "EFQM's new excellence model", *Quality Progress*, pp.118-120

Nakajima, S. (1988), *Introduction to Total Productive Maintenance (TPM*), Productivity Press, Portland, OR

Nardi, P. M., (2003). *Doing Survey Research: A Guide To Quantitative Methods*. Boston: Pearson Education.

Nemetz, P.L., Fry, L. W., (1998). "Flexible manufacturing organizations: implications for strategy formulation and organization design", *The Academy of Management Review*, Vol. 13, No. 4, pp. 627-638.

NNCO, (2008). National network for collaboration, www.crs.uvm.edu/nnco.

Nonaka, I., Takeuchi, H. (1995). *The knowledge creating company*, Oxford University Press.

Norusis, M.J., (2003). *SPSS 12.0 Statistical Procedures Companion*, Prentice Hall, Inc., New Jersey.

NPR, (1996). National Performance Review, Serving the American People: Best Practices in Resolving Customer Complaints, *Study Report*.

OECD (1999). *Principles of Corporate Governance, Organization for Economic Co-operation and Development*.

OECD (2005). *Oslo Manual: proposed guidelines for collecting and interpreting technological innovation data*, Paris.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L., (1985). "A conceptual model of service quality and its implications for future research", *Journal of Marketing*, Vol. 49, pp. 41-50.

Pearson, C. M. & Clair, J. A. (1998). "Reframing crisis management." Academy of Management Review, 23, 59-76.

Peças, P., Henriques E., (2006). "Best practices of collaboration between university and industrial SMEs", *Benchmarking An International Journal*, Vol. 13, No.1/2, pp. 54-67.

Peeters, C (2003). "Measuring ınnovation competencies and performance: a survey of large firms in belgium", *IIR Working Paper*, Hitotsubashi University, pp. 03-16.

Peters, T. and Austin, N., (1985). *A passion for excellence: the leadership difference*, HarperCollins Publishers, London.

Peters, T. and Waterman, R. (1982), *In Search of Excellence*, Harper & Row, London.

Peterson D., (1982). *Human Error-Reduction and Safety Management*, STPM Pres, New York.

Peterson, K.J., Ragatz, G.L. and Monczka, R.M., (2005). "An examination of collaborative planning effectiveness and supply chain performance", *Journal of Supply Chain Management*, Vol. 41, No. 2, pp. 14-25.

Pine, B.J. II, Victor, B. and Boynton, A.C. (1993), "Making mass customization work", *Harvard Business Review*, Vol. 71 No. 5, pp. 108-19.

Porter, L. J. and Tanner, S.J., (2003). *Assessing Business Excellence*, Oxford Press.

Prabhu V., Robsob, A., (2000). "Achieving service excellence measuring the impact of leadership and senior management commitment", *Managing Service Quality*, Vol. 10, No. 5, pp. 307-317.

Price, J., (1997). "Handbook of organizational measurement", *International Journal of Manpower*, Vol. 18, No. 4/5/6, pp. 305-558.

Quirke, B. (1996), *Communicating Corporate Change*, McGraw-Hill, London.

Ritchie, L., Dale, B.G., (2000). "Self-assessment using the Business Excellence model: A study of practice and process". *International Journal of Production Economics, Vol.* 66, No. 3, pp. 241–254.

Robledo, M. A., (2001). "Measuring and managing service quality: integrating customer expectations", *Managing Service Quality*, Vol.11, No. 1.

Rogers, D.S. and Tibben-Lembke, R.S., (2001). "An examination of reverse logistics practices", *Journal of Business Logistics*, Vol. 22, pp. 129-48.

Rojsek, I., (2001). "From red to green: towards the environmental management in the country in transition", *Journal of Business Ethics*, Vol. 33 No. 1, pp. 37-50.

Roskies, E. and Louis-Guerin, C. (1990). "Job insecurity in managers: antecedents and consequences", *Journal of Organizational Behavior*, Vol. 11, pp. 345-59.

Rupert G. Miller Jr., (1997). *Beyond Anova: Basics of Applied Statistics*, Chapman & Hall/CRC**.**

Ryder, R. and Fearne, A., (2003). "Procurement best practice in the food industry: supplier clustering as a source of strategic competitive advantage", *Supply Chain Management: An International Journal*, Vol. 8 No. 1, pp. 12-16.

Sansone C., Harackiewicz J., (2000).*Intrinsic and extrinsic motivation: the search for optimal motivation and performance*, pp.257-307, Academic Press, San Diego.

Saraph, J.V., Benson, P.G. , Schroeder, R.G. (1989), "An instrument for measuring the critical factors of quality management", *Decision Sciences*, Vol. 20 No.4, pp.810-29.

Sarabia, F., J., (1995). "Model for market segments evaluation and selection", *European Journal of Marketing*, Vol. 30, No. 4, , pp. 58-74.

Savolainen, T., (2000). "Leadership strategies for gaining Business Excellence through TQM", *Total Quality Management*, Vol. 11, No. 2, pp. 211-226.

Sekiguchi, T., (2007). "A contingency perspective of the importance of PJ fit and PO fit in employee selection", *Journal of Managerial Psychology,* Vol.22, No.2, pp.118-131.

Sekine, K. and Arai, K., (1998). *TPM for the Lean Factory-Innovative Methods and Worksheets for Equipment Management*, Productivity Press, Portland, OR.

Simpson, D. F., Power, D. J., (2005). "Use the supply relationship to develop lean and green suppliers", *Supply Chain Management: An International Journal,* Vol. 10, No.1, pp. 60–68.

Skinner, W., (1969). "Manufacturing; missing link in corporate strategy", *Harvard Business Review*, Vol.47, No.3, pp.136-45.

Slack, N., Chambers, S., Robert, J., Betts, A., (2005). *Operations and process management*, Prentice Hall.

Smith, A., Fischbacher, M., Wilson, F., (2007). "New Service development: from panoramas to precision", *European Management Journal.*

Smith A., Rupp, W., (2002). "Communication and loyalty among knowledge workers: a resource of the firm theory view", *Journal of Knowledge Management*, Vol. 6, No. 3, pp. 250-261.

Soltani, E., (2003). ''Towards a TQM-driven HR performance evaluation: an empirical study'', *Employee Relations: The International Journal,* Vol.25, No.4, pp. 347-70.

Soltani, E., Gennard, J., van der Meer, R.B. and Williams, T., (2004). ''HR performance evaluation in the context of TQM: a review of the literature'', *International Journal of Quality & Reliability Management,* Vol. 21, No. 4, pp. 377-96.

Sonntag, V., (2003). "The role of manufacturing strategy in adapting to technological change", *Integrated Manufacturing Systems*, Vol.4, No.4

Sousa, R., (2003). “Linking quality management to manufacturing strategy: an empirical investigation of customer focus practices”. *Journal of Operations Management***,** Vol. 21, No. 1, pp. 1-18.

Spricis, A., (2001). "The study programme environmental protection and impact assessment? at the University of Latvia", *International Journal of Sustainability in Higher Education*, Vol.2, No. 4, pp 339-48.

Stalk, G. J., (1988). “The Next Source of Competitive Advantage”, *Harvard Business Review.*

Stalk, G., and Hout, T.M., (1990). *Competing Against lime*, The Free Press, New York.

Stanton, J., (2000). “Reactions to employee performance monitoring: framework, review and research directions”, *Human performance*, Vol.13, No.1, pp.85–113.

Steers, R., (1977). “Antecedents and outcomes of organizational commitment”, *Administrative Science Quarterly*, Vol. 22, pp. 46-56.

Swanson, C.A., Lankford, W.M., (1998). "Just-in-time manufacturing", *Business Process Management Journal*, Vol. 4 pp.333-41

Swart, J., Mann, C., Brown, S. and Price, A. (2005). *Human Resource Development: Strategy and Tactics*, Elsevier Butterworth-Heinemann Publications, Oxford.

Swink, M. and Way, H.M., (1995). “Manufacturing strategy: propositions, current research, renewed directions”, *International Journal of Operations and Production Management*, Vol. 15, No. 7, pp. 4-26.

Tai, W.T., (2006). “Effects of training framing general self-efficacy and training motivation on trainees’ training effectiveness”, *Personnel Review*, Vol. 35 No. 1, pp. 51-65.

Tan, K. H., Platts, K., (2005). “Effective strategic action planning: a process and tool” *Business Process Management Journal*, Vol. 11, No. 2, pp.137-157.

Tanner S. J., (2005). “Is Business Excellence of any value?”, *European Centre for Business Excellence*, www.ecforbe.com/.

Tari, J., (2008). “Self-assessment exercises: A comparison between a private sector organization and higher education institutions”, *International Journal of Production Economics*, doi:10,1016/j.ijpe.2008.01.005.

TBE, (2008). “The Benchmark Excellence” www.benchnet.com/wib.htm

Teece, D. (1998). “Capturing value from knowledge assets: the new economy, markets for know-how, and intangible assets”, *California Management Review*, Vol. 40 No. 3, pp. 55-79.Oxford.

The Times, (2005). “The richest sources of wellbeing are social activities that help us feel more connected to others”.

Thompson, I. and Cox, A., (1997). “Don’t imitate, innovate”, *Supply Management*, pp. 40-3.

Tiwari, A., Turner, C., and Sackett P., (2006). “A framework for implementing cost and quality practices within manufacturing”, *Journal of Manufacturing Technology Management*, Vol. 18, No. 6, pp. 731-760

Todeva, E., Knoke, D., (2005). **“**Strategic alliances and models of collaboration”, *Management Decision*, Vol. 43, No. 1, pp. 123-148.

Tonessen, T., (2005). “Continuous innovation through company wide employee participation”, *The TQM Magazine*, Vol. 17, No. 2, pp. 195-207.

Tripathi, D., (2005). “Influence of experience and collaboration on effectiveness of quality management practices: the case of Indian manufacturing”, *International Journal of Productivity and Performance Management*, Vol.54, No.1, pp.23-33.

Troutt, M. D., Bhatt, G., (2005). "Examining the relationship between business process improvement initiatives, information systems integration and customer focus", *Business Process Management Journal*, Vol.11, No.5, pp.532-558.

TSI, (2008).Turkish Statistical Institute, http://www.turkstat.gov.tr

Ulmer, D., Syptak, J.M. and Marsland, D.W. (1999), "Job satisfaction: putting theory into practice", *Family Practice Management*, Vol. 26,

Ulusoy, G., (2000). *Moving forward: assessment of competitive strategies and Business Excellence in the Turkish manufacturing industry*, TÜSİAD, Istanbul.

Ulusoy, G., (2003). "An assessment of supply chain and innovation management practices in the manufacturing industries in Turkey", *International Journal of Production Economics*, Vol. 86, pp. 251–270.

Upton, D.M., (1994). "The management of manufacturing flexibility", *California Management Review*, pp. 72–89.

Vakurka, R. J., Davis, R.A., Fast, L.A., (1996). "Improving manufacturing performance through scrap reduction at belden wire and cable company", *National Productivity Review*, Autumn.

Venkatraman, N., Ramanujam, V., (1986). "Measurement of business performance in strategy research: A comparison of approaches". *The Academy of Management Review*, Vol.11, No.4, pp.801-814.

Vesey, J.T., (1991). "The new competitors: thinking in terms of speed to market", *Manufacturing Systems*, pp. 16–24.

Vouzas, F., (2007). "Investigating human resources context and content on TQM, Business Excellence and ISO 9001:2000", *Measuring Business Excellence*, Vol.11, No.3.

Wallace, T.F., (1990). "MRP II and JIT work together in plan and practice", *Automation*, Vol. 37, No. 3, pp. 40-2.

Watts, C.A., Hahn, C.K. (1993). "Supplier development programs: an empirical analysis", *International Journal of Purchasing and Materials Management*, Vol. 29 No. 2, pp. 10-17.

Weick, K.E., (1995). *Sensemaking in Organizations*, Sage, London.

Wheaton, B., Muthén, B., Alwin, D., F., and Summers, G., F., (1977). "Assessing reliability and stability in panel models", *Sociological methodology*, ,pp. 84–136, San Francisco: Jossey-Bass

Whicker L., Bernon, M., Templar, S., Mena, C., (2006). "Understanding the relationships between time and cost to improve supply chain performance", *Production Economics*, doi:10,1016/j.ijpe.2006.06.022.

Wickens, P.D., (1995). *The ascendant organization: combining commitment and control for long-term, sustainable business success*, Macmillan, Basingstoke.

Wickman, P., (1997). "Developing a mission for an entrepreneurial venture", *Management Decision* Vol. 35, No.5, pp. 373–381.

Wikipedia, (2008). http://en.wikipedia.org/wiki/Production,_costs,_and_pricing

Wirtz J., Heracleous, L., Pangarkar, N., (2006). "Managing human resources for service excellence and cost effectiveness at Singapore airlines", *Managing Service Quality*, Vol.18, No. 1.

Wilkinson, A., Allen, P. and Snape, E., (1991). "TQM and the management of labor", *Employee Relations*, Vol. 13, No. 1, pp. 24-31.

Williams, A.P., (1979). "Career development and employee participation: current trends and their implications", *Personnel Review*, Vol. 8, pp. 15-21.

Woods, J. (1997), “The six values of a quality culture”, *National Productivity Review*, Vol. 16, No. 2, pp. 49-54.

Yeung, A.C.L., Cheng, T.C.E., Ling-Yau Chan, (2004). “From customer orientation to customer satisfaction: the gap between theory and practice”, *Ieee Transactıons On Engıneerıng Management*, Vol.51, No.1.

Yeung, A.H.W., Lo, V.H.Y. (2002), “Impacts of supply quality management practices on quality performance: a study in Hong Kong”, Proceedings of the 4th Asian Control Conference (ASCC 2002), Singapore, 25-27 September, pp. 1804-09, .

Zairi, M. (2002). “Total quality management sustainability: what it means and how to make it viable”, *International Journal of Quality & Reliability Management*, Vol. 19 No. 5, pp. 502-7.

Zhao, X., Xie, J., Zhang, W.J., (2002). "The Impact of information sharing and ordering co-ordination on supply chain performance", *Supply Chain Management*, Vol. 7 No.1, pp.24-40.

Zineldin, M., (2000). “Beyond relationship marketing: technological ship marketing”, *Marketing Intelligence & Planning*, Vol. 18 No. 1, pp. 9-23.

APPENDIX: Questionnaire Form

Company Information

Company Name:

Sector:

Address:

Phone Number: Fax: E-mail:

Respondents' Information

Name-Surname: Position:

GENERAL FIRM CHARACTERISTICS

G1. Starting year of production:

G2. Is your company a family business? **Yes** ☐ **No** ☐

G3. Legal status

☐ Joint-stock ☐ Limited Company ☐ Commandite Company ☐ Collective Company

☐ Sole Proprietorship ☐ Other

G4. Is your company foreign capitalized? **Yes** ☐ **No** ☐

G5. Percentage of foreign capital? %

G6. What are the fields that top managers in the company had experience mostly through their business life?

☐ Production/Purchasing ☐ Accounting /Finance ☐ Personnel ☐ R&D ☐ Marketing/ Sales ☐ Other:

TECHNOLOGY AND INNOVATION TENDENCY

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

Technology Tendency

		1	2	3	4	5
TY1.	Our core manufacturing technology is appropriate for our requirements	☐	☐	☐	☐	☐
TY2.	Our core manufacturing technology allows us to compete in the market	☐	☐	☐	☐	☐
TY3.	We use all the potential of our manufacturing technology	☐	☐	☐	☐	☐
TY4.	Our procedures are well defined for monitoring and developing technology	☐	☐	☐	☐	☐
TY5.	The function for tracking technological developments and gathering information is well defined and is added to the related employee's job description	☐	☐	☐	☐	☐
TY6.	Technology absorption process is managed by a team consisting of personnel coming from different functions.	☐	☐	☐	☐	☐
TY7.	Employees receive sufficient training for using new technologies	☐	☐	☐	☐	☐

Innovation Tendency

		1	2	3	4	5
TY8.	Our firm tries to implement new ideas frequently	☐	☐	☐	☐	☐
TY9.	It is important to have an appropriate environment for innovation in our firm.	☐	☐	☐	☐	☐
TY10.	Our firm always searches for new methods for managing business.	☐	☐	☐	☐	☐
TY11.	Our firm puts emphasis on new product and service development.	☐	☐	☐	☐	☐
TY12.	Enough resource is allocated for developing new products and services	☐	☐	☐	☐	☐
TY13.	R&D collaboration with universities and/or research centers is performed.	☐	☐	☐	☐	☐
TY14.	Open innovation sources are utilized.	☐	☐	☐	☐	☐
TY15.	R&D collaboration is performed with other firms in the same or different sectors.	☐	☐	☐	☐	☐

HUMAN RESOURCES

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

		1	2	3	4	5
Hr1.	There is a development process including career plans of all employees in the firm.	☐	☐	☐	☐	☐
Hr2.	There is an efficient "upwards" and "downwards" communication in the company.	☐	☐	☐	☐	☐
Hr3.	Employee satisfaction is measured regularly in our company.	☐	☐	☐	☐	☐
Hr4.	Workplace security and health applications are excellent in our firm.	☐	☐	☐	☐	☐
Hr5.	Work analysis and design are made for contributing to employee satisfaction.	☐	☐	☐	☐	☐
Hr6.	Employee work performance is measured regularly and evaluated	☐	☐	☐	☐	☐
Hr7.	Our employment process is based on selecting the right employee to the right position approach.	☐	☐	☐	☐	☐
Hr8.	Employees are trained to improve their capability to adjust and perform different jobs easily.	☐	☐	☐	☐	☐
Hr9.	We have a human resources policy for developing required basic capabilities for producing competitive products.	☐	☐	☐	☐	☐
Hr10.	We support and encourage social activities in the company.	☐	☐	☐	☐	☐

PROCESS MANAGEMENT AND CONTINUOUS IMPROVEMENT

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

		1	2	3	4	5
Pro1	All employees in the company understand and apply "internal customer" notion.	☐	☐	☐	☐	☐
Pro2.	Everyone in the company should believe that quality is his/her own responsibility.	☐	☐	☐	☐	☐
Pro3.	We have well established techniques for measuring the quality of our products and services.	☐	☐	☐	☐	☐
Pro4.	We use activity based costing widely.	☐	☐	☐	☐	☐
Pro5.	We have a written standard benchmarking procedure in order to compare our performance with our rivals.	☐	☐	☐	☐	☐
Pro6.	Self-assessment is performed regularly.	☐	☐	☐	☐	☐
Pro7.	We have written standard procedures for defining and applying continuous improvement projects.	☐	☐	☐	☐	☐

Pro8.	We have written standard procedures to review some of the completed or terminated continuous improvement projects for learning purposes.	☐	☐	☐	☐	☐
Pro9.	We share continuous improvement projects and their results with all employees.	☐	☐	☐	☐	☐
Pro10.	We have written standard working procedures for the entire company.	☐	☐	☐	☐	☐

MANUFACTURING STRUCTURE AND OPERATIONS

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

		1	2	3	4	5
Mso1.	We focus on producing high number of different products.	☐	☐	☐	☐	☐
Mso2.	We manage several innovation projects simultaneously.	☐	☐	☐	☐	☐
Mso3.	We operate in markets that have different competitive priorities.	☐	☐	☐	☐	☐
Mso4.	There are a large number of different technologies we need to develop and support.	☐	☐	☐	☐	☐
Mso5.	We manage several improvement activities simultaneously.	☐	☐	☐	☐	☐
Mso6.	Our manufacturing activities are in accordance with our business mission.	☐	☐	☐	☐	☐
Mso7.	The capability we demonstrate in our manufacturing activities constitutes the basis of our success in the market..	☐	☐	☐	☐	☐
Mso8.	We pay attention to the design of our new products to be in line with our manufacturing and other capabilities.	☐	☐	☐	☐	☐
Mso9.	We pay attention to accept only those production orders from our customers such that their design is in harmony with our manufacturing and other capabilities.	☐	☐	☐	☐	☐
Mso10.	We apply Total Productive Maintenance extensively in our manufacturing facility.	☐	☐	☐	☐	☐
Mso11.	There is an agreement in the company about the company's existing core competencies and what they should be.	☐	☐	☐	☐	☐
Mso12	We develop our core competencies based on a plan and with the necessary funds secured.	☐	☐	☐	☐	☐
Mso13.	We make our production plans in order to secure JIT production.	☐	☐	☐	☐	☐
Mso14.	Recycling ratio is a primary criterion for us when designing new products or modifying existing ones.	☐	☐	☐	☐	☐
Mso15.	We perform collaboration for production and complementary collaboration.	☐	☐	☐	☐	☐

PLANNING

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

		1	2	3	4	5
P1.	We have a well known and supported mission statement all over the company.	☐	☐	☐	☐	☐
P2.	We use our benchmarking and self-assessment results in developing our plans.	☐	☐	☐	☐	☐
P3.	We have a well established planning process which determines short and long termed objectives and audits all process.	☐	☐	☐	☐	☐
P4.	When developing our plans, policies and objectives we take into consideration the customers' requests, suppliers' resources, and the requirements of society at large and other stakeholders'.	☐	☐	☐	☐	☐
P5.	We have a clearly expressed strategy document approved by top managers encompassing all our manufacturing structure.	☐	☐	☐	☐	☐

MANUFACTURING STRATEGIES

Identify importance level of success criteria for your company

1- Not important	2- Slightly important	3- Important	4- Very important	5-Exteremely important

	Manufacturing Quality	1	2	3	4	5
P6.	Improving product and service quality as perceived by customers.	☐	☐	☐	☐	☐
P7.	Improving product and service quality relative to our competitors.	☐	☐	☐	☐	☐
P8.	Reducing customer complaints.	☐	☐	☐	☐	☐
P9.	Reducing the number of defects.	☐	☐	☐	☐	☐
P10.	Reducing product return rates from customers.	☐	☐	☐	☐	☐
	Manufacturing Cost	1	2	3	4	5
P11.	Reducing input costs	☐	☐	☐	☐	☐
P12.	Reducing personnel cost	☐	☐	☐	☐	☐
P13.	Improving personnel productivity	☐	☐	☐	☐	☐
P14.	Reducing operation costs	☐	☐	☐	☐	☐
P15.	Reducing waste, scrap, and rework costs	☐	☐	☐	☐	☐
P16.	Reducing cost of incoming and outgoing logistic processes	☐	☐	☐	☐	☐
P17.	Reducing total cost in manufacturing process	☐	☐	☐	☐	☐
	Manufacturing Flexibility	1	2	3	4	5
P18.	Improving flexibility in manufacturing systems	☐	☐	☐	☐	☐
P19.	Increasing the flexibility of changing task priorities according to customer orders	☐	☐	☐	☐	☐
P20.	Changing the assignment of equipments according to priority of tasks	☐	☐	☐	☐	☐
P21.	Increasing the ability of producing non-standard products according to different customer orders	☐	☐	☐	☐	☐
P22.	Improving the ability of the manufacturing workers to handle diversified tasks	☐	☐	☐	☐	☐
P23.	Reducing the frequency of rejecting non-standard product orders	☐	☐	☐	☐	☐
P24.	Increasing the ability of using existing equipment and employees in a flexible way for the production of non-standard products	☐	☐	☐	☐	☐
	Delivery Reliability and Speed	1	2	3	4	5
P25.	Shortening the time between receiving the order and making the delivery	☐	☐	☐	☐	☐
P26.	Shortening manufacturing time	☐	☐	☐	☐	☐
P27.	Increasing the delivery speed of finished goods	☐	☐	☐	☐	☐
P28.	Increasing the ability of keeping delivery promises	☐	☐	☐	☐	☐
P29.	Increasing just in time delivery	☐	☐	☐	☐	☐
P30.	Reducing the difficulties about distribution and delivery	☐	☐	☐	☐	☐

CUSTOMER FOCUS

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

		1	2	3	4	5
Cf1.	We know our customers' current and future requirements	☐	☐	☐	☐	☐
Cf2.	Customer requirements are communicated throughout the organization and every employee is made to understand them.	☐	☐	☐	☐	☐
Cf3.	We make use of customer expectations, ideas, and suggestions during our new product and service design processes	☐	☐	☐	☐	☐
Cf4.	We have an efficient problem solving process for handling customer complaints	☐	☐	☐	☐	☐
Cf5.	We make use of the customer complaints to initiate process improvements	☐	☐	☐	☐	☐
Cf6.	We measure customer satisfaction regularly and systematically	☐	☐	☐	☐	☐
Cf7.	We believe that our relations with our customers will strengthen in due time	☐	☐	☐	☐	☐

SUPPLIER RELATIONS

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

		1	2	3	4	5
Sr1.	We aspire to have more extensive and efficient supplier development programs.	☐	☐	☐	☐	☐
Sr2.	We make use of our suppliers' knowledge stock for developing our production and service processes	☐	☐	☐	☐	☐
Sr3.	We make use of our suppliers' knowledge stock for developing our product and service designs.	☐	☐	☐	☐	☐
Sr4.	We share our production planning and control information with our main suppliers	☐	☐	☐	☐	☐
Sr5.	Our main suppliers share their production planning and control information with us	☐	☐	☐	☐	☐
Sr6.	We exercise quality audit to our main suppliers regularly	☐	☐	☐	☐	☐
Sr7.	Our suppliers have a quality assurance system in place	☐	☐	☐	☐	☐
Sr8.	We require our main suppliers to have an"environmental protection certificate"	☐	☐	☐	☐	☐
Sr9.	We request just in time delivery from our main suppliers	☐	☐	☐	☐	☐
Sr10.	We cooperate with our main suppliers in the form of strategic collaboration	☐	☐	☐	☐	☐

LEADERSHIP

Please state your company's *current* status clearly

1- Strongly Disagree	2- Disagree	3- Neither Agree Nor Disagree	4- Agree	5- Strongly Agree

		1	2	3	4	5
L1.	The top management of the company has adopted the culture of trust, active participation and self devotion in seeking Business Excellence	☐	☐	☐	☐	☐
L2.	Top management supports continuous change effectively for achieving the Business Excellence objective and motivates the employees accordingly	☐	☐	☐	☐	☐
L3.	A unity of goals is achieved among the employees in the company	☐	☐	☐	☐	☐
L4.	Top management executes effective plans and policies for securing continuous development of communication among the individuals and among functions within the company	☐	☐	☐	☐	☐

L5.	Top management uses team spirit and motivation approaches in an effective way in order to reach best practices	☐ ☐ ☐ ☐ ☐
L6.	Top management adopts a management style based on interactive continuous improvement rather than one exercised through momentary interventions and crisis management	☐ ☐ ☐ ☐ ☐
L7.	Environmental protection issues are managed by top management in a proactive manner	☐ ☐ ☐ ☐ ☐
L8.	Top management exerts effort effectively to establish corporate governance in the company	☐ ☐ ☐ ☐ ☐

PERFORMANCE INDICATORS

Please indicate your company's *current* performance level from the characteristics listed below in colon "A"

Measurement scale for evaluation of performance indicators

PI1	1- Very Low	2- Low	3- Satisfactory	4- High	5- Very High
PI2	1- Very Low	2- Low	3- Satisfactory	4- High	5- Very High
PI3	1- Very High	2- High	3- Satisfactory	4- Low	5- Very Low
PI4	1- Behind competitors	2- On the point of catch	3- Some strengths can be developed further	4-Better than competitors	5- Leading company in this field. Competitors follow
PI5	1- Behind competitors	2- On the point of catch	3- Some strengths can be developed further	4- Better than competitors	5- Leading company in this field. Competitors follow
PI6	1- Behind competitors	2- On the point of catch	3- Some strengths can be developed further	4- Better than competitors	5- Leading company in this field. Competitors follow
PI7	1- Behind competitors	2- On the point of catch	3- Some strengths can be developed more	4- Better than competitors	5- Leading company in this field. Competitors follow
PI8.	1- Behind competitors	2- On the point of catch	3- Some strengths can be developed further	4- Better than competitors	5- Leading company in this field. Competitors follow
PI9	1- Negative	2- Balanced	3- Slightly positive	4- Positive	5- Extremely positive

Please indicate your company's performance *trend in the last 3* years in column "B" from the characteristics listed below

1- Strongly Decreased	2- Decreased	3- Similar	4- Increased	5- Strongly Increased
		1 2 3 4 5	1 2 3 4 5	

Characteristics		A	B
PI1.	Customer satisfaction	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
PI2.	Employee satisfaction	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
PI3.	Production process setup time	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
PI4.	Productivity	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐

PI5.	Time to market	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI6.	Technological level	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI7.	Level of meeting unexpected increases in production or order plans	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI8.	Level of adaptation to unexpected due date changes in production or order plans	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI9.	Pre-investment cash flow	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Please indicate your company's *current* performance level from the characteristics listed below in colon "A"

Measurement scale for evaluation of performance indicators

PI10	1- 10%>	2- 10% –19.99%	3- 20 % –9.99%	4- %30 – %50.00	5- 50%<
PI11	1- 5 %>	2- 5% –14.99%	3- 15%– 24.99%	4- 25% - 40.00%	5- 40%<
PI12	1- 5.00 %<	2- 2.00% - 5.00%	3- 0.50% - 1.99%	4- 0.10% - 0.49%	5- 0.10%>
PI13	1- 20.00%<	2- 10.00% - 20.00%	3- 5.00% – 9.99%	4- 2.00%– 4.99 %	5- 2.00%>
PI14	1- 5.00%<	2- 3.50% - 5.00%	3- 2.50% – 3.49%	4- 1.00 %– 2.49%	5- 1.00%>
PI15	1- 15.0 % <	2- 10.0 %- 15.0%	3- 5.0%- 9.9%	4- 1.0% - 4.9%	5- 1.0%>
PI16	1- 0.50%>	2- 0.50 %- 0.99%	3- 1.00% - 1.99%	4- 2.00% - 5.00%	5- 5.00%<
PI17	1- 5.0 % >	2- 5.0 %– 9.99%	3- 10.0%– 19.99%	4- 20.0% – 50.0%	5- 50.0%<
PI18	1- 60%>	2- 60% – 79.99%	3- 80% – 89.99%	4- 90% – 96.99%	5- 97%– 100%
PI19	1- 15.0%<	2- 8.0 %– 15.0%	3- 3.0 %– 7.99%	4- 1.0 %– 2.99%	5- 1.0%>
PI20	1- 8.0%<	2- 6.0 %- 8.0%	3- 3.0% – 5.99%	4- 1.0% – 2.99%	5- 1.0%>
PI21	1- 1.50%>	2- 1.50% - 2.49%	3- 2.50 %- 3.49%	4- 3.50%- 5.00%	5- 5.00%<

Please indicate your company's performance *trend in the last 3* years in column "B" from the characteristics listed below

1- Strongly Decreased	2- Decreased	3- Similar	4- Increased	5- Strongly Increased

Performance Indicator

		A					**B**				
PI10.	Percentage of 3 years or younger products' revenue in total sales	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI11.	Percentage of 3 years or younger products in existing product portfolio	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI12.	Percentage of defective products in total production volume	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI13.	Percentage of average total in annual sales	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI14.	Percentage of average incoming material inventory in annual sales	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI15.	Percentage of quality cost in annual sales	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI16.	Percentage of R&D expenditure in annual sales	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI17.	Percentage of production workers involved in quality activities in the last 3 years	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI18.	Percentage of on time delivery	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI19.	Percentage of quality control personnel in production workers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

PI20.	Percentage of incoming material quality control workers in production workers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PI21.	Percentage of training expenditure in gross total wage and salary.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

FINANCIAL RESULTS

Please specify your total sales from production, export and added value at the end of the given years	*2004*	*2005*	*2006*
FR1. (1-2-3). Total sales revenue from production			
FR2. (1-2-3). Total export revenue			
FR3. (1-2-3). Added value			

Please specify total number of employees and blue collar employees for the given years in full time equivalent.	*2004*	*2005*	*2006*
FR4. (1-2-3). Total number of employees (Full time equivalent)			
FR5. (1-2-3). Total number of blue collar employees (Full time equivalent)			