Enabling Innovative Companies in Emerging Economies: Insights from the Turkish Innovation System and Turkish Consumer Electronics Companies

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St. Gallen, May 19, 2009

The President:

Prof. Ernst Mohr, PhD
To my dear sister

Dilara Ilman
Acknowledgements

This dissertation is the end of a six year odyssey which started in 2003. The whole endeavour has been difficult, yet rewarding, and would not have been possible without the enduring support of a few people.

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I am also deeply indebted to the employees of the case firms for giving me the opportunity to learn so much about the innovative activities of the firms.

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Zurich, August 2009

Yasar Attila Ilman
Abstract

The main objective of this dissertation is to provide insights for developing effective innovation support policies in emerging economies. In order to achieve this objective, the dissertation combines system- and company-level analysis. The subjects of the research are Turkey and its consumer electronics companies. Innovativeness at both the national (system) and company levels (consumer electronics) are investigated.

The analysis of the Turkish innovation system and consumer electronics case study highlighted trade liberalisation as one of the main drivers of the innovativeness of companies. The results show that the positive effect of exporting is most likely to materialise if local companies, instead of foreign companies, do the exporting. This means that developing countries should try to support local companies’ efforts to become integrated into global value chains, instead of attracting foreign direct investment for exporting sectors. Furthermore, the Turkish experience shows that it is important to open the local economy to import competition; otherwise the largest domestic players might remain content to dominate the domestic market without needing to innovate. This seems especially to be the case when the national innovation system is underdeveloped.

In relation to education policy, the Turkish experience suggests that linking academic career progression to scientific publishing increases publications. As publications and patents tend to correlate, such a policy could be useful for increasing the innovation output in developing countries.

In terms of innovation support schemes, the Turkish way of providing finance for R&D projects is useful, especially for supporting the R&D efforts of established companies. The strict conditions were useful in fostering an R&D project management culture and were successful in increasing cooperation between university and industry. However innovation support for smaller and less established companies needs separate programmes. Turkey’s experience also suggests that the centralisation of all technical innovation related topics is useful, at least in the early stages of development. TUBITAK (Scientific and Technological Research Council) in Turkey has operated a number of successful innovation support programmes. Additionally, it has been able to increase awareness of innovation among companies and the public.
It has also established platforms that bring companies together, resulting in a positive impact on knowledge sharing and future cooperation. Through its institutes, TUBITAK has fostered partnerships between industry and public organisations. On the other hand, the Turkish experience suggests that, in order to drive non-technological innovation such as human resources and marketing innovation, a separate organisation should have the lead. It is difficult for the same organisation to embrace both aspects of innovation.
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1. INTRODUCTION

1.1 Relevance of Topic

The role of innovation in economic development is widely recognised in recent times. The creation, diffusion and use of knowledge have become vital ingredients in economic growth and change (OECD, 1999). Trade and global competition have changed the role of innovation. In the past, innovativeness was a recipe for immediate success; currently, it is essential for survival. Today innovation is a fundamental and inherent phenomenon of modern capitalism (Lundvall, 1992). Consequently, the ability to create and maintain innovative companies is seen as essential for the competitiveness of a nation.

However, innovation is a complex process and is influenced by many factors. Because of this complexity, firms never innovate in isolation. They interact with other organisations such as customers, suppliers and universities to exchange various kinds of information. The behaviour of firms is also shaped by ‘institutions’ that act as constraints to and/or incentives for innovation; these institutions can take various forms, including laws, regulations, cultural norms and technical standards. Companies, together with all these organisations and institutions, constitute a systemic construct in which innovations materialise (Edquist, 1997).

A certain institutional set-up can explain the relative advantages that some firms or countries enjoy. The institutional framework that constitutes a comparative advantage in one sector might be a disadvantage in another (Coriat, Weinstein, 2002). Alternatively, an institutional setting that has been a comparative advantage for a certain time period can become a disadvantage as market conditions change.

In order to succeed against international competition, nations need to create institutional frameworks that support the creation of innovative enterprises. Companies need sufficient incentives to innovate; they also need access to the resources for innovation.
This thinking is at the heart of the ‘national innovation systems’ approach, which has been adopted by most OECD countries’ policy makers. According to the ‘systems’ approach, companies are at the heart of innovation. However, it is their linkage to the rest of the innovation system that is decisive for their performance. Therefore, one of the main objectives of policy making is to ensure the existence and quality of linkages between actors involved in the innovation system. The non-existence, or weakness, of such linkages is considered to be a ‘systems failure’ (Edquist, 2001), and would require intervention.

The systems approach also has relevance for developing countries. Japanese success in first catching up with and then surpassing the developed Western economies has been attributed to Japan’s national institutional framework (Freeman, 1987). Both Japanese and, later, South Korean development were made possible by institutional environments that fostered intensive learning. These successes have been an inspiration for all developing countries. Recently, the national innovation system approach has become more influential and there have been considerable efforts by developing countries to imitate the structures of more advanced economies.

So far, success has been limited. Despite Japan and South Korea’s example, few countries have been able to catch up with the developed world. Yet during the past decade we have also seen an increasing number of internationally successful companies from developing countries. A growing number of them combine low-cost labour with strong R&D capabilities (Aguiar et al., 2008).

Understanding the conditions under which such companies emerge is critical for developing-country policy makers. In order to develop effective policies, governments need to have a very good understanding of the institutional framework in which companies operate. They also need to understand the internal dynamics and characteristics of private enterprises. Moreover, they are required to have a clear overview of the entire set of factors that affect companies’ actions. This includes comprehensive knowledge of the competitive environment and market conditions in which companies operate. Therefore, it is important that governments have a
thorough understanding of their countries’ innovative capabilities not only at the system level, but at the company level.

1.2 Research Gaps

Research from Latin America to East Asia and Eastern Europe compares national systems with developed-country systems (Alcorta and Perez, 1998; Arocena and Sutz, 2005; Gu, 1999). The main focus has been the investigation of the existence and quality of linkages between innovation system actors. Moreover, innovation indicators such as R&D spending and patents are compared with benchmarks. There is also growing research on innovation policies, especially those of the European Union agencies and the OECD. For instance, some studies offer comparative assessments of policies and statistics for European Union member and candidate countries (European Commission, 2003; 2006; 2007).

However, existing research often provides very limited information on the background conditions for innovation. The macroeconomic conditions, the legal framework and the education system are often neglected. Moreover, most of the studies fail to provide a historical dimension, neglecting the development path that countries have followed. According to Gu (1999), the historical perspective is important, especially for developing countries, because it is useful for identifying causal relationships between events.

On the other hand, there is also a growing stream of research focusing on internationally successful developing-country companies. This is especially the case for companies from India and China (for instance, Xu et al., 2007). Companies that have achieved a significant international presence are celebrated as proof of the advancement of developing countries. However, there is little focus on learning and innovation. Moreover, when innovation is the focus, the development path and the reasons for innovation are often missing.

Most importantly, there is a research gap in studies that combine the system and company views. In other words, there is a lack of studies that investigate the development of the innovative activities of the companies in the context of the national innovation system in which they operate.
A combination of system and company views would provide valuable insights, and could serve as a basis for developing effective innovation support policies.

1.3 Objectives of the Dissertation and Research Questions

The main objective of this dissertation is to provide insights for developing effective innovation support policies in emerging economies. In order to achieve this objective, the dissertation aims to combine system- and company-level analysis.

The subjects of the research are Turkey and its consumer electronics companies. Innovativeness at both the national (system) and company levels (consumer electronics) are investigated. Turkey is selected owing to its position as an important developing country in Europe and the Middle East. Consumer electronics companies are selected owing to the global nature of the sector and the existing research on the innovative activities of companies in developing countries. Analysis of more sectors and companies would have been desirable; however, this was not possible owing to resource and time constraints.

One of the objectives of the dissertation is to investigate the strength of Turkey's innovation system and the development trend. There has been ongoing discussion as to whether the innovation systems of developing countries are catching up with advanced economies, or are falling further behind. For instance, there is research that suggests that innovative performance in Latin America has been declining (Alcorta and Peres, 1998). There is also research that implies Turkish firms have no possibility of catching up with higher-technology European firms (Lall, 2000). However, such research was not based on comprehensive company assessments - a gap this dissertation aims to fill.

The dissertation also aims to investigate the interaction between the innovation system and companies. It aims to identify the reasons behind the innovative activities of case study companies, and to understand the extent to which national policies have had an impact on these efforts.
Based on these objectives, detailed research questions have been formulated (Exhibit 1). The dissertation seeks to find out the current status of the Turkish innovation system and how it has developed over time. It seeks to identify the innovative capabilities of Turkish consumer electronics firms and how they too have developed over time. It also investigates the interaction between the innovation system and the companies.

The final research question builds on the answers to the preceding questions and aims to elaborate on how developing-country policy makers can support the creation of innovative companies.

Exhibit 1: Research questions

**Research question 1**: What is the current status of the Turkish innovation system and how did the innovation system develop?

**Research question 2**: What is the status of learning and innovation of Turkish consumer electronics companies and how did innovative activities evolve over time?

**Research question 3**: How do the system and companies interact and how was the system’s development compared to that of companies?

**Research question 4**: How can developing-country policy makers support the creation of innovative companies?

The answers to the research questions should provide insights into how to formulate more effective innovation support policies.

---

1 Author’s illustration
1.4 Conceptual Framework

The figure above shows companies at the heart of the innovation system. Private enterprises are part of the national innovation system and their innovative activities are influenced by the system. Government innovation policies provide resources and incentives for company innovation. In addition, background conditions for innovation such as the state of the national economy and the legal environment have a significant impact. The education system determines the knowledge base of employees, and is therefore decisive in determining the innovativeness of companies. Moreover, relationships with other companies and organisations play a major role.

Exhibit 2: Conceptual framework: company learning in the centre of the innovation system

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2 Author’s illustration
1.5 Research Approach

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Exhibit 3: Illustration of the research approach

In order to answer the research questions, the dissertation first focuses on the background conditions for innovation in Turkey. It assesses factors that impact innovation such as macroeconomic stability, access to finance, the legal and administrative environment, and the education system. It also looks at government innovation policies and the main innovation system organisations. As a next step, the study investigates the innovativeness of Turkish companies, and assesses the performance of the Turkish innovation system against international benchmarks.

Thereafter, the dissertation analyses the learning and innovation in evidence at Turkish consumer electronics companies, and investigates these companies’ innovation capabilities and their development over time. In addition, it assesses a number of innovation indicators against international benchmarks. Following these case studies, the dissertation looks at the interaction between the case study companies and the innovation system, and identifies the impact of the innovation system on the companies’ innovative activities.

Finally, based on the findings of these chapters, the dissertation discusses the implications for developing-country policy makers.

3 Author’s illustration
1.5 Structure of the Dissertation

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5. Interaction between the system and case study companies

• Comparing the system and companies, assessing their interaction

6. Summary of findings

• Summary of findings of the previous three chapters

7. Discussion and conclusions

• Implications for developing-country policy makers

Exhibit 4: Structure of the dissertation

Following this Introduction, Chapter 2 of the dissertation presents the literature on which the study is based. Chapter 3 assesses the Turkish national innovation system, and evaluates background conditions such as the macroeconomic environment, legal conditions, access to export markets, communication infrastructure and the Turkish education system. This chapter also includes a section on the innovativeness of Turkish companies and an international comparison of innovation indicators.

Chapter 4 presents a case study of two Turkish consumer electronics companies. After a brief introduction to the sector, it analyses the companies, assesses their learning capability, and compares their innovation indicators with those of their international peers. Chapter 5 investigates the development of the companies and the system and presents data collected on the interaction between them.

---

4 Author’s illustration
The final two chapters present a summary of findings and discuss the insights for developing-country policy makers.

2. LITERATURE REVIEW

Structure of the literature review
The literature review is divided into two parts: the first looks at the system view, the second looks at the company view. The system view focuses on the environment in which companies operate, and the company view focuses on the learning and innovation that takes place inside companies.

Exhibit 5: Structure of the literature review

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2.1 Introduction

2.1.1 Defining innovation

According to Niosi, Saviotti, Bellon and Crow (1993), innovations are “new and improved products and processes, new organisational forms, the application of existing technology to new fields, the discovery of new resources, and the opening of new markets” (p. 103). Nelson and Rosenberg (1993) define innovation as “…the processes by which firms master and get into practice product designs and manufacturing processes that are new to them, whether or not they are new to the universe, or even to the nation” (p. 4). Their innovation concept includes not only the first introduction of a technology but also its diffusion.

The OECD makes a distinction between product and process innovation: whereas the former refers to new or improved products, the latter refers to new or improved production or product delivery methods. In both categories a new or improved product/process needs to be new for the firm that implements it, not new for the world. According to the OECD’s Oslo Manual (1996), this definition is the most widely accepted.

For the purposes of this dissertation, a broad definition of innovation based on the Oslo Manual is used. The main innovating unit is the private firm, and a wide array of ‘new combinations’ is included. These new combinations need not be new to the world but do need to be new for the firm.
2.1.2 Learning and innovation

According to Lundvall (1992), “In the models of standard economics, innovations appear as extraordinary events, coming from outside, which temporarily disturb the general equilibrium. After a process of adjustment, reflecting the work of the price mechanism, a new state of equilibrium is established…In modern capitalism, however, innovation is a fundamental and inherent phenomenon…firms must engage in activities which aim at innovation just in order to hold their ground” (p. 68).

Lundvall (1992) recognises innovation as a gradual and cumulative process rather than a sudden touch of genius. From this perspective, the future of innovation depends on the past, and innovation is regarded as a new use of pre-existing possibilities and components: “Almost all innovations reflect already existing knowledge, combined in new ways” (p. 68). According to Cohen and Levinthal (1990), “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities” (p. 128). At the organisational level, March and Simon (1958) suggest most innovations result from borrowing rather than invention.

Based on this perspective, innovation depends much less on an epiphany or sudden discovery; instead, it is the outcome of learning processes that result in ‘new combinations’. So we move away from regarding innovation as a single event, and see innovation as a process of learning. To quote Lundvall, “Processes of interactive learning sometimes result in innovations” (p. 69).

Gregersen and Johnson (1997), offer a more precise explanation: “Put in a very simple way we regard innovations as ‘learning results’. Learning leads to new knowledge and entrepreneurs of different kinds use this knowledge to form innovative ideas and projects and some of these find their way into the economy in the form of innovations” (p. 481).

Thus, while not all learning results in innovation, all innovation is based on learning processes. It is therefore logical to assess the learning processes and learning capability of firms to understand their innovation capabilities. This is even more important when the focus is on developing countries. The second part of the literature
review will therefore focus on the organisational learning research stream and on factors that impact organisational learning.

However, before we focus on the main innovative entity, the ‘firm’, one significant question remains unanswered – do firms innovate in isolation? Why is it that most innovative companies come from the same countries or regions? If the firms are the main innovative units, why is there such a concentration of innovative activity in some parts of the world?

### 2.2 System View

#### 2.2.1 Systems approach and institutions

As discussed above, innovation is the result of a learning process. Although learning has its personal or organisational dimension, it needs external knowledge sources and feedback mechanisms. Consequently, when explaining the innovation process, Lundvall (1992) adds the term ‘interactive’ to learning (p. 9).

In the words of Edquist (1997), “processes of innovation are, to a large extent, characterized by interactive learning. It could be argued that interactivity paves the way for a systemic approach” (p. 7). According to Edquist (1997), “Firms never innovate in isolation. In the pursuit of innovation, they interact with other organisations to exchange various kinds of information. These organisations might be other firms such as suppliers, customers or competitors, or they might be universities, research institutes, banks or government bodies. The behaviour of firms is also shaped by ‘institutions’ that act as constraints to and/or incentives for innovation, such as laws, health regulations, cultural norms, social rules, and technical standards. Organisations, as well as these contextual factors, are all elements of a knowledge creation system that has an economic purpose. Innovations materialise in such systemic constructs” (p. 3).

Another important building block for the systems approach is its evolutionary nature. According to Nelson (1993), “Technical change clearly is an evolutionary process; the innovation generator keeps on producing entities superior to those earlier in existence, and adjustment forces work slowly” (p. 16). For Edquist and Johnson
(1997), the characteristics of learning processes, being interactive and cumulative, means that the institutional set-up will affect the innovation processes.

In summary, theories of interactive learning together with evolutionary theories of technical change constitute the origins of the systems of innovation approach.

**Institutions**

One of the most striking characteristics that systems of innovation approaches have in common is their emphasis on the role of ‘institutions’. According to Edquist (1997), the term ‘institutions’ is used in two main senses: “The first is ‘things that pattern behaviour’, like norms, rules and laws; the second is ‘a formal structure with an explicit purpose’, i.e., what is normally called an organisation” (p. 28). Another way of explaining the distinction between these two terms is that institutions are the rules of a game, organisations are the players. Edquist and Johnson (1997) regard organisations as being partly formed by the institutional framework and, at the same time, vehicles for their change; the players follow the rules but they also influence them.

**Functions of institutions**

According to Edquist and Johnson (1997), the three main functions of institutions are, first, to reduce uncertainty by providing information; second, to manage conflict and cooperation; and, third, to provide incentives (p. 51). According to Coriat and Weinstein (2002), institutions provide the rules of the game, authority and discretion as well as resources for agents. Their understanding is similar to that of Edquist and Johnson, with the rules of the game decreasing uncertainty and managing conflict, and the provision of resources being the same as the provision of incentives.

Institutions can provide incentives for innovation through salary schemes or tax deductions that reward innovative behaviour. Institutions also provide incentives through intellectual property protection in the form of patents, copyrights, trademarks, etc. Institutions can also provide incentives for innovation by channelling resources for innovative activities, financing the innovative activities of companies or financing public R&D activities or training. Resources may also be allocated informally to
innovation through the formation of public opinion about concepts like the knowledge society, continuous learning or the importance of innovation for competition.

According to Edquist and Johnson (1997), one of the most important incentives for innovation is the dynamics of markets. In today’s world, firms risk going bankrupt if they are not innovative enough.

**Boundaries of innovation systems**

It is possible to define an innovation system geographically, with the boundaries drawn around a country, around a group of countries like the EU, or even globally. The boundaries can also be within a country, located in a certain region.

If the nation is chosen as a boundary for the innovation system, the approach is usually called the national innovation system (NIS) and will be explained in detail in the following sections.

If a region within a country is selected as the boundary for the system, the term ‘cluster’ is often used. Famous examples of clusters are the Silicon Valley area in California and Route 128 in Massachusetts. Scholars such as Saxenian (1994) and Porter (1990) have focused extensively on the importance of cluster formation.

It is also possible to define systems in sectors or technologies independent of geography. These sectoral systems of innovation can include a part of a regional, a national, or an international system. Carlsson and Stankiewicz (1995) focus on technology as a common denominator for innovation systems and use the term ‘technological systems’ for systems that focus on specific technology fields. These systems may be restricted to only one sector but can also refer to a technology that a group of sectors have in common. “Nation-state constitutes a natural boundary of many technological systems. Sometimes, however, it makes sense to talk about a regional or local technological system…In yet other cases the technological systems are international, even global” (p. 49).
2.2.2 National innovation systems (NIS)

Definition
Nelson and Rosenberg (1993) define a national innovation system as “the set of institutions whose interactions determine the innovative performance of national firms” (p. 5). According to Patel and Pavitt (1994) “…incentive structure and competences of national institutions determine the rate and direction of technological learning in a country “(p. 79).

Background of the NIS approach
According to Freeman (1995), the first person to use the expression ‘national system of innovation’ was Lundvall. However the idea in fact goes back to Friedrich List’s work, “The National System of Political Economy”, published as early as 1841. List’s main concern was for Germany - which was relatively undeveloped at that time - to catch up with and surpass England. List had been one of the first to understand the importance of learning and knowledge in economic development. In order for a nation to achieve rapid economic development, List advocated a broad range of growth policies based mainly on learning about new technology and applying it. He also asserted that industry should be linked to the science and education institutions. According to Freeman (1995), “it was thanks to the advocacy of List and like-minded economists, as well as to the long-established Prussian system, that Germany developed one of the best technical education and training systems in the world...this was one of the main factors behind Germany overtaking England to become one of the strongest manufacturing nations today” (p. 6).

List’s focus on learning and innovation and the importance of nationwide systemic linkages between learning-producing institutions and economic actors significantly influenced current thinking on national innovation systems.

Do nations still matter?
Nelson (1992) and a group of researchers conducted a number of national innovation system case studies and came to the conclusion that nationhood matters and has a persuasive influence. “In all these cases, a distinctive national character pervades the
firms, the education system, the law, the politics, and the government, all of which have been shaped by a shared historical experience and culture” (p. 368).

However, the whole concept of national differences in innovative capabilities determining national performance has been recently challenged on the grounds that transnational corporations are changing the face of the world economy in the direction of globalisation (Freeman, 1995). Similarly, Nelson (1992) thinks that the importance of national factors will decrease in the long term owing to the stronger integration between countries and faster interaction between companies. These trends will reduce the importance of national influences.

Nevertheless, the importance of the national innovation system remains. Michael Porter (1990) has argued that: “Competitive advantage is created and sustained through a highly localized process. Differences in national economic structures, values, cultures, institutions and histories contribute profoundly to competitive success. The role of the home nation seems to be as strong as or stronger than ever. While globalization of competition might appear to make the nation less important, instead it seems to make it more so. With fewer impediments to trade to shelter uncompetitive domestic firms and industries, the home nation takes on growing significance because it is the source of the skills and technology that underpin competitive advantage” (p. 19).

According to Niosi (2002), capital easily crosses national or regional boundaries. Knowledge flows less easily, because of the tacit character of much of it, which is embodied in human brains. Human capital means tacit knowledge, which is difficult to transfer without moving people. The least mobile factors of production and the most crucial for innovation are human capital, governmental regulation, public and semi-public institutions, and natural resources. Borders and location matter to all these factors.

According to Nelson (1992), although education is becoming more international, most countries will have to rely on their home-grown workforce. And national education systems will change little in their basics. National laws, financial institutions, and fiscal and monetary policies will continue to shape economic activity. Nations will
continue to have their own distinctive views of the appropriate relationships between government and business. Moreover, defence programmes and their R&D will remain national.

2.2.3 Assessing and comparing national innovation systems

Institutions that impact innovation
The national innovation system is a set of institutions whose interactions determine the innovative performance of firms. As a number of institutions may have an impact on innovation, it is important to identify the institutions with the greatest impact. According to Lundvall (1992), the following elements are important in structuring the system of innovation:

- internal organisation of the firm
- inter-firm relationships: cooperation, competition
- the public sector: its direct support for science and development, its regulations and standards, and its role as a user of innovations developed in the private sector
- the financial system
- the R&D system, its resources, competencies and organisation
- the national education and training system.

According to Gregersen, Johnson and Segura (2004), it is possible to group institutions that influence learning and innovation into four main categories: market-driven and market-supporting institutions; institutions supporting interaction and cooperation; institutions supporting human resource development; and institutions nurturing new and existing “interactive learning spaces”.

When analysing Japanese economical success, Freeman (1995) found that the strong innovation orientation of the firms and the domestic competitive structure, including user-producer and subcontractor relationships, played a significant role. He identified network linkages and the role of international trade as important factors, and also noted the impact of the national education system and government science
and technology policy. He found that strong coordination between firms and government actors, such as the ministry of industry and trade, were especially important.

After an extensive literature review, Archibugi and Michie (1997) summarise the importance of the following institutions for innovation:

- Education and training: substantial national differences can be found between education levels or the distribution of students by disciplines.
- Science and technology capabilities: the level of resources devoted to R&D and other innovation-related activities show big differences. Moreover, there are also differences in spending patterns – how much of the spending is public or private, or what percentage of public spending is on civilian innovation or military, space or nuclear technologies.
- Industrial structure: the size of the companies or the level of competition plays a major role.
- Science and technology strengths and weaknesses: each country has its own strengths and weaknesses in different fields. The size of the country, its R&D intensity, market structure and the international division of labour impact the science and technology specialisation.
- Interaction within the innovation system: the propensity of different institutions to coordinate their activities and interact with other actors differs between countries. Some countries support the largest domestic firms, whereas others promote SMEs. The emergence of clusters where different actors interact and collaborate is also important.
- Interaction with external systems: the internationalisation process of the country and the interaction with other countries’ knowledge and technology systems is important.

Based on this academic literature, the OECD’s Oslo Manual (1996) identified four general domains in the innovation policy terrain:

- The broader framework conditions of national institutional and structural factors (for example, legal, economic, financial, and educational) setting the rules and range of opportunities for innovation.
• The science and engineering base – the accumulated knowledge and the
  science and technology institutions that underpin business innovation by
  providing technological and scientific training.
• Knowledge transfer factors that strongly influence the effectiveness of the
  linkages, flows of information and skills, and absorption of learning which are
  essential to business innovation – these are factors or human agents whose
  nature is significantly determined by the social and cultural characteristics of
  the population.
• The innovation dynamo – the companies.

In summary, the OECD approach is based on factors identified in the national
innovation systems literature, and it provides a framework for assessing the national
innovation system of a country.

National innovation systems and policy making
According to Edquist (1997), the notion of optimality is absent from the systems of
innovation approaches. Hence, comparisons between an existing system and an
ideal system are not possible. Instead, innovation system scholars focus on
comparisons between systems. Such comparisons between systems must be
genuinely empirical and therefore similar to what is often called ‘benchmarking’ at the
firm level. According to Arocena and Sutz (2005), although the notion of an optimal
system does not exist in the NIS approach, it still carries some normative weight as it
defines the important elements of a system. For example, the innovation system
approach emphasises the importance of user-producer linkages and the channels of
information between them. It is possible to identify whether the information flow exists
or not. If it does not, this is an area where intervention might be useful.

Edquist (1997) uses the notion of ‘system failures’, which is a matter of identifying
functions that are missing or inappropriate. There are at least three main categories
of system failures: organisations in the system of innovation may be inappropriate or
missing; institutions may be inappropriate or missing; or interactions or links between
these elements in the system of innovation may be inappropriate or missing.
According to Edquist, for the state to intervene there has to be a problem, and the state needs to have the ability to solve the problem.

Comparing national innovation systems
According to Lundvall (2002), one of the classical measures for comparing different national systems is R&D expenditure as a proportion of GDP. Patents, the proportion of new products in sales, and the proportion of high-tech products in foreign trade are also widely used. Lundvall regards each of these indicators as having its own weaknesses and suggests it is best to combine them.

Niosi et al. (1993) propose studying institutions by means of ratios between basic inputs (expenditures, personnel) and outputs (patents, publications, internal reports, innovations, new products), as well as analysing their interaction via variables such as size, ownership and control, and regional distribution. In their work, they also mention patents, scientific articles, and international flows of technology-intensive goods and services.

There are also attempts to capture more elements of the national innovation system. For instance, in a more recent paper Gregersen and Johnson (2005) propose a wide array of criteria. These include indicators for ICT usage, green innovation, and the use of indexes such as the human development index.

2.2.4 Findings from national innovation system studies

Findings from a 15-country comparative study of innovation systems
One of the most important research projects on innovation systems is the comparative country study by Nelson et al., (Nelson (ed.), 1993). The study focuses on 15 countries in three categories: large high-income, small high-income and low-income countries.

Path dependency
The authors of these comparative case studies found that a nation’s innovation system was shaped by factors like size and resource endowments. Countries that
possessed resources and good farmland could support relatively high living standards and could purchase imported manufactured goods. Accordingly, these countries developed publicly-supported R&D programmes to back their resource-intensive industries. Although these sectors require R&D as well, they are still much less R&D-intensive than high-tech sectors. Consequently, the authors discovered, resource-rich countries such as Denmark, Canada and Australia had lower R&D spending than others. On the other hand, countries with limited resources such as Germany, Japan and Korea had to focus on export-oriented manufacturing and on building innovation systems to support these sectors.

**Role of national security**
The authors found that national security concerns played an important role in shaping innovation systems. Countries with security concerns spent a higher percentage of government industrial R&D. Industries from which the military procures tend to be R&D-intensive, whether firms are selling to the military or to civilians. Moreover, the authors argue that even the present industrial structure of Japan and, to a lesser extent, Germany have their origins in their past imperial military build-up.

Security concerns also played a role for low-income countries, especially for Israel where much of the high-tech industry was oriented towards the military. The authors also link the development of Korea and Taiwan’s innovation systems to their need for a capable military establishment.

**Importance of company innovation**
The authors’ first observation is that the performance of the firms matters most. The bulk of the innovation needs to be done by the firms themselves. Secondly, the authors observe that whilst firms in some industries have to be large in order to innovate, in other industries this is not the case. For instance, many successful Italian, Taiwanese or Danish firms are small. The authors show that formal R&D spending is not always critical, as the innovative design activities of Italian textiles companies show. The authors also point out that public R&D programmes are not a significant success factor. They conclude that most of the input into and direction of innovative activities come from firms themselves.
**Role of competition**
The authors (as cited by Nelson, 1992), clearly state that in all cases innovative companies were exposed to strong competition. This can be within the home market, as Porter (1990) describes, or it can be export competition.

**Role of customers and suppliers**
Sophisticated domestic customers were found to be useful for innovation. However, in other cases, access to export customers could compensate for a lack of demanding local customers.

The importance of interactive linkages with upstream suppliers, as proposed by Porter (1990) and Lundvall and Johnson (1994), were verified by case studies on Japanese car firms, Danish food processing or Italian textiles. However, in other cases, such as US and German pharmaceutical companies, strong supplier connections were not significant. The same held true for aircraft production.

**Role of education and training systems**
According to the authors (as cited by Nelson, 1992) one important factor for creating innovative firms is the education and training system. The authors show how Germany trained their engineers and scientists according to industry needs whereas Britain and France failed to do so. In the lower-income sample, Taiwan and Korea succeeded in training a large workforce for the needs of its industry. The case studies show how the workforce was trained by the firms themselves, as in Japan, or by an external training system linked to the firms, as in Germany and Sweden. However, the authors also point to the cases of Argentina and Israel, which show that a well-educated workforce does not guarantee success. In these two countries the economic incentives for companies to compete were not in place, so the presence of a well-educated workforce did not automatically result in innovation.
**Impact of government policies**

The authors also assert that the fiscal, monetary and trade policies played a role, especially policies that promoted exporting. When exporting was not attractive, innovation stopped and import protection policies became stronger.

The evidence on military spending is not conclusive. Although US military spending on aircraft and electronics seems to have helped US firms to capture world markets, the authors see little evidence of civilian spill-over effects.

The evidence on infant industry protection is also unclear. Japanese car manufacturers, Korean electronics firms, and the US semiconductor and computer industries were heavily supported by their defence departments and were later able to dominate world markets. However, other industries such as France’s own electronics industry and the import-substituting industries of Argentina and Brazil failed, despite the support they received.

The authors explain the differences in the lack of incentives for these firms to compete in world markets. Companies that enjoyed a relatively easy existence in their protected home market had little incentive to innovate.

**Role of high-tech industries**

It is expected that high-tech industries usually generate large externalities for national downstream firms. Sectors such as semiconductors, computers or new materials have a special place in innovation. Advances in these fields provide the building blocks for innovation in other downstream industries such as high-speed trains, cellular phones and banking. The argument is that if a nation wants to be strong in these downstream industries, then it should be strong in the key upstream industries. According to the new trade theory argument (Krugman, 1987), these high-tech industries will support higher-than-average profits in the long run and it is legitimate to subsidise them in the short run.

The authors of the case studies seem to be divided on this topic. However, Nelson points out that although the US is the leader in many high-tech industries, its economy has not grown for 20 years (research was from early 1990ies). France
enjoyed economic success despite its efforts to nurture its high-tech sectors, rather than because of them. Italy - a country with relatively weak high-tech industries - was successful for many consecutive years. Moreover, countries such as Canada, Australia and Denmark have competitive industries based on agriculture and natural resources.

### 2.2.5 Developing-country innovation systems

According to Edquist (2001), developing countries need different kinds of organisations and institutions to developed countries. Edquist points out that for developing countries the generation of technological capability is primarily a matter of absorbing products and processes developed in other countries and deepening their knowledge about them over time.

According to Arocena and Sutz (2005), innovation in developing countries has a less systemic character and “a fundamental problem is that the micro-innovative strengths, that really exist, often remain isolated and encapsulated, thus weakening remarkably their potential contribution to the competitiveness of national economies” (p. 5).

According to Gu (1999), NISs in developing countries are less developed and therefore it is not productive to report their low-level output. Instead, it is important to give a historical perspective and to understand the causal relationship between events. Moreover, as R&D is less developed, the focus needs to be on more broadly-defined innovative activities and especially on knowledge links between firms and their suppliers and supporters.

According to Edquist (2001), there is greater need for public innovation policies in developing countries than in developed ones. Edquist thinks that developing countries should set different priorities:

- Developing countries should try to stimulate product innovation since these create employment, whereas process innovations generally increase efficiency
and decrease the need for employment. However, process innovations are still necessary as they can provide the basis for product innovations.

- Governments should create opportunities and incentives for changes in the production structure. They should promote sectors characterised by high knowledge intensity and a high level of product innovation.
- Developing countries have to put in place an education system that secures basic education for all and advanced education and training for a large portion of the population.
- There should be a balance between complete exposure to competition and temporary protection of domestic firms against such competition. In other words, the public organisations and institutions should be designed in such a way that they support the generation of domestic innovation capability.

**Summary of innovation systems literature review**

Innovation is based on interactive learning and has an evolutionary character. This interactiveness paves the way for a systemic approach. In other words, companies do not innovate in isolation and are affected by their environment, or the innovation system in which they reside.

Institutions - defined as the rules of the game - greatly influence the innovativeness of companies. They decrease uncertainty, and provide incentives and resources for innovation. The most important institutions identified by the literature review are the macroeconomic setting, the legal and finance system, science and technology policy, the education and training system, and the institutions that impact interaction and cooperation.

Comparative country innovation system cases show there is a certain path dependency to innovation, where the resources of a country determine its innovation path. The education and training system is identified as playing a very central role. Exporting is seen to have a positive impact on innovation, but the role of government support or defence industries is disputed. Access to demanding customers and cooperation with suppliers also seem to be important.
In comparing and assessing innovation systems, the focus is on input factors like R&D spending and personnel on the one hand and output factors such as high-tech exports, patents and scientific articles on the other. When using the innovation system approach to help policy making, the most promising approach is to use comparative country cases and apply ‘benchmarking’. Moreover, assessing the existence of linkages between actors or resources for innovation can help identify ‘system failures’. For instance, if there is little interaction between the actors of the system and few resources are channelled to innovation, this would indicate the need to intervene.

With regard to developing countries, their innovation systems are often undeveloped, and actors remain isolated. Many competences do not exist, and instead of radical innovation, the diffusion of innovations from other countries is more important. Moreover, the market may not function well enough for resources to be channelled, and thus there is a stronger need for government intervention.

Main building blocks for the dissertation

- Institutions that have a significant impact on the innovative activities of companies are identified. These will be the dissertation’s focus areas for assessing the Turkish national innovation system.
- The input and output factors for measuring and comparing innovations systems are identified.
- The characteristics of developing-country innovation systems are elaborated.

2.3 Company View

2.3.1 Background of organisational learning research

The work of Argyris and Schön (1978) is considered a major early contribution to the introduction of the term “organisational learning”. Argyris and Schön proposed that organisations have different levels of learning. Single-loop learning referred to the performance improvement of an organisation's tasks, whereas double-loop learning allowed an organisation to revise the values and criteria that are used to define and assess performances.
The work of Senge (1990) increased the popularity of the organisational learning research stream since it showed organisations a practical way of applying and improving learning. In fact, during this period, a new inter-related concept emerged: the concept of the learning organisation, a new type of organisation that intentionally develops strategies to promote learning.

Currently, there are two streams of empirical research on organisational learning (Bapuji and Crossan, 2004). The first stream uses organisational learning concepts to explain organisational phenomena such as performance, strategic alliances, innovation, market orientation and technology adoption. The second stream focuses on the facilitators of organisational learning. Studies that examine facilitators of organisational learning typically use organisational learning as a dependent variable and examine the processes that lead to it.

**Focus of study**
The objective is to identify factors that impact the learning capability of organisations.

**Definitions: Organisational learning and learning organisations**
Argyris and Schön (1978) defined organisational learning as a process in which “members of the organisation act as learning agents for the organisation by detecting and correcting errors in organisational theory-in-use and embedding the results of their inquiry in private images and shared maps of the organisation” (p. 29). Later, this focus on problem detection and correction came to be seen as too limited and the attention shifted to the knowledge creation process that leads to the generation of new ideas and behaviours (Dierkes, Nonaka, Child and Antal, 2001). Building on this, Jerez-Gomez et al. (2005) define organisational learning as a dynamic process based on knowledge, which implies moving among different levels of action, going from the individual to the group level, to the organisational level and then back again.

Dixon (1994) emphasises the purposeful nature of the process in her definition: “the intentional use of learning processes at the individual, group and system level to continuously transform the organisation in a direction that is increasingly satisfying for its stakeholders” (p. 5).
From this intentional use of the learning process we arrive at the learning organisation. According to Dodgson (1993), “Firms that purposefully construct structures and strategies so as to enhance and maximise organisational learning are designated ‘learning organisations’” (p. 377).

2.3.2 The organisational learning process

Most of the organisational learning analysis is based on individual learning theories. Huber (1991) defines organisations as single entities having the same information searching and processing behavioural responses as individuals. The interpretation process includes environmental scanning, interpretation, and learning. From the understanding of the meaning of data collected, subsequent actions are undertaken by organisational members to align with the environment and to be competitive and innovative (Bell, Whitwell and Lukas, 2002).

Huber’s (1991) view of organisational learning as firm-wide information processing is the most pervasive theme within the literature. The argument is that learning incorporates the processes of information acquisition, dissemination, interpretation, and memory (Bell et al., 2002).

- **Knowledge acquisition** is the process by which knowledge is obtained
- **Information distribution** is the process by which information from different sources is shared and thereby leads to new information and understanding.
- **Information interpretation** is the process by which distributed information is given meaning or commonly understood.
- **Organisational memory** is the means by which knowledge is stored for future use (Sinkula, 1994).

However firms’ learning is more than the sum of the parts of their employees’ learning. Shared norms and values are agreed as being indicative of organisational rather than individual learning.

**Learning process and levels in organisations**

Organisational learning is a dynamic process based on knowledge, which implies moving among different levels of action, going from the individual to the group level, to the organisational level and then back again (Jerez-Gomez et al., 2005).
Crossan, Lane and White (1999) stress the necessity of considering both the process and level of learning occurring within organisations. Intuition and interpretation occur at the individual level; interpretation and integration occur at the group level; and integration and institutionalisation occur at the organisational level. Although the framework is depicted in a hierarchical fashion, the recursive nature of the phenomenon means there are many feedback loops among the levels.

Nonaka and Takeuchi (1995) describe the process of knowledge creation in Japanese companies as a "spiral", oscillating between tacit and explicit, and moving forward and backward among different levels in organisations. They cite the organisational knowledge creation process in the context of new product development as a typical example, involving different interacting individuals from different backgrounds and mental models.

### 2.3.3 Towards a learning organisation: factors that impact organisational learning capability

Firms that purposefully construct structures and strategies so as to enhance and maximise organisational learning have been designated “learning organisations”. The learning company is defined by Pedler et al. (1989), as “an organisation that facilitates the learning of all its members and continually transforms itself” (p. 91). They argue that the learning company:

- has a climate in which individual members are encouraged to learn and develop their full potential
- extends this learning culture to include customers, suppliers and other significant stakeholders
- makes human resource development strategy central to business policy
- continually undergoes a process of organisational transformation.

While Pedler et al. (1989) argue that there is no blueprint for learning firms, students of large Japanese firms have identified many similar characteristics in innovative firms. Such companies place heavy emphasis on human resource development to
facilitate learning and focus on the direction and effective utilisation of learning activities (Dodgson, 1993).

Senge (1990) proposes five main ‘disciplines’ which form the foundation of the ‘learning organisation’: mental models, shared vision, personal mastery, team learning, and systems thinking. Mental models are the deeply ingrained assumptions that we hold about the nature of the world, and which inform the actions that we take. Shared vision is the process whereby the personal views of key leaders are translated into forms that can be shared by all members of the organisation. Personal mastery involves a commitment to lifelong learning and the discipline of continually challenging and clarifying personal visions. Team learning involves maximising the insights of individuals through dialogue and an awareness of the patterns of group behaviour that can undermine learning. Systems thinking is the conceptual ‘glue’ that binds these different elements together and provides the tools that enable isolated actions to be seen as integrated patterns (p. 6-11).

According to Jerez-Gomez et al. (2005), the effective development of organisational learning capability requires four conditions. First, company management must provide decisive backing to organisational learning. Second, it requires the existence of a shared vision. Third, it needs the development of organisational knowledge, based on the transfer and integration of knowledge acquired individually. Creating a corpus of organisational knowledge, steeped in the routines and processes of the work itself, is essential for guaranteeing the organisation’s continuous learning, irrespective of the individuals who form part of it. Fourthly, the firm must go beyond adaptive learning; it must be able to question the organisational system in force and, if necessary, and make changes in search of more innovative and flexible alternatives. This learning type is what the authors call ‘generative learning’ and requires an openness to new ideas and experimentation.

**Assessing organisational learning capability**
Recently, there have been attempts to measure learning capability. For instance, the study of Goh and Richard (1997) identifies five dimensions (clarity of purpose and mission, leadership commitment and empowerment, experimentation and rewards, transfer of knowledge, teamwork and group problem solving), and establishes a
learning scale made up of 21 items. A study by Hult and Ferrell (1997) attempts to measure the four dimensions they consider part of organisational learning capability (team orientation, systems orientation, learning orientation, and memory orientation). Building on these two approaches, and also on an extensive literature review of the dimensions of learning capability, Jerez-Gomez et al. (2005) developed a scale for measuring organisational learning capability. Although the scale is strong in internal consistency and convergent and discriminant validity, it is limited by its focus on a single industry (chemicals).

All the above-mentioned studies focus on similar dimensions such as the commitment of management, systems orientation, teamwork, experimentation, rewards and empowerment. This dissertation uses the scale developed by Jerez-Gomez et al. (2005) since it builds on the existing scales and has proven consistency and internal validity.

Factors that impact organisational learning capability

<table>
<thead>
<tr>
<th>Management commitment</th>
<th>Systems perspective</th>
<th>Openness &amp; experimentation</th>
<th>Knowledge transfer &amp; integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Management attitude towards changes</td>
<td>• Generalized knowledge of company objectives</td>
<td>• Innovation promotion</td>
<td>• Failure tolerance</td>
</tr>
<tr>
<td>• Employee learning expenditure</td>
<td>• Company interconnection &amp; coordination</td>
<td>• Corporate culture &amp; experimentation</td>
<td>• Teamwork &amp; socialization</td>
</tr>
<tr>
<td>• Employee involvement &amp; innovation rewards</td>
<td></td>
<td>• Benchmarking &amp; external knowledge sourcing</td>
<td>• Knowledge sharing instruments</td>
</tr>
</tbody>
</table>

Exhibit 6: Factors that impact organisational learning capability

2.3.4 Learning results: innovation indicators

The previous section focused on the learning capability of companies. This section focuses on assessing the ‘learning results’ that are ‘innovations’.

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\[6\] Jerez-Gomez et al. (2005)
Innovations in this context are new or improved products and processes that are new to the company, although not necessarily new to the world. There are various types of innovations (Oslo Manual, 1996, p. 16):

- introduction of a new product or a qualitative change in an existing product
- process innovation new to an industry
- the opening of a new market
- development of new sources of supply for raw materials or other inputs
- changes in industrial organisation

Measures such as R&D inputs, patent counts, patent citations, counts of new product announcements, and more specific survey-based measurements have been used to capture innovative performance (Hagedoorn and Cloodt, 2003).

It is also possible to assess the innovative activities of enterprises by focusing on the inputs and outputs for innovation.

**Inputs for innovation**

The most prominent input from the perspective of technological innovation is R&D activity. However, this has two shortcomings: first, it relates only to technical change, and second, it does not encompass all the innovative efforts made by firms (Oslo Manual, 1996). Therefore, it is important to assess other innovative activities.

Acquisition of technology such as patents, trademarks and licences are among the inputs for innovation. Companies that purchase new or improved machines are considered innovative. Training expenditure related to the introduction of new or improved product or processes is a type of innovation input.

Joint participation in R&D projects with other organisations, such as universities, research institutes and other companies, is a further means of identifying innovating firms (Flor and Oltra, 2004).

**Outputs of innovation**

The ultimate indicator of innovative activities is the performance of the firm. Companies engage in innovation in order to contribute to the success of the firm.
However, the performance of a company depends on many factors, and innovation may or may not play the most important role.

Introduction of new or improved products is another output indicator. It is expected that innovative enterprises have a higher percentage of sales coming from new products.

Intellectual property statistics such as patents, trademarks and designs are among the most widely used innovation indicators. Application for intellectual property protection implies that the company has created commercially applicable new knowledge that it would like to protect.

**Two additional input and output indicators**

According to Niosi, Saviotti, Bellon and Crow (1993) the definition of innovation includes the ‘opening of a new market’. Using this definition allows us to treat ‘new market entries’, even with existing products, as innovation if the company needs to upgrade its knowledge base. Whereas simple export to another neighbouring country would not be considered as innovation, entry into a new geographical market that requires new processes and additional knowledge *could* be regarded as innovation.

Another category that falls outside the usual indicators is design. Industrial design is regarded as part of technological innovation, whereas artistic design is often excluded. If the focus of innovation went beyond technological innovation, this exclusion would no longer apply and all design activities would be categorised as innovative activity. For instance, the existence of a design department is considered innovation input whereas design awards and sales from uniquely designed products are innovation outputs.
As a result, the following input and output indicators can be used to assess the innovativeness of companies:

<table>
<thead>
<tr>
<th>Innovation Indicators</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D spending</td>
<td></td>
<td>Sales from new/improved products or processes</td>
</tr>
<tr>
<td>R&amp;D personnel</td>
<td></td>
<td>Intellectual Property statistics</td>
</tr>
<tr>
<td>Intellectual Property statistics</td>
<td></td>
<td>Sales from new markets</td>
</tr>
<tr>
<td>Acquisition of technology</td>
<td></td>
<td>Design awards</td>
</tr>
<tr>
<td>Expenditure on manufacturing, marketing and training for new products/process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design development expenditure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New markets entered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 7: Innovation indicators

Summary of the company view
Organisational learning has many similarities with individual learning but the focus is also on the knowledge transfer between the individual, team and organisational levels. Factors that impact organisational learning capability are management commitment to learning, systems perspective, openness and experimentation, knowledge transfer and integration. The innovativeness of companies can be assessed by input factors such as R&D spending, and training of personnel, and by output factors such as patents, and sales from new products.

Main building blocks for the dissertation
- Factors that impact organisational learning, including a question set for assessment, are identified.
- Innovation indicators for determining the innovativeness of companies are also identified.
3. THE TURKISH NATIONAL INNOVATION SYSTEM

This chapter analyses the Turkish innovation system, using factors identified in the literature review. It leans strongly on the OECD approach outlined in the Oslo Manual (1996).

Five areas are assessed:

- **Background conditions** such as macroeconomic stability, the legal and bureaucratic environment for business, the finance system and the communication infrastructure.

- **Education system**: the quality and reach of the education system.

- **Turkish innovation policies**: the main innovation system actors, and government support for companies: R&D credits and grants, tax support, access to knowledge and infrastructure, etc.

- **Innovativeness of companies**: the innovative activities of Turkish companies. The chapter also analyses the impact of the innovation system on the innovativeness of companies.

- **How the innovation system compares with that of** other countries, using input and output factors.
Main data sources

The analysis of the Turkish innovation system is based on a variety of qualitative and quantitative data. The main data used are given below:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Statistics Sources</td>
<td>Turkish Statistics Institute (TUIK)</td>
</tr>
<tr>
<td></td>
<td>OECD national statistics</td>
</tr>
<tr>
<td></td>
<td>World Bank statistics</td>
</tr>
<tr>
<td></td>
<td>World Intellectual Property Organization (WIPO) statistics</td>
</tr>
<tr>
<td></td>
<td>World Trade Organization (WTO) statistics</td>
</tr>
<tr>
<td></td>
<td>Eurostat: EU Community Innovation Surveys: 2002-2004</td>
</tr>
<tr>
<td></td>
<td>IMD Competitiveness Survey 1999-2007</td>
</tr>
<tr>
<td></td>
<td>World Bank Knowledge Economy Index and Survey 2006</td>
</tr>
</tbody>
</table>

Exhibit 8: Innovation system analysis: overview of information sources 

3.1 Background Conditions for Innovation

3.1.1 Macroeconomic environment

The macroeconomic environment has a significant impact on the innovative activities of companies. Unstable macroeconomic settings make it difficult for companies to plan ahead, and this makes long-term innovation investment difficult. When inflation is out of control or when the cost of capital is increasing, companies tend to focus only on short-term activities for survival, often shelving investment in innovation. On the government side, high budget deficits and financing problems tend to reduce public investment in education or innovation support funding. This can affect companies' innovative potential.

8 Author’s illustration
Development of the Turkish economy

In order to understand the context in which the innovation system has developed, it is important to understand the development of Turkey’s macroeconomic environment. This section provides a brief overview of the past 25 years.

Import substitution period: average growth (pre-1980)

The Turkish economy was dominated by the state and highly regulated. Import substitution policies were used extensively and the economy was protected from competition. Between 1968 and 1980, real GDP growth was 4% per annum and real GDP per capita growth was 1.6%, reflecting high population growth.

Start of liberalisation: high growth (1980 to 1990)

After a state coup in 1980, Turkey switched to a policy of liberalisation. A number of reforms were implemented to open the country to trade, and liberalise the financial markets. Generous export incentives together with policies to reduce domestic demand were used to promote exports. As a result, exports increased during this period and the economy grew more quickly: real GDP growth was 5.2% per annum, and real GDP per capita growth was 2.8% per annum.

Continued liberalisation: erratic growth (1990 to 2002)

Rapid development ended in the early 1990s. The Turkish economy suffered excessive volatility and had to struggle with an increasing budget deficit, high real interest rates, and high inflation. The country experienced a severe financial crisis in 1994 and had to cope with external shocks, such as the Gulf crisis in 1991, and the Russian crisis and an earthquake in 1999. As a result of these contractions and episodes, the economy achieved low average growth rates: 3.4% real GDP growth per annum, and 1.8% real GDP per capita growth per annum (McKinsey Global Institute, 2003).
**Stability and high growth: (2002-2007)**

After the crisis of 2001, Turkey elected a one-party government which brought back stability. It also implemented a number of reforms. The banking sector was consolidated and the government deficit was brought under control. This period coincided with a strong global economy, and a significant amount of capital poured into Turkey, which profited from the growth opportunities. Turkey’s economy grew quickly, with both GDP and exports achieving record growth.

**Political instability and external shocks**

The list below is an overview of Turkey’s governments since 1983. As can be seen, the 1990s were especially unstable in political terms.

- 1991-1995: coalition, with a total of 3 governments
- 1995-1999: coalition, with a total of 4 governments
- 1999-2002: coalition, with 2 governments
- 2002-: one-party government (Sabah, 2007).

Turkey had a total of 16 governments in less than 20 years, making it very difficult to implement long-term policies conducive to growth and innovation. Many policies started by one government were reversed as a new one arrived, and the recurring ‘election economics’ resulted in irresponsible spending. As a result, until 2001 the budget deficit continued to increase and the allocation of government resources became increasingly inefficient.

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OECD (2004)
In addition to political instability, Turkey faced a number of external crises. The Gulf and the Russian default both had a negative impact on the fragile Turkish economy. Moreover, Turkey suffered two serious earthquakes, which cost thousands of lives, interrupted business and cost the country billions in reconstruction costs. Overall, the 1990s were difficult years for Turkey. However, after 2002, Turkey entered a new phase of stability and growth.

**International comparison of macroeconomic stability**

Although progress has been made since 2001, Turkey remains a risky country in terms of macroeconomic stability. The World Economic Forum (WEF) Competitiveness Survey ranked Turkey a dismal 111th overall in this regard, and Turkey’s overall performance was worse than the majority of the 125 countries covered. Whereas inflation has fallen significantly around the world in recent years, Turkey’s inflation rate of 8.2% in 2005 still places it 94th overall, alongside the likes of Georgia, Botswana and Honduras, and well below any EU member. Further, in 2005 the government budget deficit (5.9% of GDP) and debt (72.8% of GDP) were still high by international standards, putting Turkey at 115th and 86th respectively. According to the WEF (Blanke and Mia, 2006), “Turkey must continue to bring down its debt levels if it is to reduce its vulnerability to rising worldwide interest rates and exchange rate volatility. The overall picture is that, compared with the other emerging market economies which have experienced financial crises in recent years, such as Argentina, Brazil and Russia, Turkey remains highly vulnerable to external shocks. In particular, Turkey’s burgeoning current account deficit (estimated by the IMF at 6.7% in 2006) raises cause for concern, as it leaves the country prey to the whims of international investors” (p. 12).

**3.1.2 Financial system**

In Turkey, banks are the most important financial institutions; other financing options have been traditionally less developed. During past decades Turkish businesses have had serious difficulties in gaining access to bank credits. Interest rates were high since most bank lending was channelled to cover the needs of the state. The share of government securities in the banking system’s total assets reached over 40% in the early 2000s, and government security investing became the central know-
how in banking. Moreover, macroeconomic and political instability, governance issues in companies, and the inefficiency of the fragmented banking sector increased the country risk premium (OECD, 2004).

After the crisis in 2001, a banking sector reconstruction programme was implemented, its aim to financially restructure and rehabilitate banks and strengthen the banking system. Through the banking sector restructuring programme, risk management and auditing systems were established, eight banks were merged, and measures for the financial recovery of the banks were taken (Elci, 2003).

Following consolidation, a number of foreign banks entered the Turkish market by purchasing the banks that had been taken over by the state. By 2005 foreign banks’ share in the sector was 14%.

<table>
<thead>
<tr>
<th>Financial Consolidation</th>
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<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Concentration¹</td>
</tr>
<tr>
<td>Number of Banks</td>
</tr>
</tbody>
</table>

¹ Bank concentration is defined as the five largest banks’ share of the banking sector’s assets.

Exhibit 10: Banking consolidation: number of banks 1999-2005 ¹⁰

The result was a consolidated and financially more robust banking system. According to the World Bank, the Turkish banking system had been strengthened significantly and would be able to absorb a number of downside scenarios, such as a sudden stop to capital flows, without system distress (Başçı, 2006).

Following the crisis, the government was able to bring down inflation and state deficits to manageable levels. As a result, real interest rates decreased significantly, and this stimulated the demand for credit.

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¹⁰ Başçı (2006)
Turkish banks began to shift away from large holdings of government securities towards traditional banking activities, such as lending to the private corporate and household sectors (World Bank, 2008a). The aggressive credit policies of foreign banks positively affected credit growth (Başçı, 2006).

Although household credit increased faster than corporate borrowing, large companies in particular were able to access the international credit market after 2001. According to the OECD (Gönenç et al., 2008), “The currency appreciation also contributed, by widening the gap between high capital costs in the local market and much lower costs of externally borrowed funds after exchange-rate adjustments. Fiscal consolidation having cut public borrowing needs, international savings funded for the most part increases in private business investment and household consumption“ (p. 30-31).

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OECD (2004)
By 2006, domestic credit to the private sector as a percentage of GDP was 32%, compared with 27% in Poland and 22% in Mexico. In contrast, though, the figure for Spain was 167%, for Korea 102% and for Thailand 88% (World Bank, 2008a).

Accordingly, in the World Economic Forum (WEF) Competitiveness Survey, Turkey registered rather mediocre scores for the availability of capital from the local market in terms of loans from the banking sector (73rd, out of 125 countries) and venture capital (77th) (Blanke and Mia, 2006). Turkey also continues to have one of the highest real interest rates in the world, which helps the country to attract foreign capital but increases the cost of financing. Results from an IMD executive opinion survey show that this is an issue. Asked if the cost of capital encourages business development, 3.3 (out of 10) responded positively in 2008, fewer than in Thailand (4.9) and Poland (4.04), (IMD World Competitiveness Yearbook, 2008).

Overall, although Turkey has improved its financial system, problems remain. International surveys from both the WEF and the World Bank show that the Turkish banking system is still perceived as being unstable. In the soundness of banks criteria in the World Bank survey, Turkey scored lower than Thailand and Mexico (World Bank, 2008a). Nevertheless, we have to take into account that these surveys measure perception, and, following the banking crisis, it will take a long time to regain

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12 Gönenç et al. (2008)
the confidence of investors even if the system itself is objectively sound. A European
Union study on innovation in candidate countries during 2001-2003 concludes that
while the Turkish system performs relatively well in its capacity to provide domestic
credit, the financial system is still uncompetitive owing to the high cost of capital
(European Commission, 2003).

3.1.3 Legal and bureaucratic environment

This section looks at two categories: first, the overall legal and bureaucratic set-up for
business, and, second, the legal environment for intellectual property protection.

Ease of doing business

According to the findings of the latest OECD report on the Turkish economy (Gönenç
et al., 2008), the formal regulatory framework in Turkey is not supportive of growth.
Even significant reforms that were implemented after 2000 were not able to change
this overall verdict. Between 2003 and 2005, Turkey implemented a number of
changes to help businesses – for instance, it launched one-stop registration for
companies, by combining seven procedures into a single visit to the company
registry. As a result, the time it took to start a business fell from 38 days to 9, and the
cost fell by a third. Consequently, the number of registrations rose by 18%. Turkey
also reduced the top rate for corporate income tax from 30% in 2005 to 20% in 2006,
and introduced a new corporate tax code. It reduced the tax on interest from 18% to
15% in 2006 and simplified other taxes, such as property tax and the tax on cheque
transactions. It also improved e-filing, reducing the time businesses need to comply
with tax regulations by 31 hours. Turkey also adopted corporate governance codes
for public companies (World Bank, 2008b).

Nevertheless, many issues remain. Product and labour market regulations still make
it difficult and costly for businesses to comply fully with the law. Many companies
prefer to operate informally, which provides them with flexibility and lower costs, but
means they lose access to capital and skilled labour. According to the OECD
(2008b), the main issues are: 1) very high minimum wage/average wage ratios, 2)
high labour tax wedges, and 3) rigorous employment protection and the highest
severance payments in the OECD area (Gönenç et al., 2008).
According to the latest ‘Doing Business’ report by the World Bank (2008b), covering the period April 2006 to June 2007, Turkey was the 57th (out of 178) easiest country to do business in, which put it behind countries such as Mexico and Thailand. Turkey scored low at terms of the ease of employing workers, dealing with licences and closing a business. Mostly as a result of recent reforms, it performed better in terms of the ease of starting a business, registering property and paying taxes but also overall in enforcing contracts (World Bank, 2008b). In 2006, based on 2004 data, Turkey had a ranking of 93 in the world (in 2007 it improved to 84) with Poland at 54, Mexico 73, Spain 30, Thailand 20, and Korea 27. In summary, although Turkey has been able to improve its ranking over time, it is still behind other rapidly developing countries.

**Intellectual property protection**

In the area of copyright, Turkey has adhered to the Berne Convention on the protection of literary and artistic works, and the Rome Convention on the protection of performers, producers and phonogram and broadcasting organisations. Turkey's law no. 5846 is based on these conventions to protect intellectual and artistic works including computer programmes. There has been a trademark protection law since 1995, and the Turkish Patent Institute (TPI) is in charge of managing trademark applications. Protection is granted for 10 years from the date of filing, and can be renewed. There has also been a patent law since 1995. To obtain a patent, the application is lodged with the TPI. Patents are granted for 20 years for any invention in any field of technology, which is novel, involves an inventive step and is suitable for industrial applications. The TPI received around 60,000 trademark applications in 2005 and registered slightly fewer than 35,000. In the same year, around 5,300 applications for design were received and more than 5,200 registered. Design registration requests are predominantly of Turkish origin.

According to the EU, Turkey has reached a considerable level of legislative alignment with the acquis (EU law) in the area of intellectual property rights (IPR). However, its administrative capacity is still not sufficient to ensure the effective enforcement of intellectual property law (European Commission, 2006).
According to the Office of the United States Trade Representative (2007), Turkey’s IPR regime has improved in recent years, but still has serious problems. Turkey remained on the Special 301 “Priority Watch List” in 2006 owing to concerns about the lack of protection for confidential test data submitted by pharmaceutical companies against unfair commercial use, and continued high levels of piracy and counterfeiting of copyright and trademark materials. However, there have been recent improvements. For instance, the number of items seized has doubled every year since 2002, and 3.7 million items were seized in 2005, essentially CDs and VCDs, in a total of 3,800 operations (European Commission, 2006).

In summary, then, although legislation alignment with the EU exists, enforcement is not yet sufficient. Overall, a positive trend has been observed.

3.1.4 Market access and buyer relationships

Market access

After 1980, Turkey changed its strategy from import substitution to export promotion. From the mid-1990s, Turkey’s integration into world trade has gained greater pace. Turkey became a member of the World Trade Organisation (WTO) on 26 March 1995 and accords at least MFN treatment to almost all WTO Members. In 1996, a customs union between Turkey and the EU entered into force. The customs union provides for free trade in, and a common external tariff on, industrial goods and the industrial component of processed agricultural goods (World Trade Organisation, 2008).

The customs union between Turkey and the EU goes beyond bilateral trade. The agreement has a number of integration elements including: the adoption of the Community’s commercial policy towards third countries including textile quotas, the adoption of free trade agreements with all the EU’s preferential partners including EFTA, Central and Eastern European and Mediterranean countries; cooperation on the harmonisation of agricultural policy; mutual minimisation of restriction on trade in services; and harmonisation of Turkey’s legislation with that of the EU in the areas of competition policy, state aid, anti-dumping, intellectual and industrial property rights, public procurement and technical barriers to trade (Utkulu and Seymen, 2004). In terms of tariffs, Turkish producers of industrial goods are now protected from external
competition to exactly the same extent as EU producers. However they are not protected by tariffs and have to face competition from duty-free imports of industrial goods from world-class pan-European firms. In return, industrial producers have duty-free market access, unrestrained by the rules of origins and tariffs, to the European Economic Area (EU-25 and EFTA).

Since the entry into force of the customs union, trade between the EU and Turkey has increased significantly. Moreover, contrary to some expectations, Turkey has been able to decrease its trade deficit with EU countries (Kaminski and Ng, 2006).

This is especially true for the automotive, consumer durables, shipbuilding and textiles sectors.

Through the common trade policy with the EU, Turkey has concluded a number of trade agreements with countries or country blocks. For instance, it has concluded bilateral trade agreements with a number of Mediterranean partners.

In addition to the customs union with the EU, Turkey has recently been very active at making agreements with countries or county blocks to get preferential access for its industrial goods. As a result of these efforts, trade with neighbouring countries in particular has increased tremendously during the past years, creating a counterweight against trade with the EU. The efforts over the past decade have

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13 Turkish statistics institute (2008a)
opened up many markets to Turkish companies, and exports have increased continuously.

Exhibit 14: Turkish exports, in billion US$

Turkish exports grew from US $14 billion in 1992 to US $107 billion in 2007. The importance of the export market for Turkish firms is increasing as well. In 2002, a survey carried out by the Istanbul Chamber of Industry indicated that 90% of large companies, 80% of medium-sized companies and 60% of small companies exported their products. Overall, the proportion of companies exporting their products was 74.2% (Elci, 2003).

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14 Turkish statistics institute (2008a)
Access to advanced users

Exhibit 15: Exports per region

More than 60% of total Turkish exports go to either European Union countries or North America. These markets are among the most demanding markets in the world, meaning that Turkish exporters have access to feedback from the most advanced users. The EU especially has had a huge impact on Turkish producers. In areas such as safety and environmental-friendliness, the European Commission sets strict regulations. Moreover, Western European consumers are often among the early adopters of new technologies. This helps Turkish producers to identify global trends faster than they could do in the domestic market.

Integration into global production networks

It is possible to divide international production networks into two broad categories: ‘buyer-driven’ and ‘producer-driven’ value chains (Kaminski and Ng, 2006). Buyer-driven networks refer to global buyers creating a supply base upon which production and distribution systems are built. Examples include textiles, footwear and furniture. Global retailers are particularly engaged in this sort of value chain. Producer-driven value chains refer to highly-specialised production networks. Examples include automotive networks, and information and communication technology networks. These networks differ in several important respects from traditional, buyer-driven global value chains. They include two-way flows of parts and components across firms in various countries for further processing, and development occurring at several tiers, with large multinational corporations playing a central role in

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15 Turkish Statistics Institute (2008a)
coordinating the production process. Overall, it can be said that exports through buyer-driven networks have been the norm for developing countries. As the development level increases, participation in producer-driven networks gains pace. Engagement in global networks in the electronics or automotive industries usually comes at higher stages of economic development.

Overall, these two forms of network trade account for almost two-thirds of Turkey’s EU-destined exports. Turkey started with mainly textiles, exporting to European buyer-driven networks. Although Turkey entered buyer-driven networks earlier, the value of the exports of parts and final products from producer-driven networks increased by 178% from 2000-2004, while the value of exports from buyer-driven networks increased by 50% (Kaminski and Ng, 2006). Increasingly, Turkish firms have been exporting under their own brand names to reach end-consumers. Companies in white goods, TVs, food and ceramics have been capturing international market share and have also been purchasing well-known brands. Own-branded exports constitute the most advanced form of exports since brand management requires sophisticated skills. Innovation also becomes more important as companies try to succeed under their own brand.

3.1.5 Industry structure and competitive environment

In terms of industry structure, the largest 500 firms play a dominant role in the Turkish economy. They generated 49% of total industrial value-added and 54% of exports in 2006 but employed only 12% of the industrial labour force (Gönenç et al., 2008).
Although large firms have been in a strong position, according to the OECD, medium-sized enterprises have been the main engine of growth in Turkey in the 2000s. These companies have been established in a variety of regions in Turkey and many are highly entrepreneurial, first-generation family businesses. Moreover, many are engaged in exporting. Their labour intensity is higher than in larger companies, which makes them dependent on Turkish exchange-rate movements.

There are also a growing number of foreign firms, most of which entered the market after 2001. Foreign direct investment (FDI) firms are concentrated in domestic market-oriented activities such as banking, telecommunications and retail trade. Their role in export-oriented manufacturing is minor, except in the car industry. The foreign imports that have started entering Turkey, especially since the customs union with the EU, have had a positive impact on competition. According to the OECD, increased import penetration did not provoke the feared output loss for local industries but generated above-average productivity and output growth (Gönenç et al., 2008).

With regard to competition policy, Turkey adopted a competition law in 1994, and later, in 2002, passed secondary legislation to address three issues relating to competition policy: (1) agreements, decisions, and concerted practices that hinder,

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16 Gönenç et al. (2008)
distort or restrict competition among enterprises, (2) the abuse of a dominant position by enterprises, and (3) mergers and acquisitions that distort the competitive structure of the market (Elci, 2003). In 1997, Turkey also established a competition authority which is widely regarded as one of the best-run state institutions.

The results of the International World Bank Survey (2008b) on the intensity of local competition seem to validate the overall positive picture. Turkey scored 5.5 out of a possible 7 – almost at the same level as Spain and Korea (both 5.6) but higher than Poland, Mexico and Thailand.

3.1.6 Transportation and communications infrastructure

Transportation infrastructure
Turkey’s railway density is lower than any EU member country, and the railway infrastructure is relatively old (Gönenç et al., 2008). With regard to road density, Turkey’s 0.55km per square km is significantly better than Mexico and Thailand but lower than Poland and Spain which have 1.35 and 1.32 respectively (IMD World Competitiveness Yearbook, 2008).

According to the OECD (Gönenç et al., 2008) “Overall, Turkey’s infrastructure falls short of OECD and EU standards. Budget constraints have limited new infrastructure investments since the mid-1990s, and there remain major concerns regarding the efficiency of public spending in this area. The dominant transport mode – road – suffers from localised congestion and deteriorating road quality. Consequently, the railway lines between the highly populated cities are not suitable for high speed and good quality service” (p. 72).

Although such comparative analysis depicts a gloomy picture for Turkey, there are other opinions about the infrastructure. “Consider the potential of a country such as Turkey. It ranks 12th in the world in the total number of kilometres of highways and has excellent expressway linkages to the EU, as well as more than 100 ports and 8 international airports” (Huttenczapski et al., 2006, p.4).
Turkey has relatively few broadband subscribers but is one of the fastest-growing countries in this respect. Moreover, Turkish households are larger than Western European ones, meaning that the same subscriber figures involve more individuals being reached.

As noted, Turkey has almost caught up with other countries in terms of communications infrastructure, mostly thanks to mobile telecommunication which is easier to deploy in large areas than fixed lines. Overall, Turkey is still very much behind the OECD average in many areas. However, the main problem for companies is not the availability of services but the cost. This applies not only to telecommunication services but also to other services such as electricity.

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17 OECD (2008a)
18 IMD World Competitiveness Yearbook (2008)
Consequently, businesses in Turkey are burdened by costly, low quality backbone infrastructure services (Gönenç et al., 2008).

\small{\textsuperscript{19} OECD (2004)}
3.2 Education and Training System

After a brief historical overview, this section assesses the basic education system, the vocational education system and the university education system in Turkey. It then provides an international comparison.

3.2.1 Historical perspective

The predecessor of the Turkish Republic was the Ottoman Empire. It was a multi-ethnic and multi-religious construct, and the ruling class was Muslim Turks. The Empire had a division of labour, where Turks provided the bulk of the army, and certain minorities conducted most of the trade. The imperial bureaucracy was based on young war captives of Christian origin. This bureaucracy was educated at the Palace School (Enderun) in the Topkapi Palace in Istanbul for instruction in military science and the liberal arts. The basic education of the masses was offered in the medresses (‘places to study’), established as a part of every mosque complex. Instruction was mainly based on Arabic, Koranic instruction, philosophy, and sciences (Muzeyyen, 2006). At the end of the 19th century, the Ottomans tried to create a modern school system, establishing French-style lycées (high schools). However, traditional religious schools continued to service the majority of the school-age population attending school. Moreover, commercial education was in the hands of the minorities, and attendance paralleled the division of work in Ottoman society (Ozelli, 1974).

After the decline of the Ottoman Empire, the new government focused on the task of ‘nation-building’ and gave education a special role. “Mustafa Kemal and his colleagues, in replacing the Ottoman Islamic state with a secular republic, regarded the educational system as the most effective institution to break the restraints of Islamic institutions, beliefs, and outlook” (Ozelli, 1974, p. 78). After abolishing the Caliphate in 1924, Atatürk and his colleagues created a centralised secular education system, abolishing religious schools altogether. Moreover, they introduced a new alphabet based on Latin characters, completely breaking away from the past. The major aim of the new Republic was to increase literacy, using the new alphabet. At the same time, there was a need to create a new bureaucracy to administer the new state. Consequently, the education policy of the new Republic focused until 1930 on
increasing literacy and creating a new bureaucracy. Later, it made efforts to increase technical and vocational training. Owing to the weakness of private enterprise, state enterprises became dominant, with technical schools mainly catering to their needs. After the Second World War, efforts focused on increasing primary education coverage. Enrolment more than doubled between 1945 and 1960. By the end of the 1950s, Turkey had achieved over 70% primary school enrolment (Turkish Ministry of National Education, 2007). However, it had not succeeded in creating a technical/vocational system that focused on the needs of the private sector, and the dominant role of the state in the economy continued.

3.2.2 Basic education

Turkey’s adult literacy rate was an estimated 15% in 1923 and 30% in 1950 (Gürüz and Pak, 2002). This number increased to 78.4% (89.8% for men and 67.4% for women) in 1990 and then to 87.5% in 2002 (95.3% for men and 79.9% for women) (OECD, 2007a). Although Turkey had reached over 70% primary school enrolment by the end of the 1950s (Ozelli, 1974), it proved difficult to achieve universal coverage. Moreover, schooling rates beyond the compulsory five years remained low.

The most important educational development of recent years has been the 1997 legislation that increased the length of compulsory elementary education from five to eight years. In 1961, Turkey tried to make three years of secondary education compulsory, but was not able to create the necessary infrastructure. In 1983, it had to amend the education law to make secondary education compulsory only where the physical infrastructure was adequate – this was, in effect, an acceptance of failure. It was not until 1997 that Turkey made a legal commitment and the resources available to ensure that a compulsory eight-year basic education would become a reality.

As a result, by 2005 net enrolment rates had increased at all education levels. The increase of the compulsory period automatically increased junior high school (lower secondary) enrolment, and also had a positive impact on high school enrolment. By 2005, gross enrolment for high schools was 85%.
<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th>Junior High</th>
<th>High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>89%</td>
<td>53%</td>
<td>37%</td>
</tr>
<tr>
<td>2005</td>
<td>90%</td>
<td>90%</td>
<td>57%</td>
</tr>
</tbody>
</table>

Exhibit 20: Turkish Enrolment ratios per school level in 1994 and 2005

However, Turkey still lags behind OECD averages in education. In particular, girls are less educated than boys, with primary schooling rates at 93.4% for boys and 86.9% for girls. The Turkish government has tried to decrease this gap with initiatives such as the ‘Come on Girls, Let’s Go to School!’ campaign that started in 2003. Results for the beginning of the school year 2004 showed increases in enrolment of up to 47%. There has also been a focus on girls-only boarding schools (OECD, 2007a).

A recent World Bank report on Turkish Education (Fretwell and Wheeler, 2001), gives credit to the Turkish administration: “Undeniably, the rate and extent of expansion of secondary education represent a major achievement by successive Turkish administrations…The more restricted access of girls due to religious and other factors…is no longer the major problem that it was in the past” (p. 3).

Turkey has succeeded in increasing enrolment rates to a great extent but the quality of education seems to have become an issue. The rate of population increase, which is about 2% per year, is not proportional to the availability of primary education. It is very common to find rural families with more than seven children. The result is double-shift instruction, overcrowded classrooms, a lack of teaching materials and equipment, unwilling teachers, and unmotivated students (Muzeyyen, 2006).

According to the World Bank Report (Fretwell and Wheeler, 2001), the quality of teaching is an issue. Teachers in public schools receive low pay which decreases the appeal for students to study teaching at university. This results in the low quality of future teachers. The training that they receive is also mostly theoretical and outdated. Once they join, service competence is neither recognized nor rewarded and the basis for promotion is length of service only. Moreover, the study notes that limited operating budgets further decrease the quality of teaching. “The system is increasingly under-funded, and in particular that quality-related items such as textbooks, teaching-materials, and laboratory and workshop supplies are suffering

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20 Turkish Ministry of National Education (2007)
from lack of resources. Moreover, schools have few means to access sources of financing other than the central government budget” (p. 4).

That quality is an issue can be seen from the results of the latest PISA (OECD’s Programme for International Student Assessment) study. PISA assesses students at age 15, at the end of compulsory schooling (basic education). In PISA 2003, Turkish students performed significantly below the OECD average on all measures, and were second to last among OECD countries (Mexico was consistently the lowest-performing country).

Exhibit 21: PISA performance per country

Differences between schools in mathematic proficiency were greater in Turkey than in any other OECD country, which suggests significant disparities among schools in the country (Gönenç et al., 2008). Analysis by the OECD shows that the performance of the Anatolian and Science high schools were above the OECD average, whereas that of general high schools was much lower. Anatolian and Science high schools select their students through a central examination at the end of primary school, and therefore have access to above-average pupils. Another advantage of the Anatolian and Science schools is that public spending is much higher than in general schools. For instance, spending per pupil in Anatolian schools is double that in general high schools.

21 Gönenç et al. (2008)
Recent government policies and priorities

In 2003, a commission of academics, practitioners, and the Ministry of National Education and Culture developed a new curriculum. By 2005, this had been implemented all around the country (OECD, 2007a). According to the OECD, the curriculum development process followed steps that reflect best practice in other OECD countries. The new curriculum puts an emphasis on ‘student-centred learning’ which will require a change from the usual memorising approach to a more active learning role for students (Gönenç et al., 2008).

After 2004, the Turkish government defined its priorities as (OECD, 2007a):

- Improving the rate of schooling at every level: by 2010 25% for pre-school education, 100% for primary education, 75% for secondary education and 37.3% for higher education.
- Eliminating the disparity in participation between boys and girls in primary/basic education.
- Expanding compulsory education to 12 years.
- Increasing the proportion of students enrolling in secondary vocational education as opposed to general secondary education by ensuring horizontal...
and vertical transition between institutions, improving vocational standards required by the labour market, and strengthening guidance and counselling.

- Significantly increasing the resources available for education. A new initiative, to increase private support for education, “100% Support for Education”, has generated US $1 billion in private contributions from business. The stimulus for these contributions is a new law passed on 11 September 2003, which provides 100% tax deduction for contributions to education. Before this change, the deduction was only 4%.

- Improving the quality of education by reducing the class size to 30 students per classroom, implementing a new curriculum for primary (basic) education emphasising student-centred learning, and implementing new teacher competencies.

In 2003, the government launched an initiative to bring broadband internet connection to all schools. By 2007, 85% of primary schools and 95% of secondary schools had internet access, totalling 29,500 schools. Plans are also underway to connect the remaining schools with broadband or, if not possible, with satellite connection. In three years the government connected over 21,000 schools to the internet, and all schools have computer classes (Yeni Şafak, 2007).

### 3.2.3 Vocational education

The Ottoman Empire lacked an industrial base and subsequently did not have a tradition of vocational-technical education. Its successor, the Turkish Republic, has also struggled to create a vocational-technical training system that supports industrial development.

After the 1980s, vocational-technical high school graduates were allowed to continue to university just as general school graduates could. The result was that industry training and work-based experience became less of a priority for pupils. The 1986 Apprenticeship and Vocational Education Law reduced the time spent in school in favour of practical experience in industry settings. Students spend three days a week in the industry for practical training and two days a week in general academic or vocational schools (Simsek and Yildirim, 2000).
However, the Turkish vocational education system retains several weaknesses. According to Simsek and Yildirim (2000) the system is strictly centralised, and very bureaucratic in nature. Moreover, there is little information flow between schools and industry. Companies do not have the possibility of giving feedback on the curriculum so that it fits their needs. Industry managers also complain about the weaknesses of teachers and the school infrastructure.

Accordingly, Turkey was not able to achieve its objectives in terms of vocational school enrolment. In 1986, the aim of the government was to channel 65% of school-age children in secondary education into vocational/technical education and 35% into general education by 1995 (OECD, 2007).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>53</td>
<td>108</td>
<td>244</td>
<td>520</td>
<td>900</td>
<td>875</td>
<td>1'244</td>
</tr>
<tr>
<td></td>
<td>as a percentage</td>
<td>104%</td>
<td>126%</td>
<td>113%</td>
<td>73%</td>
<td>-3%</td>
<td>42%</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 23: Turkish vocational secondary school enrolment, 1950-2006

One of the main issues in Turkey has been access to university. At the end of the 1990s, the government of the time restricted university entrance for vocational students beyond their fields. However, this decreased overall demand for places in vocational schools. Later, in 2001, first steps were taken to make vocational education more attractive. A 2001 law aiming to strengthen vocational and technical education and to encourage more students to pursue vocational education came into force. The highlights of this law include:

- Graduates of vocational and technical schools can attend post-secondary technical higher schools without taking any exams.
- A National Board of Vocational Education that includes employers and also provincial boards has been introduced.
- Companies with 20 employees or more must now provide training places to vocational and technical students.

In 2002, Turkey initiated, with support from the EU, the Project on Strengthening the Vocational Education and Training System (SVET), to develop a new national vocational standards system to meet the requirements of the labour market. In

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23 Turkish Ministry of National Education (2007)
2003, it launched the Project on the Modernisation of Vocational and Technical Education, to increase the quality of teacher training.

In summary, Turkey has tried to address the problems that vocational education faces. However, by 2005 vocational and technical high schools still constituted only 31.4% of enrolment (OECD, 2007). The 65%-35% target in favour of vocational studies was far from being accomplished.

### 3.2.4 Higher education

In 1923, Turkey had just one higher-education institution, previously the House of Sciences, which was transformed into Istanbul University in 1933. Since the 1980s Turkey has followed a strong expansion strategy. Following the 1982 reforms of higher education, strategies followed five major routes: (1) sharp increases in enrolments in the existing institutions, (2) establishment of new universities, (3) expansion of two-year vocational colleges within the universities, (4) expansion of non-conventional approaches to higher education such as distance education and evening programmes, and (5) development of non-profit-making private universities.

<table>
<thead>
<tr>
<th>Year</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>6%</td>
</tr>
<tr>
<td>1994</td>
<td>18%</td>
</tr>
<tr>
<td>2000</td>
<td>22%</td>
</tr>
<tr>
<td>2005</td>
<td>34%</td>
</tr>
</tbody>
</table>

Exhibit 24: Turkish university enrolment percentage 1994-2005

The number of universities increased to 3 in 1950, 7 in 1960, 9 in 1970, 27 in 1982, 75 in 2001 and 116 in 2007. The first private university was opened in 1984, and a further 8 opened in 1992; by 2001 there were 17 such institutions, and by 2007 there were 31 (Gürüş and Pak, 2002). The government also established an "Open Faculty" at Anadolu University in 1982 (it provides higher education through televised courses and correspondence study). Since then, the role of distance education has increased remarkably: for example, enrolment in open education increased from less than 10% of total enrolments in 1982 to over 30% in 1992.

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24 Turkish Ministry of National Education (2007)
Another important development of the 1980s was the expansion of graduate programmes. According to Dundar and Darrell (1999), before 1982 structured graduate programmes were absent in most universities, and graduate education was limited to research staff expected to become faculty. The 1982 reforms imposed standards for admission and graduation, course credits, and research projects. As a result, graduate student numbers increased dramatically from 13,395 in 1983 to 46,780 in 1991. In-house training of faculty within new and formalised graduate programmes became an important source of faculty supply during the 1980s.

The rapid increase in quantity gave rise to quality concerns, however. Although the number of institutions and students more than tripled between 1982 and 1996, the amount of recurring public resources allocated to higher education increased in real terms only by about 15-20%. Thus, average student funding decreased, and this has allegedly reduced the quality of teaching and research across the system.

Currently, there is no international comparison possibility for assessing the quality of undergraduate education. For graduate education the number of scientific publications provides a proxy.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Scientific Publications</th>
<th>Publications per Million Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>1'154</td>
<td>21</td>
</tr>
<tr>
<td>2000</td>
<td>6'426</td>
<td>95</td>
</tr>
<tr>
<td>2007</td>
<td>21'273</td>
<td>304</td>
</tr>
</tbody>
</table>

Exhibit 25: Number of scientific publications

Between 1990 and 2007, the number of Turkish-originated scientific publications increased by almost 20 times. Moreover, publications per million population also increased by 15 times. The 1982 reforms in graduate education seem to have been very successful in promoting scientific research.
Exhibit 26: Ranking of countries according to total number of scientific publications

Exhibit 26 shows Turkey’s ranking in the world according to total published articles. As can be seen, Turkey not only increased its publications significantly, but did so at a pace that was much faster than most other countries. However, in terms of scientific publications per million of population, Turkey was still ranked 45th in 2007, up from 79th in 1990 (Turkish Science and Technology Institute, 2008).

According to a Turkish Academy of Science (TUBA) report on doctoral studies in Turkey (2006), the number of PhD graduates in Turkey has barely increased over the past few years. On the one hand, enrolment in doctoral programmes has not increased significantly, and on the other, the time taken to finish has increased substantially. The explanation for relatively low enrolment is the lack of employment opportunities (owing to the low number of academic researcher positions). The TUBA report attributes the length of the study period to the poor quality of prior education that the doctoral students bring. Whereas the number of PhDs has not increased, the number of scientific publications has increased rapidly. This shows that, on average, researchers have become more effective in producing output. In the long run, Turkey would need to increase the number of PhDs in order to continue the increase in publications.

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26 Turkish Science and Technology Institute, (2008)
3.2.5 Performance of the Turkish education system

This section presents a number of statistics that compare Turkish education to other countries. It uses a cluster of large developing countries, and also includes latecomers such as Spain and Korea.

Education level for population aged 25-65

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>76</td>
<td>51</td>
</tr>
<tr>
<td>Mexico</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>Poland</td>
<td>51</td>
<td>26</td>
</tr>
<tr>
<td>Spain</td>
<td>49</td>
<td>40</td>
</tr>
<tr>
<td>Turkey</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>Brazil</td>
<td>30</td>
<td>8</td>
</tr>
</tbody>
</table>

Exhibit 27: Education level for population aged 25-65

In general, the Turkish population is not well educated. In terms of graduates of upper secondary school and university, Turkey lags behind other developing countries. In tertiary education, as of 2005, Turkey was even behind Mexico (a country which is constantly below Turkey in most of OECD’s development statistics).

In terms of quality of education, Turkey’s performance is not much better.

PISA 2006 results

<table>
<thead>
<tr>
<th></th>
<th>Mathematics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>547</td>
<td>556</td>
</tr>
<tr>
<td>Poland</td>
<td>495</td>
<td>508</td>
</tr>
<tr>
<td>Spain</td>
<td>480</td>
<td>461</td>
</tr>
<tr>
<td>Turkey</td>
<td>424</td>
<td>447</td>
</tr>
<tr>
<td>Thailand</td>
<td>417</td>
<td>417</td>
</tr>
<tr>
<td>Mexico</td>
<td>406</td>
<td>410</td>
</tr>
<tr>
<td>Brazil</td>
<td>370</td>
<td>393</td>
</tr>
</tbody>
</table>

Exhibit 28: PISA 2006 results

---

27 OECD (2007a)
28 OECD (2006)
According to the latest PISA assessment, Turkey is behind Poland but above other developing countries such as Mexico, Thailand and Brazil. In order to close the gap with countries such as Spain and Poland, Turkey needs to increase the pace of its efforts. Unfortunately, the performance of Turkish students has not improved compared to the last wave, which was conducted in 2003.

### Percentage of tertiary graduates, by field of education (2005) only tertiary A

<table>
<thead>
<tr>
<th></th>
<th>Health and welfare</th>
<th>Life sciences, physical sciences &amp; agriculture</th>
<th>Mathematics and computer science</th>
<th>Humanities, arts and education</th>
<th>Social sciences, business, law and services</th>
<th>Engineering, manufacturing and construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>8.4</td>
<td>7.6</td>
<td>5.0</td>
<td>25.9</td>
<td>26.1</td>
<td>27.1</td>
</tr>
<tr>
<td>Mexico</td>
<td>8.4</td>
<td>4.8</td>
<td>8.5</td>
<td>16.1</td>
<td>46.8</td>
<td>14.3</td>
</tr>
<tr>
<td>Poland</td>
<td>7.2</td>
<td>3.6</td>
<td>4.7</td>
<td>24.4</td>
<td>52.7</td>
<td>7.4</td>
</tr>
<tr>
<td>Spain</td>
<td>14.6</td>
<td>7.6</td>
<td>5.1</td>
<td>22.9</td>
<td>35.4</td>
<td>14.3</td>
</tr>
<tr>
<td>Turkey</td>
<td>9.5</td>
<td>9.7</td>
<td>4.0</td>
<td>40.0</td>
<td>25.0</td>
<td>11.9</td>
</tr>
<tr>
<td>Brazil²</td>
<td>12.1</td>
<td>4.6</td>
<td>3.3</td>
<td>31.7</td>
<td>38.1</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Exhibit 29: Tertiary graduates by field, selected countries, 2005

In terms of the number of graduates, Turkey lags slightly behind in engineering but has a very high percentage of graduates in the humanities, arts and education. If a manufacturing-based export strategy is pursued, the Korean engineering percentage can be used as a benchmark for Turkey. Consequently, Turkey would need to divert more resources into engineering education, and focus less on humanities and arts.

During the past decade there has been a trend towards digital technology. As a result, the importance of software has increased significantly. The supply of well-educated computing and software engineers has become important for all countries.

---

²OECD (2007a)
## Number of computing graduates

<table>
<thead>
<tr>
<th>Year</th>
<th>1998</th>
<th>2001</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>4'276</td>
<td>10'211</td>
<td>9'544</td>
<td>10'711</td>
</tr>
<tr>
<td>Mexico</td>
<td>0</td>
<td>21'341</td>
<td>28'889</td>
<td>30'262</td>
</tr>
<tr>
<td>Poland</td>
<td>0</td>
<td>3'802</td>
<td>19'133</td>
<td>19'931</td>
</tr>
<tr>
<td>Spain</td>
<td>6'006</td>
<td>7'423</td>
<td>8'655</td>
<td>9'379</td>
</tr>
<tr>
<td>Switzerland</td>
<td>308</td>
<td>1'723</td>
<td>1'048</td>
<td>1'131</td>
</tr>
<tr>
<td>Turkey</td>
<td>739</td>
<td>1'181</td>
<td>2'458</td>
<td>2'489</td>
</tr>
</tbody>
</table>

Exhibit 30: Computing graduates, selected countries

The Turkish supply of computing graduates remains very limited. A country of Turkey’s size needs more graduates for its own requirements, and would need many more if it wanted to make use of the increasing software outsourcing trends. The success of the Indian software industry has been based on having a large supply of computing graduates. We cannot expect a similar development in Turkey in the near future.

Scientific publications reflect the output of academic activity and have been included among innovation indicators. Moreover, there are studies that show a correlation between publications and patent applications.

### Scientific publications (per million population)

<table>
<thead>
<tr>
<th></th>
<th>1995</th>
<th>2005</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>399</td>
<td>694</td>
<td>74%</td>
</tr>
<tr>
<td>South Korea</td>
<td>119</td>
<td>479</td>
<td>303%</td>
</tr>
<tr>
<td>Poland</td>
<td>191</td>
<td>344</td>
<td>80%</td>
</tr>
<tr>
<td>Turkey</td>
<td>40</td>
<td>194</td>
<td>385%</td>
</tr>
<tr>
<td>Mexico</td>
<td>32</td>
<td>66</td>
<td>106%</td>
</tr>
</tbody>
</table>

Exhibit 31: Scientific publications per country per million population

Scientific publications are the field in which Turkey scores best. In this respect, the efforts on graduate education seem to have succeeded.

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30 OECD (2007a)
31 OECD (2007a)
Government education spending as percentage of GDP

Exhibit 32: Government education spending as percentage of GDP

The government has increased education spending from 9.4% (of total government budget) in 2001 to 13% in 2006. However, this is still lower than during the periods after 1982 and 1992. According to the World Bank (2008c), Turkish public plus private education spending in 2002 was around 7% of GDP; among OECD countries, only Denmark and the United States spent more on total education as a share of GDP in that year. As government spending increased to 4% in 2006, we can expect total spending to be well over 7%, especially considering the strong increase in private education.

32 Türkmen (2002)
Education spending per student per year (US $ ppp)

<table>
<thead>
<tr>
<th></th>
<th>Primary education</th>
<th>All secondary education</th>
<th>All tertiary education excluding R&amp;D activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>4'490</td>
<td>6'761</td>
<td>6'154</td>
</tr>
<tr>
<td>Mexico</td>
<td>1'694</td>
<td>1'922</td>
<td>4'834</td>
</tr>
<tr>
<td>Poland</td>
<td>3'130</td>
<td>2'889</td>
<td>3'893</td>
</tr>
<tr>
<td>Spain</td>
<td>4'965</td>
<td>6'701</td>
<td>6'853</td>
</tr>
<tr>
<td>Turkey</td>
<td>1'120</td>
<td>1'808</td>
<td>4'231</td>
</tr>
</tbody>
</table>

Exhibit 33: Education expenditure per student

Turkey’s education spending is extremely low in primary education, falling below Mexico, for example. Secondary education spending also remains low. Only in university education do we see that Turkey spends comparably much more per student, and that the gap between Turkey and other countries is much less. We can conclude that Turkey has been spending disproportionately high amounts on university education.

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33 Gönenç et al. (2006)
3.3 Innovation Policies: Resources and Incentives for Innovation

3.3.1 Assessment of main innovation system actors

Each innovation system consists of a number of organisations that have an impact on the innovativeness of companies.

Exhibit 34: Overview of innovation system organisations

A brief overview of the organisations within the Turkish innovation system is given in Appendix B.

A European Commission study on innovation (European Commission, 2003) in 2001-2002 covering candidate countries Latvia, Lithuania, Malta, Romania, the Slovak Republic and Turkey concludes that “the only country with significant institutional resources and capabilities in the field of (science, technology and) innovation policy is Turkey…In terms of implementation, Turkey is the only country with specialised governmental and non-governmental agencies with a track-record of managing funding and delivering assistance to enterprises for innovation” (p. 19). The same study outlines how Turkey is the only country with dedicated innovation support agencies supporting industry. “Although not large in number, given the size of the country, there are private or publicly funded organisations in various regions that

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34 Author’s illustration
provide innovation support to business through technology parks, incubators, R&D centres, and consultancy, training and information dissemination mechanisms” (p. 92).

In summary, Turkey has a complete set of organisations active in the innovation system. However, weaknesses remain. According to Elci (2003), the intensity and quality of linkages and cooperation between actors is not strong enough.

3.3.2 Development of government innovation policies

Successive Turkish governments have been active in technology and innovation policy making. This section provides a brief overview of the policies over time.

The period 1963-1982

It is possible to mark the year 1963 as the start of science and technology policy making in Turkey. The first five-year development plan (1963-1967) prepared by the state-planning organisation mentioned the importance of high-technology development without outlining a clear implementation plan (Göksel, 2000). The main achievement of this planning period was the establishment of the Scientific and Technological Research Council of Turkey (TUBITAK) to prepare and coordinate the implementation of Turkish science and technology policy. In the second five-year planning period, the Marmara research centre was established in 1972 to conduct contractual research for the industry. During this period, science and technology were part of development planning, but only in general terms. Since 1972 implementation plans have been formulated by TUBITAK in a tacit consensus with the government, without wider involvement from other stakeholders. Overall, few tangible results have been produced (European Commission, 2006).

During this period one of the main reasons for failure has been the unenthusiastic approach of industrial entrepreneurs. During the import substitution period entrepreneurs were using imported technology and there was no focus on creating these technologies domestically (Erbil, 2007).
The period 1983-1993

In 1983, the government issued its first national science policy document “Turkish Science Policy, 1983-2003”, which mainly focused on increasing R&D activities in the country and defining technology priority areas (European Commission, 2006). It was the first time Turkey defined not only qualitative but also quantitative targets. It also set long-term policies and targets on scientific and technological development.

In the same year, the Supreme Council of Science and Technology (BTYK) was established, chaired by the Prime Minister. It comprises top-level representatives from related ministries and public administrations. Its establishment can be seen as a milestone for Turkey in terms of recognising the importance of science and technology for the country. In 1985, a tax postponement incentive for industrial R&D was introduced. In 1991, the first business R&D financing started. A programme for supporting R&D projects was set up, using funds from the World Bank. The period covered was 1991-1998 and there was a budget of €108 million (European Commission, 2006).

Back in 1983, Turkey had already identified various focus areas such as electronics engineering, computer science, and telecommunications to support capacity creation. It also said that areas such as semiconductor technology, digital communication systems should be developed. However, these decisions were not implemented since the government institutions involved were not committed enough, leaving the whole programme on paper only (Erbil, 2007). Overall, this period ended disappointing as there was no significant increase in R&D spending or personnel.

The period 1993-2002

When the BTYK finally met for the second time in 1993, it formulated the Turkish Science and Technology Programme: 1993-2003, and defined quantitative targets. These included increasing the full-time equivalent R&D personnel per 10,000 economically active population from 7 to 15 by 2003; increasing the share of gross expenditure on R&D in total GDP from 0.33% to 1%; and increasing the share of private sector R&D from 18% to 30%. 
Starting with the Seventh Five-Year Development Plan (1996-2000), the Turkish government started bringing together relevant stakeholders from the private and public sectors, academia and non-governmental organisations in the policy making process (European Commission, 2006). It is also during this period that the term ‘national innovation system’ is mentioned as a policy making goal: “the main objective of the science and technology policy is defined as “establishment of the national innovation system that would enable systematic operation of the whole institutions and mechanisms required to carry out scientific and technological research and development activities and to transform the results of those activities into economic and social benefit” (European Commission, 2003, p. 105).

This period saw a shift towards giving business R&D a more central role, with the government launching several initiatives to support it. In 1995, the Turkish government launched an industrial R&D support programme, creating an implementation agency within TUBITAK, called TIDEB (now TEYDEP). In 2000, the government passed legislation on “State Support for R&D Investments”, providing loan support for the procurement of equipment for R&D activities. One year later, in 2001, the Technology Development Zones Law came into force. The law provided incentives for the establishment of technoparks by universities or research centres, and aimed to encourage cooperation between research centres and companies. The incentives were for academic staff’s participation in industry projects and R&D tax incentives for tenant companies in technoparks.

It was not until 1993 that Turkey started to focus on the institutional and legal environment for innovation. At the same time Turkish policy makers recognised the central role that private companies should play.

**2002 onwards**

In 2002, Turkey started a foresight study called Vision 2023. One of the most important objectives of the project was to create a common vision and understanding among all innovation system stakeholders to serve as the basis for the strategies for the next decade. Previously, a lack of a shared vision and commitment had been identified as one of the reasons for the poor performance of the innovation system.
In order to achieve high levels of participation and commitment, a steering committee, consisting of 65 representatives from 27 governmental bodies, 29 industrial organisations and NGOs and 9 academic organisations, was established. Technological foresight panels were set up in 12 social and economic areas. As a result of these panels, strategic technological areas and strategic technology roadmaps were created. Another part of the Vision 2023 project was to set up an inventory of Turkey’s technological capabilities. For this purpose a comprehensive survey to determine the innovative capabilities of companies was conducted.

In line with the Vision 2023 National Foresight strategy, the BTYK decided in 2004 to:

- increase R&D spending as a percentage of GDP to 2% by 2010
- increase the number of R&D personnel to 40,000 FTE by 2010
- focus on the areas of defence and space technology research, scientist development and science park establishment
- create a system for coordinating the network of institutions that work on R&D, in order to increase innovation. The BTYK defined the “Turkish Research Area” (TARAL) where the private and public sectors and non-governmental organisations would create a strategic focus and collaborate on R&D (Turkish Science and Technology Institute, 2008)

**Recent trends: 2006 onwards**

Since 2006, Turkey has been very active in introducing new initiatives. For instance, it introduced a number of new measures to strengthen the links between the research community and the private sector. One project supports the development of technological network organisations, and another provides incentives for cooperation with suppliers or competition. There is also a programme that encourages master and doctoral thesis preparation in line with the needs of industry. Another focus area has been the creation of technology start-ups. Turkey established various programmes that support tech-entrepreneurs, as well as a programme that supports the first two R&D projects of SMEs. There has also been a focus on green energies and energy saving, with various incentives designed to support technology development in this area.
The BTKYK also approved the framework for the performance measurement system for evaluating the national science and technology system (with a selection of indicators used by the OECD, World Economic Forum and World Bank among others) (European Commission, 2007). Finally, the most important measure for larger firms has been the new R&D Law (2008). According to this law, companies with more than 50 R&D staff will have lower employment costs and will receive 100% tax deductions on their R&D activities.

3.3.3 Innovation finance support initiatives

Innovation project grants and credits

TUBITAK-TEYDEP is a TUBITAK agency (Scientific and Technological Research Council of Turkey) that supports innovating companies by paying up to 60% of the total R&D investment. At the beginning of 2008, TEYDEP had supported a total of 3,907 projects in 1,720 companies. Of these supported companies, 271 were large companies and 1,449 were SMEs. In terms of projects, 40% of the projects were from large firms - 1,550 projects - versus 2,357 projects for SMEs. The average support for projects was US $520,000 (Cebeci, 2006).

<table>
<thead>
<tr>
<th>Year</th>
<th>TEYDEP allocated funds per year (m$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>2</td>
</tr>
<tr>
<td>1997</td>
<td>8.4</td>
</tr>
<tr>
<td>1998</td>
<td>10.2</td>
</tr>
<tr>
<td>1999</td>
<td>14.2</td>
</tr>
<tr>
<td>2000</td>
<td>19.7</td>
</tr>
<tr>
<td>2001</td>
<td>29.9</td>
</tr>
<tr>
<td>2002</td>
<td>24.8</td>
</tr>
<tr>
<td>2003</td>
<td>38.2</td>
</tr>
<tr>
<td>2004</td>
<td>45.6</td>
</tr>
<tr>
<td>2005</td>
<td>100</td>
</tr>
<tr>
<td>2006</td>
<td>128.1</td>
</tr>
</tbody>
</table>

Exhibit 35: R&D support funds allocated by TUBITAK-TEYDEP

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35 Cebeci (2006)
Allocated funds were relatively insignificant until 2003, but then rose sharply, reaching US $128 million by 2006. The number of supported companies, as well as the companies that applied for support for the first time, increased steadily after 2001. Of the total supported projects, 30% were in the machinery sector, 23% in IT, and 16% in the electronics sector.

Another significant innovation financing organisation is the semi-governmental TTGV (Turkish Technology Development Foundation). TTGV provides fast access to credit that can be repaid over three years at very low interest rates. TTGV provided a total of US $224m for 662 projects from 1991 to 2007. Of these projects, 84% were carried out by SMEs, and the remainder 16% by large companies. 27% of the supported firms have been active for fewer than 5 years, and 52% of the firms were more than 10 years old (Telçeken, 2008).

**Tax incentives for R&D activities**

From 1986 on, there has been a R&D tax incentive scheme whereby companies can use their R&D spending to postpone 20% of their yearly corporate tax for a period of three years without interest. Later, in 2004, this rate was increased to 40%. However, the impact of this measure has been very limited. For the period 1997-2001, only 108 companies benefited from the scheme (Turkish Industrialist Association – TUSIAD, 2003).

According to a European Commission’s report analysing Turkish innovation policies (2003), the main reason for the low number of applications was that SMEs were not accustomed to accounting for R&D expenditures as separate items in their balance sheets since they did not have separate R&D departments. This is also evident from the fact that in 1997-2001 only 1.4% of the companies that benefited from the scheme were SMEs. However, the use of tax incentives is making a comeback, as in 2008 a new R&D law was launched that allows a deduction of 100% for R&D spending (for R&D departments with over 50 employees).
**Venture capital**

Turkey’s 1993 Venture Capital Investment Trusts legislation gave tax breaks to venture capital firms allowing them to operate totally free of corporate tax. However, the law also included a number of strict requirements limiting the establishment of such companies. Only two local venture capital firms were founded following the passing of this legislation.

In 2003, new legislation allowed the formation of venture capital firms with less strict conditions. However, even after this legislation venture capital has not reached the desired levels. One recent positive development was the announcement of a new venture capital fund involving the Turkish Technology Foundation of Turkey (TTGV), the SME Development Organisation of Turkey (KOSGEB) and the public Development Bank of Turkey (TKB) (European Investment Fund, 2001).

### 3.3.4 Innovative start-ups and clusters

**Technoparks**

In 2001, Turkey passed the Technology Development Zones legislation to promote ‘techno-cluster’ formation. The objective is to bring academic structures and companies together to support technology companies. Consequently, all technoparks are located near a university, a high-technology institute or an R&D centre. Since 2002 on, technoparks have been established in different regions of Turkey; by 2008 18 technoparks had been set up and 801 firms were operational (Uludag University, 2008).

The technopark law provides companies with significant incentives for locating in technoparks:

- entrepreneurs are not liable to corporation or revenue tax on the income they earn from their R&D or software activities at technoparks until the end of 2013.
- researchers, software engineers and R&D personnel at technoparks do not have to pay income tax on their earnings from their activities at technoparks until the end of 2013.
• companies in technoparks are exempt from VAT on their products or services in the fields of in-system software, data management software and internet, and mobile or military command control software produced in technoparks until the end of 2013.

• SMEs also benefit from technopark rent subsidies and financial support for construction of production plants and R&D offices in technoparks in accordance with the SME support regulations.

The first and largest technopark in Turkey, which was established at the Middle East Technical University (ODTU) Campus in Ankara, attracted 216 tenant companies with US $178 million in annual revenues (Middle East Technical University, n.d.). The second largest technopark, which is attached to Istanbul Technical University (ITU), had 62 tenants by 2006 and included the top three fastest-growing technology companies in Turkey (Istanbul Technical University, n.d.).

<table>
<thead>
<tr>
<th>Year</th>
<th>Total # of patents from technoparks</th>
<th>Total exports technoparks in $m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>38</td>
<td>28</td>
</tr>
<tr>
<td>2005</td>
<td>25</td>
<td>43</td>
</tr>
<tr>
<td>2006</td>
<td>31</td>
<td>73</td>
</tr>
<tr>
<td>2007</td>
<td>63</td>
<td>196</td>
</tr>
</tbody>
</table>

Exhibit 36: Number of companies located in technoparks

Exhibit 37: Patents and exports in Turkish technoparks 2004-2007

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36 Uludag University (2008)
37 Uludag University (2008)
As Exhibit 37 shows, both the exports and patents of companies located in technoparks have increased significantly over the past years. An analysis of technoparks in Turkey (Koçak and Can, 2007) concludes that the aim of creating agglomerations around universities has at least been partially achieved with more than 800 companies located at technoparks, and good occupation rates at all technoparks. However, there is also criticism that the use of tax incentives attracts larger firms rather than start-ups. The analysis showed that only 25% of companies located in technoparks were start-ups. As tax incentives are only relevant for established companies, more grants would have been useful for promoting start-ups. Another finding was the dominance of software firms in technoparks. The criticism here is that all activities of software firms are considered as R&D activity whereas other firms can only include research activities. Thus, the technopark can potentially become a tool for helping companies avoid taxes instead of promoting innovation and cooperation. Moreover, the strict controls imposed by the technoparks to monitor the activities of personnel have also been found to be detrimental. Another interesting development has been a new R&D law which extends the existing technopark incentives to company’s internal R&D departments with more than 50 employees. This means that large firms do not need to be located at the technoparks to profits from these incentives.

**Incubators**

The first incubator - known by the acronym TEKMER - was established in 1991. In the following years, up to 18 technology incubators were established based on the protocols signed between KOSGEB and relevant universities. The aim of these incubators is to improve the conditions for SMEs and enhance their competitive capacity by providing financial support and technical and managerial assistance. The incubators rent office space to R&D-intensive small start-ups at very low rates for a period of up to four years. They also channel government-sponsored grants, funds and other services both to their tenant firms and to non-resident firms that qualify. Nearly all technology-oriented incubators are public organisations run by KOSGEB.
Start-up support programmes
In 2006, TTGV launched a number of programmes to support innovative start-ups.

- **Pre-Incubation supports** aim to provide financial support to entrepreneurs who have an innovative idea and who are at the initial phase of setting up their business or have not started a business yet. Business plan support and funds of up to US $50,000 are provided.

- **Risk-sharing facility support**: Newly-established companies with high-risk projects can apply for this support, which has an upper limit of US $200,000. TTGV will disburse up to 50% of the company’s expenses without asking for guarantees/security. The minimum duration of this support is two years.

- **Start-up support**: The upper limit for this support is US $400,000, and it comes in the form of equity capital. In order to apply for this support, a business must already have a business plan.

In 2007, TUBITAK-TEYDEP launched a programme called ‘Technogirisim’ (techno enterprise) to support high-tech start-ups. This programme is aimed at new graduates and provides them with funds of up to 100,000 YTL (US $67,000), or 75% of the total cost. Business consultancy support is also provided.

3.3.5 Public R&D activities

**Universities**
There are over 100 universities in Turkey and the number is increasing each year. Universities have an important role in R&D as well as other innovation-related areas such as specialised BA and MBA programmes in technology and innovation management, and lifelong learning centres.
University R&D spending represented 60% of Turkey’s total R&D spending in 2000; in 2005 it still accounted for 55% of total expenditure. There are few other countries with such a high university R&D ratio. Although the weight of university spending is slightly decreasing, universities remain a significant pillar of the innovation system and, therefore, efforts to increase their support to company innovation are very important.

**TUBITAK research institutes and public R&D programmes**

TUBITAK operates a number of research institutes in fields such as IT, energy, genetics, chemicals, materials, defence technologies and aerospace. Recently, the work in these fields has gained pace.

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38 Turkish Statistics Institute (2008c)
As the tables above show, TUBITAK institutes have not only increased the number of projects they implement but also the income they earn.

TUBITAK also runs a number of R&D support programmes for state needs. The biggest is the defence R&D programme SAVTAG and the second biggest is KAMAG, which caters for the needs of all other state organisation needs. Both industry and state organisations can jointly apply for support to solve a state need using R&D.

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39 Scientific and Technological Research Council of Turkey – TUBITAK (2007)
40 Scientific and Technological Research Council of Turkey – TUBITAK (2007)
41 Scientific and Technological Research Council of Turkey – TUBITAK (2007)
In 2007, projects worth a total of 503 million YTL were receiving support, and the allocated spending was 290 million YTL (Scientific and Technological Research Council of Turkey – TUBITAK, 2008).

**Use of government procurement to increase innovative capabilities**

Using government procurement to increase the innovative capabilities of national companies has been a policy objective for many decades. However, only recently have concrete developments in this area become visible. In defence especially, which is the biggest procurement area, Turkey has made important advances. Local procurement has increased from less than 20% in the 1980s to 50% over the last few years. Currently, Turkey is working on a national tank project and has just selected a consortium led by a national company for a contract to supply attack helicopters, and another national contractor for a project on unmanned aircraft. Most of these projects are supported by TUBITAK and have strong R&D components.

### 3.3.6 University-industry cooperation

Developing university-industry relations has been part of the Turkish innovation policy since the Seventh Development Plan (1996-2000). One of the most important examples of such cooperation is projects funded by TTVG and TEYDEP. Both organisations use academic experts as referees and consultants for industry projects. There are also financial incentives for university-industry support:

- TUBITAK-TEYDEP increases the amount of support by 30% in cases where an industrial company collaborates with a university and/or a research institute on a R&D project.

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42 Scientific and Technological Research Council of Turkey – TUBITAK (2007)
There is a grant of up to EUR 100,000 if universities and/or public research centres cooperate with local industrial companies in international programmes such as Eureka (European Commission, 2003).

Technology Development Centres (incubators) are also important for closing the gap between universities and the business sector. Most of these incubators are located at universities in technoparks.

The University-Industry Joint Research Centres (USAMP) Programme was launched by TUBITAK-TIDEB (now TEYDEP) in 1996, with the aim of increasing university-industry cooperation. It focuses on the research needs of the industry. As of 2008, there were five active and successful centres jointly funded by TUBITAK and participating firms: the Microelectronic Research Centre at Middle East Technical University (METU); the Biotechnology-Biomedical Research Centre at Hacettepe University; METU and the Ankara-OSTIM Industrial Zone: the Ceramics Research Centre at Eskisehir Anadolu University; and the Adana University-Industry Joint Research Centre. The Ceramics Research Centre (SAM) at Eskisehir Anadolu University has been especially successful since its establishment in 1998. In 2006, TUBITAK ended the University-Industry Joint Research Centres Programme. However, the existing centres have continued their operations and even created a platform for cooperating with each other and supporting new establishments.

More recently, the Turkish government launched a number of initiatives to increase university-company cooperation. One initiative encourages university students to prepare their masters and doctoral theses on topics based on the requirements of the industry. Eligible projects are provided with grant finance for up to 75% of the project budget. The rest is financed by the private sector, while test and laboratory services are covered by the universities where the projects are being carried out.

Another initiative launched in 2006 encourages R&D cooperation between buyers-suppliers and competitors. The research consortia need to include one or more companies, suppliers, universities and research centres working in the same sector. A soft loan is available for such projects and the upper limit for support is EUR 2,000,000 (up to 60% of the project budget) (European Commission, 2007).
The ISBAP programme, launched in 2007, aims to promote the establishment of sectoral or technological networks and platforms among national and international enterprises, public research institutes and scientific communities working on basic research, applied research, social sciences and related technology areas. Organisations interested in establishing a network can get funding of up to EUR 140,000 per year.

3.3.7 Assessment of government innovation policies

Company innovation finance

In 1998, a Turkish Statistics Institute (TUIK) innovation survey showed that only 1.2% of industrial companies had used TTGV support and only 2.7% had used TEYDEP support (Uzun, 2001). Since many companies profited from both programmes, we can estimate that around 3% of all companies had been getting support from one of these organisations. The same survey revealed that these low figures could be explained by the lack of information and the long and difficult application process. Interestingly, 90% of applicant companies regarded TTGV credit as financial support, whereas only 65% regarded the TEYDEP grant as financial support. In reality, the TEYDEP grant is the greater real support as there is no repayment. The perception difference was explained by the payment timing: TTGV makes monthly payments, whereas TEYDEP makes payments every six months. Most of the firms also expressed their need for additional financing for the commercialisation process of their innovations. A more recent innovation survey by TUIK, covering 2004-2006, showed that of the 34% of industrial companies that were innovative during that time, 22.6% received support from the government, meaning that 8% of all industrial companies were receiving support. These numbers are consistent with the significant increase in supported projects, firms and total funds.

The low percentage of firms getting innovation support in 1998 was not due to lack of funding. Indeed, the financial resources of both TEYDEP and TTGV were much higher than the rate of applications, meaning that supply was higher than demand (Turkish Industrialist Association - TUSIAD, 2003). According to the TUSIAD report, while problems such as lack of information about programmes or application process
difficulties can play a role, they still do not explain the low number of participant firms. According to the authors, the lack of financial support for commercialisation was the main problem. Lack of a large venture capital market is also a factor, as is the overall economic situation. The TUSIAD study (2003) quotes many industrialists who explain their low level of innovation as being related to the weaknesses inherent in the Turkish financial system. Until very recently, companies had difficulties in getting access to financing, and if they had their own financial resources, their income from interest could exceed their operating income. Therefore, there was little incentive for them to invest in innovation.

Following this line of argument, the recent increase in companies profiting from innovation support has mostly to do with improved economic conditions, without which innovation support would have remained uninteresting. Continuous efforts to inform more companies about the innovation support possibilities may also have played a positive role.

**Start-up support**

Until recently, support for start-ups in Turkey was very low. Existing mechanisms such as TEYDEP project finance were more useful for established companies. In order to access support, companies needed to overcome bureaucratic hurdles and pre-finance their investments.

We now see that Turkish institutions have recognised this and have launched a number of initiatives since 2006. In particular, TTGV changed its strategy to give greater support to the first phases of innovative companies, leaving financial support for established companies totally to TEYDEP. TEYDEP also started a programme to support start-ups by university graduates. Moreover, a new programme that supports the first R&D projects by SMEs was launched. Although it is too soon to judge the performance of these programmes, we can see that there has been an appropriate policy response to a clear need.

The lack of venture capital for start-ups has been another weakness of the Turkish system. Turkish policy makers have tried to react on this front as well, by making venture capital law in Turkey more attractive to international funds. One positive
announcement in 2008 was that of a joint venture between the European Investment Fund (EIF), the Technology Foundation of Turkey (TTGV), the SME Development Organisation of Turkey (KOSGEB) and the public Development Bank of Turkey (TKB) to set up a target EUR 200 million dedicated fund of funds and co-investment programme in Turkey. However, overall venture capital remains very limited in Turkey, with only six venture capital companies active in Turkey as of 2008.

University-industry cooperation

Turkish policy makers have actively promoted cooperation between universities and industry. Most of the initiatives comprise incentives or mechanisms to increase such cooperation. An earlier assessment of the innovation financing mechanisms of TTGV and TEYDEP shows that both were effective in promoting research-community-industry cooperation. Most of the companies supported by one of these two institutions had also cooperated with universities or public research institutes (European Commission, 2003).

Another initiative has been the establishment of technoparks. Statistics (as seen in chapter 3.3.4) show that the number of technoparks, the firms that participate and also the output, in terms of exports and patents, increased. Although it is still too early to reach a conclusion, it is a promising start.

Another important initiative has been the University Industry Joint Research Centre Project (USAMP). This programme produced a number of successful centres but many centre applications failed. The discontinuation of USAMP in 2006 can be interpreted to mean that it has failed to develop in the desired direction. According to the European Commission report on Turkish innovation (2003), the main reasons for failure have been universities’ lack of strategy and long-term commitment to cooperating with industry. On the other hand, there are also problems in bringing industrial companies together to establish a centre for carrying out joint R&D projects with universities, as their conservative strategies mean they are not open to cooperation with others. The main problems in establishing strong linkages between the research community and business sector lie in cultural differences. Companies also have concerns about confidentiality issues. Another interesting finding was that companies that previously received support from TTGV or TEYDEP were more likely
to cooperate with universities. A report by the Turkish Industrialist Association (TUSIAD) on Turkish innovation asserts that both universities and companies are not yet ready for such cooperation.

Elci (2003) proposes setting new rules for academic promotion, basing it mainly on performance in terms of cooperating with industry. She also proposes revising the relevant legislation in order to grant academics the opportunity to establish their own companies.

Recently, a number of initiatives were launched in order to increase cooperation between industry and universities. One creates incentives for writing a thesis on topics that serve the needs of companies. As seen, the government has recognised the need for more university-industry cooperation and is working on solutions. However, it seems that more needs to be done to align the interests of universities with those of industry. Topics such as the rules on academic promotion or working for companies alongside pursuing an academic career need to be addressed.

**Public R&D**

Recently, the Turkish government has increased R&D spending through the R&D institutes of TUBITAK; spending at universities has also remained high. Spending on areas such as state enterprise innovation, aerospace and, especially, defence technology have increased significantly. There are projects to create a national satellite, national tanks, and national navy ships and submarines. Most of the defence projects are carried out jointly with Turkish companies with support from TUBITAK. It is interesting to observe that most of these projects are very recent, starting after 2000. Another point to highlight is that most of these projects are undertaken by consortia of private and public companies, sometimes with cooperation with foreign firms. Turkey has not become any more nationalistic than in the past, and actually spends less on defence. Therefore, we can interpret that new national capabilities, especially in the private sector, have made it possible for the government to follow such a strategy.
Overall assessment of innovation policy making

After the adoption of the innovation system approach in the mid-1990s, a more participatory approach to decision making has been followed. The state has started to see companies as the main innovators and has developed initiatives to support them. There is a stronger focus on using statistics to monitor progress. Turkey has been following best practice from the OECD: for instance, TUBITAK has participated in the Science and Technology Policies Working Group of the OECD, and it receives input from World Bank and European Union programmes. In fact, the adaptation of the innovation system itself is an example of knowledge transfer from the OECD (since 1993, OECD has been one of the main drivers of this approach). The fact that Turkey has started to follow this approach shows the strong influence of the OECD on Turkish innovation policy making.

A European Commission study (European Commission, 2003) in 2001-2002 on innovation in the candidate countries Latvia, Lithuania, Malta, Romania, the Slovak Republic and Turkey concludes that “the only country with significant institutional resources and capabilities in the field of (science, technology and) innovation policy is Turkey. Broadly speaking, the results of the analysis lead to the conclusion that an innovation policy can only be considered to exist in Turkey. Turkey also leads in the diversity and range of instruments fostering innovation. It has adopted numerous programmes supporting R&D through soft loans and a grant system. Moreover, evaluation results have concluded that the companies supported have benefited from an improved competitive position” (p. 19). The study also states that “the higher level of policy sophistication of Turkey is reflected in the existence of an ‘evaluation culture’ in the field of technology and innovation policy” (p. 20). Furthermore, the study identified that in Turkey business interests are represented in debates about science, technology and innovation; only in Lithuania and Malta was this also the case.

Currently, Turkish innovation policy focuses on four main categories: increasing the R&D investment of companies; increasing interaction and cooperation between actors; increasing technology start-ups; and increasing the rate of commercialisation/marketing of the results of R&D activities by research and higher education organisations. Recently, Turkey’s efforts have gained momentum, especially in the last three policy categories. At the moment, there is no focus on fostering an overall
innovation-friendly environment, developing the future skills base, innovation intermediaries and non-technological innovation, optimising financial regulations, and exploiting new market opportunities (European Commission, 2007).

According to the European Commission innovation report (2007), cooperation among stakeholders is weak and the evaluation of innovation policy is not systemic. Moreover, there is a lack of focus on regional innovation development.

Although initiative-level evaluation mechanisms can be improved, we can see that Turkish policy makers have travelled a remarkable learning path over recent years. They have addressed a significant number of gaps that had been identified in the past, such as weak start-up support and the unattractive venture capital law. Compared with the past, a significant body of statistics can now be publicly accessed, and this has formed the basis of this dissertation. With regard to the narrowness of innovation policy, an over-ambitious strategy would not have a realistic chance of implementation and might be even counterproductive.

Another European Union report (Elci, 2003) asserts that Turkey has too strong a focus on technology development, as opposed to knowledge diffusion. The innovation policy is excessively supply-oriented. This perceived weakness seems to be more serious as Turkey cannot afford not to focus on knowledge diffusion. The biggest advantage of R&D is that it produces measurable results such as patents. Moreover, a science organisation such as TUBITAK is less suited to supporting non-technological innovation. On this account, Turkey might need to give the lead to another organisation to promote non-technological innovation and human resource development.

The weakness of regional policy making is a general weakness of the overly centralised Turkish government. The disadvantage is that large parts of the population are not reached and the particular needs of certain groups are not covered.

Another interesting remark in the European Commission innovation report (European Commission, 2007) is that the national governance system reflects national culture:
“while entrepreneurship, risk-taking and mobility are important strengths of the Turkish innovation system, cooperation, communication and coordination are the main cultural weaknesses which affect innovation governance in a negative way” (p. 11).

### 3.4 Innovativeness of Turkish Companies

This section focuses on the innovative activities of Turkish companies, their development over time, and how they compare with companies in other countries.

The following topics are covered:

- overview of the innovative activities of Turkish companies
- innovation spending and financing
- cooperation and knowledge sources
- use of process innovation
- innovation and exports.

#### 3.4.1 Overview of the innovative activities of Turkish companies

This section is based on data from four waves of Turkish innovation surveys. The data is collected by the Turkish Statistics Institute using the Community Innovation Survey (CIS) questions. This survey is based on the Oslo Manual developed by the OECD and is being used in EU member states, candidate states, Iceland and Norway. For this study statistics from three successive waves were analysed: 1998-2000, 2002-2004, and 2004-2006 (Data was retrieved from the Turkish Statistics Institute statistics portal).
During the period 2004-2006, 60.8% of Turkish industrial companies and 53.6% of service companies indicated that they had conducted an innovative activity. The definition of innovation in the OECD Oslo Manual refers to a new or improved product or process. The minimum criterion for innovation is that it is new for the company, not necessarily new for the world.

Most of the remaining analysis focuses on technology innovation and industrial companies.

As seen in the table above, Turkish industry innovativeness has increased steadily over time. However, the pace of increase seems to have slowed lately. We can also observe that the number of companies doing only process innovation has decreased.
over time. As companies become more advanced, their product innovation increases – this seems to have happened in Turkey as well.

<table>
<thead>
<tr>
<th></th>
<th>Industry</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>73%</td>
<td>58%</td>
</tr>
<tr>
<td>Spain</td>
<td>37%</td>
<td>32%</td>
</tr>
<tr>
<td>Poland</td>
<td>27%</td>
<td>22%</td>
</tr>
<tr>
<td>Romania</td>
<td>22%</td>
<td>16%</td>
</tr>
<tr>
<td>Turkey*</td>
<td>35%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Exhibit 45: Percentage of companies engaged in technological innovation in selected European countries, 2002-2004

If we compare the results for the same survey for the EU for the period 2002-2004 we can see that Turkey’s result is rather high compared to its overall development level. For instance, in industry Turkey has almost the same percentage of innovative companies as Spain and significantly more than Poland.

**Impact of innovation**

Innovation can have an impact on a variety of areas. According to the latest innovation survey, covering the period 2004-2006, 83% of innovative companies achieved a quality increase, 77% introduced new products and 74% increased their domestic market share. Another 49% were able to increase their international market share. Two years earlier, companies indicated that the impact of innovation had been higher. For instance, during 2002-2004, 70% of companies were able to increase international market share through innovation. It seems that innovative companies reaped the benefits of innovation earlier and are now facing diminishing returns.

<table>
<thead>
<tr>
<th></th>
<th># of products increase</th>
<th>New market or market share increase</th>
<th>Quality increase</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>38%</td>
<td>31%</td>
<td>37%</td>
<td>10%</td>
</tr>
<tr>
<td>Spain</td>
<td>28%</td>
<td>20%</td>
<td>35%</td>
<td>23%</td>
</tr>
<tr>
<td>Poland</td>
<td>33%</td>
<td>27%</td>
<td>35%</td>
<td>25%</td>
</tr>
<tr>
<td>Romania</td>
<td>17%</td>
<td>29%</td>
<td>37%</td>
<td>15%</td>
</tr>
<tr>
<td>Turkey (04-06)</td>
<td>75%</td>
<td>75%</td>
<td>83%</td>
<td>65%</td>
</tr>
</tbody>
</table>

Exhibit 46: European comparison of company innovativeness, 2002-2004

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45 Parvan (2007a, p. 1), Turkish data from Turkish Statistics Institute (2008b)
46 Parvan (2007a, p. 5), Turkish data from Turkish Statistics Institute (2008b)
However, the current impact of innovation in Turkey is still much higher and more diverse than in other European countries. One explanation is that, especially for advanced countries like Germany, the scope for advancement has decreased. For instance, entering new markets becomes more difficult as a certain internalisation level is reached. The fact that Turkish percentages have decreased significantly from 2002-2004 to 2004-2006 would support this assumption.

**Nature of innovation**

Innovation in developing countries is often driven by the implementation of advanced machinery. As the development level increases, companies’ own R&D efforts drive innovativeness. We can observe the same development in Turkey.

<table>
<thead>
<tr>
<th>Activities in %</th>
<th>In-house R&amp;D</th>
<th>External R&amp;D</th>
<th>Equipment or software for innovation</th>
<th>Innovation related training</th>
<th>Marketing of innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-49</td>
<td>32%</td>
<td>12%</td>
<td>44%</td>
<td>47%</td>
<td>43%</td>
</tr>
<tr>
<td>50-249</td>
<td>26%</td>
<td>10%</td>
<td>40%</td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>250+</td>
<td>34%</td>
<td>8%</td>
<td>49%</td>
<td>56%</td>
<td>48%</td>
</tr>
<tr>
<td></td>
<td>56%</td>
<td>24%</td>
<td>39%</td>
<td>74%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Exhibit 47: Innovation-related activities of industry according to company size (2004-2006) 47

In the period 2004-2006, only 32% of the innovative industrial companies had in-house R&D, and 12% used external R&D. Other statistics of note are that 44% purchased machinery or software for innovation, and 43% introduced their innovations to the market. As company size increases, we see that the importance of in-house R&D increases.

**Differences according to sectors and company size**

A sectoral assessment of innovation activities shows that the innovativeness increase has not been uniform, with some sectors becoming less innovative over time. For instance, the percentage of innovative firms in the textiles sector decreased from 23% in 1995-1997 to 18% in 1998-2000 and even to 12% in 2002-2004. The percentage of innovative firms in the leather products sector decreased from 36% to 18% during the same period. The medical, precision and optical instruments, watches and clocks sector also showed a steady decline: from being a top performer

47 Turkish Statistics Institute (2008b)
in 1995-1997 with innovative companies at 79%, it fell to 50% in 1998-2000 and further to 43% in 2002-2004.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Textiles</td>
<td>23%</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>Medical, precision and optical instruments, watches and clocks</td>
<td>79%</td>
<td>50%</td>
<td>43%</td>
</tr>
<tr>
<td>Radio, TV and communications</td>
<td>47%</td>
<td>37%</td>
<td>81%</td>
</tr>
<tr>
<td>Motor vehicles</td>
<td>38%</td>
<td>25%</td>
<td>60%</td>
</tr>
<tr>
<td>Fabricated metal products</td>
<td>28%</td>
<td>35%</td>
<td>40%</td>
</tr>
<tr>
<td>Tobacco products</td>
<td>11%</td>
<td>20%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Exhibit 48: Percentage of innovative companies in Turkey per year and per sector

Some sectors showed a more erratic performance, with up and downs during the period covered. For instance, the percentage of innovative firms in the motor vehicles sector first decreased from 38% to 25% in the 1998-2000 period but then increased in the 2002-2004 period to 60%. The same was true for the top-performing sector of the 2002-2004 period, the radio, TV and communications equipment sector. Here we observe that innovativeness decreased from 47% to 37% in the 1998-2000 period, but then increased to 80% in the period 2002-2004. Other sectors showed a steady increase in innovativeness. For instance, the fabricated metal products sector’s innovativeness increased from 27% of firms to 35% and then to 40%. The same trend was observed in the metal and tobacco products industries.

Overall, we can see that larger companies are more likely to engage in innovative activities than smaller ones. In the period 2004-2006, 30% of companies with fewer than 49 employees were innovative, compared to 44% of companies with more than 250 employees. However, over the past decade the percentage of innovative companies increased in the smaller company segment whereas it stagnated in the large company segment. For instance, in 1995-1997 only 17% of companies with 10-19 employees and 21% of companies with 20-49 employees were innovative. In 2004-2006, almost 30% of companies with 10-49 employees were innovative.

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48 Turkish Statistics Institute (2008b)
Lack of financial resources has been the major obstacle to innovation. The last survey – for 2004-2006 – shows that perceived obstacles decreased overall, including the lack of finances. We also see that the lack of qualified personnel is becoming more important for innovative companies.

**Process innovation examples in international comparison**

The ability to use the most up-to-date technology to improve processes and products is important, especially in developing countries where this diffusion of knowledge is critical in catching up. The European Manufacturing Survey has collected data on a number of European countries, including Turkey, for the period 2003/2004. This survey covers non-R&D based innovation and presents a cross-national comparison of the diffusion of selected technical process innovations (Ulusoy and Yegenoglu, 2007).

According to this survey, 79% of Turkish companies were using continuous improvement techniques such as ‘Kaizen’. The popular Japanese concept of ‘Kaizen’ has been adopted by the entire world following the success of Japanese firms. The

---

49 Turkish Statistics Institute (2008b)
main focus of Kaizen, or other similar continuous improvement systems, is to improve product and process quality in order to gain competitive advantage.

Among other European countries, only Slovenian companies had a higher percentage than Turkey in this measure. The authors of the European Manufacturing Survey bulletin explain this by highlighting Turkey’s supplier-customer relationships with Original Equipment Manufacturers (OEM), which use such processes and force their suppliers to adopt them. Ulusoy and Yegenoglu (2007) also report that continuous improvement was the most extensively-used management technique in their survey of the Turkish manufacturing sector.

Another finding was that 86% of Turkish companies were using teamwork; this rate was higher than in any other European country except Croatia. The survey attributes this to the high flexibility that is needed from companies in these countries. Another reason could be the collectivistic nature of Turkish society.

Turkish companies also score relatively well in the adaptation of enterprise resource planning (ERP) software in order to increase the efficiency of supply chain operations: 32% of Turkish companies use such software, compared with 28% of Italian companies and 26% of UK companies. In their survey of the Turkish textiles, chemicals, food and metal sectors, Ulusoy and Yegenoglu (2007) found out that Turkish firms had started to implement ERP in the 1990s, with the chemicals and metal industries the early adopters. The diffusion rate picked up in all sectors after 2000. In the period 2004-2005, around 42% of firms in the chemicals sector and 22% in the other three sectors employed ERP; and 24% in metal, 16% in textiles and 12% in food and chemicals were planning to employ it in the next two years.

Overall, we see that Turkish companies are quick to adapt performance improving techniques, and are strong in teamwork. According to Ulusoy and Yegenoglu (2007), the manufacturing sector in Turkey has recently increased the weight of the product differentiation strategy away from low-cost strategy. Accordingly, quality has become a corporate priority, and this explains the use of continuous improvement techniques. According to their study, the dominant strategy has evolved over the past seven years from ‘follower in the market’ to ‘first in the market’ and the product strategy has evolved from ‘focus on cost’ to ‘focus on differentiation through product variety’.
Innovation, which was the least important factor in explaining success four years ago, is considered to be a major means for survival.

Turkish companies scored lowest in the take-up of regular appraisal interviews. Appraisal interviews give companies the possibility of communicating with employees about positive and negative issues, and offer the possibility for development. They should increase employee motivation, increase cooperation between the manager and the employee, and bring the employee’s goals in line with those of the organisation (Wunderer, 2000, as cited by Ulusoy and Yegenoglu, 2007). Here we see that Turkey is the biggest laggard with only 42% of companies using this technique. Authors of the EMS survey hypothesise that the higher power difference in Turkey’s culture might be the reason for this.

### 3.4.2 Innovation spending and financing

Turkish industry R&D spending is low historically, and dependence on foreign technology is high. Only recently has a new focus on own-technology development emerged; this in turn has increased the importance placed on R&D activities.

![Innovation spending according to activity](image)

During the period 1995-1997, company internal R&D accounted for only 4.5% of the innovation expenditure (Uzun, 2001). In the period 1998-2000 this figure went up to

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50 Turkish Statistics Institute (2008b)
26.5%, and by 2004-2006 company internal R&D accounted for 29% of the innovation expenditure (Turkish Statistics Institute, 2008b).

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Personnel</th>
<th>Other current</th>
<th>Machinery</th>
<th>Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>267</td>
<td>108</td>
<td>74</td>
<td>15</td>
</tr>
<tr>
<td>2001</td>
<td>436</td>
<td>151</td>
<td>169</td>
<td>31</td>
</tr>
<tr>
<td>2002</td>
<td>529</td>
<td>125</td>
<td>254</td>
<td>41</td>
</tr>
<tr>
<td>2003</td>
<td>510</td>
<td>228</td>
<td>95</td>
<td>29</td>
</tr>
<tr>
<td>2004</td>
<td>701</td>
<td>331</td>
<td>140</td>
<td>39</td>
</tr>
<tr>
<td>2005</td>
<td>1,298</td>
<td>588</td>
<td>227</td>
<td>37</td>
</tr>
<tr>
<td>2006</td>
<td>1,629</td>
<td>822</td>
<td>176</td>
<td>24</td>
</tr>
</tbody>
</table>

Exhibit 51: Total Turkish enterprise R&D expenditure per year (million YTL)

Starting from rather low levels, Turkish industry R&D spending has increased significantly during the past decade. More recently, in 2004-2006, Turkish private enterprises’ R&D spending more than doubled. In terms of personnel spending, spending in 2006 was more than three times the 2004 level. The overall increase in R&D spending surpassed all total sales or export figures, indicating its growing importance for the competitiveness of companies.

<table>
<thead>
<tr>
<th>Total Personnel</th>
<th>Other current</th>
<th>Machinery</th>
<th>Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,629</td>
<td>606,620</td>
<td>822,476</td>
<td>175,921</td>
</tr>
<tr>
<td>443,353</td>
<td>665,791</td>
<td>979,044</td>
<td>179,046</td>
</tr>
</tbody>
</table>

Exhibit 52: Total Turkish R&D expenditure per business, 2006 (YTL)

The sectoral breakdown for 2006 R&D spending reveals that the most active sectors were the automobile, white goods and ICT sectors. These are also among the fastest-growing export sectors. The textiles sector has very low R&D spending compared with the total size of the sector.

51-Turkish Statistics Institute (2008c)
52-Turkish Statistics Institute (2008c)
Although Turkey has increased its business R&D spending significantly, its spending level still remains low compared to other countries.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>1.77%</td>
<td>2.29%</td>
<td>2.49%</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>0.11%</td>
<td>0.25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>0.23%</td>
<td>0.18%</td>
<td>0.18%</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>0.46%</td>
<td>0.49%</td>
<td>0.60%</td>
<td>0.67%</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.07%</td>
<td>0.21%</td>
<td>0.27%</td>
<td>0.28%</td>
</tr>
<tr>
<td>China</td>
<td>0.54%</td>
<td>0.91%</td>
<td>1.01%</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>0.53%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 53: Business enterprise expenditure on R&D as % of GDP, selected countries

We can see that Turkish R&D spending is higher than Polish spending and around at the same level as Mexican spending. However, Mexican companies seem to have increased spending by a higher rate than Turkish companies. We can also note that Chinese firms spend over 1% of GDP on R&D.

Overall, we can conclude that Turkish business enterprise spending on R&D is still too low. For instance, in 2006 companies accounted for only 37% of total Turkish R&D spending, with the rest coming from universities and the government. In contrast, companies accounted for 49% of spending in Mexico, 71% in China, and 56% in Spain. Only Poland had a lower percentage than Turkey, with 32% (OECD, 2008b).

Public research and development support

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>7%</td>
<td>5%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>9%</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>32%</td>
<td>14%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>12%</td>
<td>7%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Turkey</td>
<td>4%</td>
<td>7%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>7%</td>
<td>5%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>16%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 54: Business enterprise R&D expenditure financed by the government, selected countries

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53 OECD (2008b)
54 OECD (2008b)
By 2006, 9% of Turkish business enterprise R&D spending was financed by the government. The table above shows that the government’s contribution more than doubled between 2000 and 2006. While Turkey’s R&D support by the government has increased, it is still below the levels of Poland and Spain. Normally, a government’s contribution decreases as the development level of a country increases. We can expect the same to happen in Turkey, but, as the example of Spain shows, country-specific factors play a role as well.

**Innovative companies getting innovation support**

Of the 34% industrial companies that were innovative in 2004-2006, 24% received support from the government (Turkish Statistics Institute, 2008b).

<table>
<thead>
<tr>
<th>Innovation Support</th>
<th>2004-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public-Semi Public</td>
<td>22.6%</td>
</tr>
<tr>
<td>Public: Local-Regional</td>
<td>1.7%</td>
</tr>
<tr>
<td>European Union</td>
<td>1.5%</td>
</tr>
<tr>
<td>EU accession program</td>
<td>1.6%</td>
</tr>
<tr>
<td>Other international</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

Exhibit 55: Innovation support according to source

According to data from the 2002-2004 innovation survey, 5% of innovative Bulgarian companies and 29% of Spanish companies received public support for their innovative activities. Turkey’s 24% figure for the period 2004-2006 compares relatively favourably with these percentages. More advanced countries do not support their companies much more: for instance, only 15% of German companies or 23% of French companies received any support (Parvan, 2007b, p. 4).

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55 Turkish Statistics Institute (2008b)
3.4.3 Innovation cooperation and knowledge sources

For the period 1995-1997, Uzun (2001) reports that the major sources of information were company internal, clients and customers, fairs and exhibitions, and suppliers of equipment, materials, components, and software. The least important were universities and public research institutes. The later waves of the innovation surveys show a similar trend, with suppliers and customers the most frequently-mentioned knowledge sources in all the innovation surveys.

![Exhibit 56: Innovation knowledge sources of innovative companies](image)

It is also possible to observe that from 2002-2004 onwards, ‘competition’ becomes more important. In all the waves, universities and public research institutes are the least-mentioned knowledge sources. Companies with over 250 employees are most likely to work with these institutions: 47% of those in the survey versus the average of 22% (2004-2006 survey). The same applies to public research institutes, with a figure of 34% for large companies against an average of 22%. The only knowledge source that large companies used less than average was ‘customers’, which could imply that they have gone beyond buyer-push innovation and started to develop their own indigenous technology (Turkish Statistics Institute, 2008b).

---

56 Turkish Statistics Institute (2008b)
**Innovation cooperation**

In the period 2004-2006, only 17% of companies innovated through cooperation. However, cooperation increased as the size of the company increased, from 17% of companies with 10-49 employees to 36% of companies with more than 250 employees. It is also possible to observe that for companies with over 250 employees, cooperation with suppliers and customers decreased in importance, whereas cooperation with universities and public R&D increased (Turkish Statistics Institute, 2008b).

The 2002-2004 Community Innovation Survey showed that in the EU-27, 26% of innovative enterprises cooperated in innovative activities (Parvan, 2007a).

<table>
<thead>
<tr>
<th>% cooperating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>16%</td>
</tr>
<tr>
<td>Spain</td>
<td>18%</td>
</tr>
<tr>
<td>Poland</td>
<td>42%</td>
</tr>
<tr>
<td>Romania</td>
<td>17%</td>
</tr>
<tr>
<td>Turkey (04-06)</td>
<td>17%</td>
</tr>
</tbody>
</table>

Exhibit 57: Percentage of innovative companies cooperating with other organisations, selected European countries, 2002-2004

Turkey’s cooperation percentage is low compared to Poland, but not compared to more advanced countries such as Spain or Germany. On the other hand, in advanced countries there are more companies with strong in-house capabilities and the need for cooperation might be lower. Since Turkish companies are relatively underdeveloped, the usefulness of cooperation would be greater.

**Inter-company cooperation**

In Turkey, we see a number of sectors with strong backward linkages. Among medium technology-intensive sectors, the Turkish white goods sector stands out with its strong backward linkages with its suppliers. There are over 500 local suppliers for end production. Moreover, these suppliers are even exporting directly to other, mostly European producers, with over US $500 million in exports being traded (Sanir, 2007). The automotive sector also has very strong backward linkages. The import intensity – as measured by the ratio of imports of parts to total automotive exports – of the automotive sectors has fallen rather steeply since 1996, dropping from 135% in 1995.

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57 Parvan (2007a, p. 4), Turkish data from Turkish Statistics Institute (2008b)
to 62% in 2004. “In other words, while in the 1990s imported parts were used among others to assemble cars and trucks for protected domestic markets, the 2000s witnessed the emergence of firms producing parts both for exports and domestic consumption as well as cars destined for foreign markets” (Kaminski and Ng, 2006, p. 36).

On the other hand, the ICT sector does not have strong backward linkages with domestic suppliers. Most of the components that are needed, for instance for the production of a TV, come from East Asia. In 1995, the import of parts as a percentage of exports stood at 253%. By 2000, it was down to 174%, and by 2004 to 97%. This 97% comprised not only the manufacture of export products but also all products for the domestic market, meaning that the local part percentage is also higher. Overall, even in this sector there has clearly been a trend towards more local production (Kaminski and Ng, 2006).

The importance of these backward linkages in promoting innovation cooperation becomes evident when we search for examples. Not surprisingly, the most important cooperation occurs in the automotive sector. In 2001, TOFAS, representing one of the biggest automotive manufacturers in Turkey, established the ‘Target’ network with 63 members, both large companies and SMEs. ‘Teknorama’ was set up as a private initiative in 2002 with the aim to carry out specific studies of common interest to the 100 network members (Elci, 2003).

Moreover, the Association of Automotive Parts and Components Manufacturers (TAYSAD) operates an industrial zone with common facilities and centres for R&D. As of 2008, 81 firms were located in this industrial zone, employing 6,000 people (Association of Automotive Parts and Components Manufacturers – TAYSAD, 2008).

According to Elci (2003), inter-firm cooperation has been difficult for the Turkish business sector owing to firms’ conservative structures as family-owned and owner-managed companies. However, “driving forces such as globalisation, EU candidacy (especially participation in the EU’s 6th framework programme), government initiatives (e.g. incentives for technology development zones) and, most importantly, the effects of the severe macroeconomic crises in 2000 and 2001 (i.e. export orientation of the industry due to narrowed local market) have forced the business
sector to become innovative. As a result, networking and co-operation have been initiated by the business sector itself in a bottom-up manner, as in the cases of TARGET and TEKNORAM…Awareness raising on the benefits and importance of networking by presenting the results of such efforts is very effective” (p. 80).

Recently there have been positive developments. Government initiatives such as the technology development zone and technoparks bring companies physically together. Sectoral policy platforms initiated by TUBITAK are bringing various actors together in discussions. The growing importance of exports is decreasing the intensity of competition between firms in the same industry, and they are becoming more cooperative as they share mostly the same problems. Moreover, Turkish society is becoming more open and interactive, and this is reflected by companies’ behaviour.

3.4.4 Innovation and exports

Increasing the technology content of exports is used as an output indicator for the innovation system. Moreover, the relative unit values of exports are increasingly used in international literature as an indicator of the innovativeness and qualitative differentiation of a country’s industry. In this account, Turkish exporters appear to have climbed innovation and quality ladders in recent years (Gönenç et al., 2008).

Exhibit 58: Revealed competitive advantages according to the technology intensity of industries, selected countries

58 Gönenç et al. (2008)
We can see that the comparative advantage of Turkey has increased in higher-technology exports. ‘Road vehicles’ is Turkey’s new and rising area of specialisation. The share of ‘road vehicle’ exports in total exports rose from 1.9% in 1993 to 13.7% in 2006. ‘Iron and steel’ are also slowly becoming a specialisation area. These products represented 8.5% of total exports and 5% of total imports during the reference period. ‘Electrical machinery and appliances’ are another area of recent progress. In 2006, the share of electrical products in total exports attained 5% (Gönenç et al., 2008).

Ozcelik and Taymaz (2004) analysed firm-level innovation survey data covering the 1995-1997 period for 4,000 firms, in order to find out the determinants of export performance. They conclude that innovation and R&D activities are crucial for the international competitiveness of Turkish manufacturing firms. On the other hand, technology transfers through licence or know-how agreements and being a member of a business group are not significant determinants of export performance. Therefore, promoting in-house innovation needs to have priority. Technology transfers and licence or know-how agreements may be seen as ‘complementary’ processes through their effect on enhancing innovation possibilities.

### 3.5 International Comparison of Turkey’s Innovation System

The section compares the performance of innovation systems based on a number of input and output indicators. It compares Turkish performance to that of selected OECD member countries and associates.

For this assessment the following indicators are used:
- research and development spending
- number of researchers
- science and engineering enrolment
- foreign direct investment (FDI) inflows
- royalty payments and receipts
- exports and high-tech exports
• successful international companies
• patent applications
• number of scientific articles.

R&D spending

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>2.39%</td>
<td>2.98%</td>
<td>3.23%</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>0.37%</td>
<td>0.51%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>0.88%</td>
<td>0.64%</td>
<td>0.57%</td>
<td>0.56%</td>
</tr>
<tr>
<td>Spain</td>
<td>0.80%</td>
<td>0.91%</td>
<td>1.12%</td>
<td>1.20%</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.33%</td>
<td>0.64%</td>
<td>0.79%</td>
<td>0.76%</td>
</tr>
<tr>
<td>China</td>
<td>0.90%</td>
<td>1.33%</td>
<td>1.42%</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 59: Total R&D spending as % of GDP (GERD) selected countries

Turkish R&D spending as a percentage of GDP has been higher than in other developing countries such as Poland and Mexico; however, it is considerably lower than in China. The trend during the last decade has been very positive and spending has increased from 0.33% in 1990 to 0.76% in 2006.

Other innovation input indicators

<table>
<thead>
<tr>
<th>Innovation System</th>
<th>Turkey</th>
<th>Poland</th>
<th>Mexico</th>
<th>Spain</th>
<th>Korea, Rep.</th>
<th>Thailand</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI Inflows as % of GDP, 2000-2005</td>
<td>1.3</td>
<td>3.5</td>
<td>4.1</td>
<td>0.9</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Royalty and License Fees Payments (US$/population), 2006</td>
<td>5.09</td>
<td>34.74</td>
<td>4.82</td>
<td>57.49</td>
<td>92.68</td>
<td>31.6</td>
</tr>
<tr>
<td>Science and engineering enrolment Ratio (% of total), 2006</td>
<td>21.39</td>
<td>19.98</td>
<td>31.34</td>
<td>29.84</td>
<td>39.9</td>
<td>n/a</td>
</tr>
<tr>
<td>Researchers in R&amp;D / million people, 2006</td>
<td>476</td>
<td>1,628</td>
<td>331</td>
<td>2,528</td>
<td>3,723</td>
<td>286</td>
</tr>
</tbody>
</table>

Exhibit 60: Selected innovation indicators, selected countries

Turkey historically has not received significant amounts of foreign direct investment. Only in recent years has FDI increased, but the focus has been on non-export-generating service sectors such as banking. We can see from the table above that, as a percentage of GDP, FDI was lower in Turkey than in all other countries except Korea. Another area in which Turkey scores very low is licence and royalty payments. Turkey’s payments are much lower than in all the countries bar Mexico. In

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59 OECD (2008b)
60 World Bank (2008c)
fact, FDI and royalty payments are to a high extent related, as foreign affiliates are responsible for most of the payments.

In science and engineering enrolment share, Turkey scores low and is ahead of only Poland. In Korea, almost 40% of students are enrolled on a science or engineering course. When we look at the number of researchers in R&D per million population, we see that university enrolment and, later, the number of employed people does not correlate directly. Turkey scores higher than Mexico and Thailand but considerably lower than Poland.

### Export development

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>132</td>
<td>172</td>
<td>194</td>
<td>372</td>
</tr>
<tr>
<td>Mexico</td>
<td>117</td>
<td>166</td>
<td>165</td>
<td>272</td>
</tr>
<tr>
<td>Poland</td>
<td>28</td>
<td>32</td>
<td>54</td>
<td>138</td>
</tr>
<tr>
<td>Spain</td>
<td>112</td>
<td>115</td>
<td>156</td>
<td>242</td>
</tr>
<tr>
<td>Thailand</td>
<td>54</td>
<td>69</td>
<td>80</td>
<td>152</td>
</tr>
<tr>
<td>Turkey</td>
<td>27</td>
<td>28</td>
<td>47</td>
<td>107</td>
</tr>
</tbody>
</table>

Exhibit 61: Development of exports in billion US$, selected countries

During the past decade, most of the selected countries were able to increase their export figures. Turkey exports less than all the other countries, but has been increasing its exports faster than any other country except Poland.

### High-tech exports

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>..</td>
<td>29.2</td>
<td>37.1</td>
<td>36.1</td>
</tr>
<tr>
<td>Mexico</td>
<td>7.0</td>
<td>23.2</td>
<td>28.7</td>
<td>28.4</td>
</tr>
<tr>
<td>Poland</td>
<td>..</td>
<td>4.2</td>
<td>6.4</td>
<td>6.6</td>
</tr>
<tr>
<td>Spain</td>
<td>8.4</td>
<td>8.7</td>
<td>10.2</td>
<td>10.8</td>
</tr>
<tr>
<td>Turkey</td>
<td>3.5</td>
<td>2.1</td>
<td>7.9</td>
<td>6.5</td>
</tr>
<tr>
<td>OECD total</td>
<td>..</td>
<td>21.3</td>
<td>26.9</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Exhibit 62: Percentage of high-technology exports (of total exports), selected countries

In terms of high-tech exports, Turkey scores lower than Poland or Mexico. Part of the explanation is that Turkey did not attract any FDI in high-tech sectors such as aerospace or semiconductors. Moreover, Turkey lacks national firms that have

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61 IMD World Competitiveness Yearbook (2008)
62 OECD (2008b)
significant production in such sectors. Although there has been some increase in this area, there is not yet a clear development path. Turkey’s exports are based mainly on medium-technology sectors such as the automotive, TVs and white goods sectors, which are not included in this list.

**Successful international companies**

The number of successful international companies is not one of the common innovation system output indicators. However, it will be used here to indicate whether countries have been able to increase their national innovation capacity, or if they rely predominantly on FDI. For instance, if a country has high-technology exports but not from locally-owned companies, this might indicate that there are few spill-over effects from FDI.

BCG’s Global Challengers 2008 report tracks emerging multinationals for developing countries and excludes foreign-owned companies.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Emerging Multinationals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>3</td>
</tr>
<tr>
<td>Mexico</td>
<td>7</td>
</tr>
<tr>
<td>Thailand</td>
<td>2</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
</tr>
</tbody>
</table>

Exhibit 63: Number of emerging multinationals, selected countries

One good example to study is Mexico. Although Mexico scores low in terms of many innovation system factors, it has still managed to produce seven emerging multinationals, whereas Poland, with its much better indicators, has produced only one company and that was a fossil fuels company. Four of Mexico’s seven companies were food companies, one was in the telecommunications sector, one was in automotive equipment and the other was a building materials company. Both of Thailand’s companies were in the food sector. Turkey’s companies were in chemicals, home appliances (white goods) and consumer electronics. Here we can observe that Turkey has created internationally-competitive companies in medium-technology sectors.

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63 Aguiar et al. (2008, p. 8)
In terms of patenting activity, we can see that Turkey is ahead of all other developing countries except China. This has been a result of the progress made over the past three years. Overall though, we can see that developing countries have very low patenting activity. Even Spain, which is considered a developed country, has a low number of patents. Only China seems to have made real progress in this sphere, and seems to be catching up with advanced economies.

The complete lack of royalty receipts shows that Turkey is not able to produce globally-marketable intellectual knowledge. All the other countries included have some receipts, even if they are at low levels.

Exhibit 64: Patent applications to WIPO, selected countries

Exhibit 65: Royalty and licence fees 2006, selected countries

Exhibit 66: Total number of scientific articles, selected countries

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64 World Intellectual Property Organisation (n.d.)
65 World Bank (2008c)
66 IMD World Competitiveness Yearbook (2008)
The number of scientific articles is the field in which Turkey performs best. As already seen in the section on education, Turkey has made significant progress in this area and has almost caught up with developed countries. However, in terms of articles per million population, it remains behind Poland.

3.6 Impact of the National Innovation System on Company Innovation

This section matches the information from innovation surveys to a variety of innovation system areas. The aim is to understand the impact of national innovation system on company innovation.

Macroeconomic stability
During the 1990s, Turkey was unstable, going from one crisis to another. Not surprisingly, an opinion survey in 2002 (Elci, 2003) showed that the negative effect of the macroeconomic environment (inflation, exchange rates, etc.) on innovation was high, and that this was the most important obstacle to innovation. As Turkey has become more stable, we could expect the negative impact on innovation to decrease. There is no recent data on this topic. However, Turkey is still considered riskier than other developing countries as the risk premium on its external borrowing shows. As a consequence, the perceived lack of macroeconomic stability may continue to hinder innovation until a strong confidence in the future of the economy is achieved.

Financing
According to all community innovation surveys, the high cost of innovation has been the major obstacle to innovation. However, the most recent survey, covering 2004-2006, shows some improvement on this account. Both the amount of overall private enterprise credit and the innovation financing from the government support this development. Elci's 2002 innovation opinion survey highlighted the fact that the insufficient level of venture capital finance and start-up funds for new technology-
based firms was seen as an important drawback by interviewees. Overall, the level of government funding for R&D undertaken within, or for, private enterprises was found to be inadequate.

It can be clearly seen that recently there have been some developments in this area as the government has launched a number of new initiatives. The impact of these initiatives is yet to be seen. The IMD executive opinion survey data from 1999 to 2008 shows a clear improvement in the financing of technological development.

**Legal environment for innovation**

An innovation opinion survey in 2002 (Elci, 2003) found that the “negative effect of legal and administrative procedures for creation of new technology based firms, and current legal framework on innovation was found to be relatively low” (p. 48). The 1998-2000 community innovation survey showed that the lack of strong IPR protection was seen as a major obstacle to innovation. The IMD executive opinion survey, in fact, shows that the perception of IPR protection actually decreased and was lower in 2008 than in 1999. In international comparison, Turkey scored levels to similar to Mexico, Poland and Thailand but lower than Spain and Korea.

**Human resources**

The 2004-2006 community innovation survey showed that the lack of qualified personnel was especially a problem for innovating companies. However, overall, the lack of qualified personnel for industry increased. In fact, this was the only obstacle to innovation that did not decrease significantly compared with the 2002-2004 survey. It seems as if, after years of strong growth, the Turkish human resources markets became less capable of supporting innovation. The IMD executive survey shows similar trends, with executives rating the availability of qualified engineers as lower in 2008 than in the early 2000s. However, in the international comparison, Turkey still had the best perception in this area, scoring higher than even Korea and Spain. The availability of overall skilled labour showed exactly the same trend.

The consultancy BCG also depicts a good overall picture in research conducted in 2005.
However, according to the OECD (Gönenç et al., 2006), “the most binding human capital shortages are at the middle and low end of the labour market…the quality of education remains low at the majority of schools, and the education system focuses predominantly on providing good quality education to the most able students, who are channelled towards university and work in the formal sector” (p. 153).

### Cooperation and knowledge sources

According to the 2004-2006 community innovation survey, only 17% of innovative manufacturing firms were engaged in any kind of cooperation. Although this is the same as in Germany and Spain, it is significantly lower than the over-40% level seen in Poland. In terms of cooperation, suppliers and customers have been the leading partners followed by competition and specialised R&D companies. University and public R&D units were mentioned by fewer than 35% of respondents (out of the 17% that do cooperate). However, for large companies the percentages have been higher. Royalties, licences and knowledge from FDI also play a very minor role in Turkey, much less than in other developing countries.

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67 Hutten-Czapski et al. (2006)
4. Case Study: Turkish Consumer Electronics Firms

4.1 Case Study Strategy

This chapter first explains the choice of the employed research strategy, the single embedded case study. It presents the analytical strategy used, and introduces the research procedures, explaining which data sources are utilised. This is followed by a discussion of the ‘quality’ of the research design. Here the challenges to the validity and reliability of research findings are assessed, and the methods employed to mitigate these issues are introduced. The final section describes the structure of the case study.

Objective of empirical study

The research objective of this study is, to use Yin’s terminology (2003, p. 39), ‘revelatory’. Revelatory case studies focus on situations that have been previously inaccessible to scientific investigation. The case study is worth conducting because the descriptive information is valuable.

The case study focuses on the main research question: what is the state of the organisational learning capability of the Turkish consumer electronics sector? The findings are of a descriptive nature and serve as a basis for the discussion part that will follow in the next chapter. In this next chapter, the institutional analysis of Turkey will be assessed together with the specific information about the company. This is then compared to the experiences of other developing countries.

4.1.1 Research design

The research design determines the approaches and techniques for collecting and analysing empirical data (Denzin and Lincoln, 1994).
It is, in a way, a ‘blueprint’ of research, dealing with at least four problems: what questions to study; what data are relevant; what data to collect; and how to analyse the results (Philliber, Schwab and Samsloss, 1980).

**Selection and definition**
This section discusses which case study type is suitable for the research question. It is based on the case study categorisation by Yin (2003) which is the most influential in this field. Yin’s categorisation is based on two main elements; first, it assesses whether the research question requires multiple cases, and secondly, whether there are multiple units of analysis involved.

**Single and multiple designs**
According to Yin (2003), the primary distinction in designing case studies is between single and multiple case designs. Before starting with data collection, the researcher needs to decide whether a single case or multiple cases are needed to address the research questions.

A multiple case study, according to Yin, is like multiple experiments. It follows replication logic. The aim is to reproduce significant findings from the first case in those cases that follow. These replications would ensure that the findings from the first case are robust and trustworthy. Although the evidence from multiple cases is considered to be more compelling, in many cases the rationale for single case designs cannot be satisfied by multiple cases. Moreover, multiple case studies often require resources that are beyond the means of a single researcher.

Yin describes five main situations where a single case study should be used. The first one is the critical case that is used to test a well-formulated theory. The researcher aims to confirm, challenge or extend the theory using one case study. The single case is used to “determine whether a theory’s propositions are correct or whether some alternative set of explanations might be more relevant” (Yin, 2003, p. 40). The second rationale for using a single case study is when the research is about an extreme or unique case. Here the research focuses on an extreme or rare case where the phenomenon is so rare that researchers will not have the possibility of establishing any common patterns with comparable cases. As a third situation, Yin mentions the representative or typical case. This is quite the opposite of the critical case: it focuses on a very common situation. Yin gives the example of a ‘typical’
manufacturing firm, or a ‘typical’ neighbourhood. The lessons learned from these cases are assumed to be informative about the experiences of the average person or institution. Another rationale for a case study is the longitudinal case. Here the researcher studies the case at two or more points in time. The focus is on identifying whether the change as predicted by theory actually takes place. Single case studies are also the preferred method when the researcher has the “opportunity to observe and analyse a phenomenon previously inaccessible to scientific investigation”. Yin (2003, p.42) calls this the revelatory case. The case study is worth conducting because the descriptive information alone will be revelatory. The difference between this and the rare or unique case is that the case itself is not necessarily unique, but that researchers have not had the opportunity to investigate it before (p. 40-42).

**Unit of analysis**
Prior to data collecting, the researcher also has to decide on the unit of analysis. According to Yin (2003), there are two choices of design: the holistic and embedded case study. The holistic design is when the focus is on the ‘global nature’ of an organisation or programme, where no distinction between subunits is made. The embedded case study, on the other hand, focuses on subunits. If a single case study looks at a programme that consists of a number of projects, then these projects would be the embedded units (p. 42-46).

**Rationale for using the single embedded case study method**
The specific research question that we focus on requires a single case study approach since the nature of the study is revelatory.

An extensive literature review on this area shows that the organisational learning capability of Turkish consumer electronics firms (or other Turkish firms) has never been researched before. In general, organisational learning literature has focused more on companies that are seen as benchmarks in organisational learning (mostly from developed countries), rather than companies from developing countries that have been trying to catch up.

This case study is not a critical or a longitudinal case since the paper does not aim to validate or reject existing theory, but instead focuses on revealing the existing situation. We cannot claim, not beforehand at least, that organisational learning in the Turkish consumer electronics sector constitutes an extreme or rare case. Moreover, it
is not possible to present it as a typical case for all developing firms. As a result, we can conclude that we need to use a single case study design as opposed to a multiple design, since we are focusing on a revelatory case study.

This case study uses an embedded design and focuses on subunits as part of the overall case study. The study is a single case in the Turkish consumer electronics industry but has the two main producers as subunits. This approach is selected since the differences between the two subunits (companies) could provide valuable insights. Both companies are the products of the same institutional environment; consequently, the similarities and differences between each other offer the possibility of identifying the impact of institutional factors.

In summary, the present case study represents a revelatory case, and involves two units of analysis. The single embedded case study is therefore the most suitable method for the purpose of this dissertation.

4.1.2 Analytical strategy

The general analytical strategy for a case study should define the priorities of what to analyse and why. For each case, there is a wealth of information to be collected. The analytical strategy should act as guidance on which data is relevant for the case. There are three main strategies: relying on theoretical propositions, setting up a framework based on rival explanations, and developing case study descriptions. (Yin, 2003).

According to Yin (2003), the preferred strategy is to follow the theoretical propositions on which your case study is based. “The propositions would have shaped your data collection plan and therefore would have given priorities to the relevant analytic strategies” (p. 112).

This case study is based on the theoretical framework, and propositions that have been identified during the literature review. These are the dimensions of organisational learning capability (Jerez-Gomez, Cespedes-Lorent and Valle-Cabrera, 2005) and innovation indicators. The data collection focuses on these dimensions and uses question sets that have been used and validated by prior research.
Factors that impact organisational learning capability

<table>
<thead>
<tr>
<th>Management commitment</th>
<th>Systems perspective</th>
<th>Openness &amp; experimentation</th>
<th>Knowledge transfer &amp; integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Management attitude towards changes</td>
<td>• Generalized knowledge of company objectives</td>
<td>• Innovation promotion</td>
<td>• Failure tolerance</td>
</tr>
<tr>
<td>• Employee learning expenditure</td>
<td>• Company interconnection &amp; coordination</td>
<td>• Corporate culture &amp; experimentation</td>
<td>• Teamwork &amp; socialization</td>
</tr>
<tr>
<td>• Employee involvement &amp; innovation rewards</td>
<td>• Benchmarking &amp; external knowledge sourcing</td>
<td></td>
<td>• Knowledge sharing instruments</td>
</tr>
</tbody>
</table>

Exhibit 68: Factors that impact organisational learning capability

Learning and innovation indicators

Learning capability survey data are complemented with innovation indicators that are part of the innovation system research stream.

<table>
<thead>
<tr>
<th>Innovation Indicators</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>• R&amp;D spending</td>
<td>• Sales from new/improved products or processes</td>
<td></td>
</tr>
<tr>
<td>• R&amp;D personnel</td>
<td>• Intellectual Property statistics</td>
<td></td>
</tr>
<tr>
<td>• Intellectual Property statistics</td>
<td>• Sales from new markets</td>
<td></td>
</tr>
<tr>
<td>• Acquisition of technology</td>
<td>• Design awards</td>
<td></td>
</tr>
<tr>
<td>• Expenditure on manufacturing, marketing and training for new products/process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Design development expenditure</td>
<td>• Benchmarking &amp; external knowledge sharing instruments</td>
<td></td>
</tr>
<tr>
<td>• New markets entered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 69: Innovation indicators

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68 Jerez-Gomez et al. (2005)

69 Author’s illustration
4.1.3 Research procedures

Research procedures describe the data sources and data analysis techniques that are employed. The overall aim is to maximise the validity and reliability of the research findings.

Data collection

The richness, range and depth of data collected during a case study have a major impact on its quality. One of the most important strengths of the case study method is that it can combine a wide range of data sources (Yin, 2003; Eisenhardt, 1989). These sources are of a complementary nature, and the use of as many sources as possible is desirable. This dissertation uses data collected from three sources: interviews, direct observation, and documents.

Documentation

Documents play a useful role in improving the depth and reliability of previously-collected data. A variety of documents can be relevant for a case study, and they can be useful even if they are neither accurate nor objective. In most cases, documents do not reflect the reality as it happened. One important point is to understand for which audience and with what purpose a certain document is published. Once the objective of the author and the context in which the document was published are identified, the documents’ interpretation becomes more realistic and thus useful (Yin, 2003, p. 87).

This case study makes extensive use of all available material. Company internal documents such as company magazines provide valuable insights. Media are also a significant source of information. Data have been collected, on the one hand, through official press releases, advertising and company executive interviews and, on the other, through independent articles and news about the company. Yet another source of information is independent analysis and reviews by investment banks and research institutes. These can provide valuable insights that are not accessible otherwise.

Overall, it is important to collect data from a variety of sources in order to arrive at a realistic picture of the situation. Only when all the evidence produces a consistent picture can the results be considered reliable.
Interviews and surveys

Interviews are the most important data collection technique in the social sciences (Denzin and Lincoln, 1994; Yin, 2003, p. 89). Yin distinguishes between three kinds of interviews: open-ended, focused, and structured interviews that resemble surveys.

In open-ended interviews, respondents are asked not only about the facts of a matter but also about their opinions about events. In contrast, focused interviews are usually shorter and follow a certain set of questions. Nevertheless, the respondent can still be asked open-ended questions as well as about their own opinions. The third type of interview is much like a survey. It is designed as part of a case study and produces quantitative data as part of the case study evidence. According to Yin, this type of interview follows both the sampling procedures and instruments used in regular surveys, and is analysed accordingly. The difference between a regular survey and this type of interview is that the findings are not the final result but one component of the overall investigation. For instance, if we conduct a survey among the employees of a firm about the organisational learning of that firm, the result would not necessarily be the absolute measurement of learning but rather one component of the assessment.

This case study is mainly based on focused interviews that cover the main elements that impact learning at an organisation. The time constraints of interview partners also make a focused approach necessary.

Direct observation

Direct observation is based on reflections and impressions collected at the case study site. According to Yin (2003, p. 92-93), observations can range from formal data collection activities like measuring the incident of certain types of behaviours during certain periods of time to less formal observations made throughout a field visit. Most of the direct observations for this case study were made during visits for the interviews and during a factory visit.
List of data sources

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews</td>
<td>6 interviews with Vestel employees/executives</td>
<td>Oct 05- Mar 06</td>
</tr>
<tr>
<td></td>
<td>4 interviews with Arcelik employees/executives</td>
<td>Oct 05- Mar 06</td>
</tr>
<tr>
<td></td>
<td>2 written correspondence with Arcelik executives</td>
<td>June 08</td>
</tr>
<tr>
<td></td>
<td>2 interviews with industry experts</td>
<td>Oct 05- Mar 06</td>
</tr>
<tr>
<td>Personal Observation</td>
<td>2 visits to Vestel HQ in Istanbul</td>
<td>Oct 05- Mar 06</td>
</tr>
<tr>
<td></td>
<td>2 visits to Arcelik HQ in Istanbul</td>
<td>Oct 05- Mar 06</td>
</tr>
<tr>
<td></td>
<td>1 visit to Vestel City in Manisa (production and R&amp;D)</td>
<td>June 08</td>
</tr>
<tr>
<td></td>
<td>Press releases</td>
<td></td>
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<tr>
<td></td>
<td>Financial reports</td>
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<td></td>
<td>Bank analyst reports</td>
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<td></td>
<td>Media clippings</td>
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<td></td>
<td>Datamonitor statistics and reports</td>
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<tr>
<td></td>
<td>European Patent Institute Database</td>
<td></td>
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<td></td>
<td>Design award data</td>
<td></td>
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<td></td>
<td>Company web sites</td>
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<td></td>
<td>Company magazines</td>
<td></td>
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<tr>
<td></td>
<td>Case studies or articles about involved companies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presentations from company executives</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 70: List of data sources, case study

Quality measures of the research design

Four measures are most commonly applied to ensure the quality of empirical research streams (Scandura and Williams, 2000).

These are:

- **Construct validity**: establishing the correct operational measures for the concept being studied.
- **Internal validity** (for explanatory or causal studies only, and not for descriptive or exploratory studies): establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships.
- **External validity**: establishing the domain to which a study’s findings can be generalised.
- **Reliability**: demonstrating that the operations of a study – such as the collection procedures – can be repeated, with the same results.

70 Author’s illustration
This case study is a descriptive study and the focus is therefore establishing construct validity and ensuring reliability. Owing to the descriptive nature of the study, there is no specific focus on internal and external validity.

**Establishing construct validity and reliability**

One of the main criticisms levelled against the case study is that ‘subjective’ judgments are used to collect data. According to Yin, three main tactics that can be used to address problems of *construct validity* are: using multiple sources of evidence, establishing a chain of evidence, and having key informants review the draft study report. For *reliability* purposes, the aim is to make sure that if another investigator followed the same procedures, s/he would arrive at the same findings and conclusions (using exactly the same case and settings). The most important procedure for ensuring reliability is to document precisely the research steps that have been taken. Consequently, creating a case study database and maintaining a chain of evidence are the most useful tactics to be employed (Yin, 2003, p. 35).

In summary, the tactics that can be employed to increase both the construct validity and reliability are: using multiple sources of evidence, creating a case study database, and establishing a chain of evidence.

The most important advantage presented by using multiple sources of evidence is the development of converging lines of inquiry, a process of *triangulation*. Obviously findings based on several information sources are going to be much more precise. Data triangulation is useful for addressing the potential problems of *construct validity* since multiple sources provide multiple measures of the same phenomenon.

The main purpose of the case study database is to contain enough data that the reader of the report can draw independent conclusions about the case study. A precondition for this is that the case study report makes sufficient citations of the documents and information included in the case study database. It is also important that the database shows the circumstances under which the evidence was collected; for example, the time and place of an interview (Yin, 2003, p. 101).

Another important principle for increasing the *reliability* is to maintain a chain of evidence. Yin (2003) compares this approach to forensic investigation methods. “The principle is to allow an external observer – in this situation the reader of the case study – to follow the derivation of any evidence, ranging from initial research
questions to ultimate case study conclusions. As with criminological evidence, the process should be tight enough that evidence presented in ‘court’ – the case study report – is assuredly the same evidence that was collected at the scene of the “crime” during the data collection process” (p. 105).

4.1.4 Case study structure

Exhibit 71: Case study structure

The case study first provides an overview of the sector, presenting boundaries and explaining major trends. It also provides background information about the Turkish consumer electronics industry.

The second part focuses on the two main companies in the industry: Vestel and Arcelik. This section provides an in-depth analysis of these two companies, focusing on their learning capability and innovation indicators. The final part is a synthesis of the preceding parts and provides a summary of findings. It also provides an international comparison of learning/innovation indicators, and assesses to what

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71 Author’s illustration
extent the learning path of Turkish companies resembles the learning path of companies in other countries in the same sector.

4.2 Overview of the Turkish Consumer Electronics Industry

4.2.1 Industry background

Sector definition
The term consumer electronics can refer to brown goods such as TVs and DVDs and also to PCs and mobile phones. It can also refer to all of these plus white goods such as refrigerators.

Consumer electronics

<table>
<thead>
<tr>
<th>Products</th>
<th>Brown goods</th>
<th>White goods</th>
<th>PC and peripherals</th>
<th>Mobile phones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Televisions, DVD players, VCRs, home stereo systems, and portable audio equipment.</td>
<td>• Refrigerators, washing machines, dishwashers, air conditioners, and household appliances.</td>
<td>• Desktops, laptops, and all their peripherals such as optical and magnetic storage, monitors, and keyboards.</td>
<td>• Wireless telephone handsets</td>
</tr>
<tr>
<td>Market Size</td>
<td>• $158 billion</td>
<td>• $265 billion</td>
<td>• $160 billion</td>
<td>• $117 billion</td>
</tr>
</tbody>
</table>

Exhibit 72: Overview of world consumer electronics market

72 McKinsey Global Institute (2003b)
Characteristics of segments.\textsuperscript{73} There are significant differences between the subsegments of the consumer electronics sector. They differ from each other in terms of the speed of technological change, their internationalisation level, and the importance of delivery cost in competition.

**PCs and peripherals:** This subsegment is the furthest along the process of value chain disaggregation. Widely-adopted hardware and software standards have enabled the creation of separate markets for most components and peripherals. Most of the component markets in this subsegment are characterised by rapid technological change and high levels of global competitive intensity.

**Mobile phones:** The subsegment is characterised by very rapid technological change, standardisation at the regional level, and a low bulk-to-value ratio.

**White goods:** These products tend to be bulkier to transport, and have fewer components and a slower rate of technological innovation than most other consumer electronics products. Therefore domestic production usually plays an important role, and acquisitions are significant.

**Brown goods:** This subsegment is the most varied, covering products with very different bulk-to-value ratios, and rates of technological change (for example, standard low-end radios, DVD players, and large-screen TVs).

**Focus of study**
In this study, the focus is on brown goods and white goods. This is, firstly, because the Turkish consumer electronics sector has significant presence in these subsegments only. Secondly, most Turkish consumer electronics companies have significant presence in both segments. In brown goods, special attention is given to TVs as they constitute 75% of the value. In white goods, the focus is on large kitchen appliances. Small kitchen appliances are a very heterogeneous group with many

\textsuperscript{73} McKinsey Global Institute (2003b)
companies leading different subsegments. In addition, Turkey’s production in this subsegment is not significant.

Main trends in consumer electronics

Transition to digital
Heightened consumer demand for digital TVs, in particular flat-panel TVs, has been the driver behind the recent surge in consumer electronics sales. There is a rapid move away from analogue CRT TVs to LCD and plasma TVs. Although the price of these new TV sets is up to five times more expensive, the promise of a superior viewing experience has created considerable demand. As prices fall, analogue TVs are being driven out of the market in industrialised nations.

Environmentally-friendly products
Environmental issues are becoming more of a concern for consumers on a global scale. Climate change caused by global warming has made consumers think about how their actions affect the planet. This in turn means that environmental issues are now influencing consumers’ purchasing decisions when it comes to domestic electrical appliances. However, the influence of environmental concerns on individual consumers varies depending on the economic conditions in a region. The wealthier a region is, the more likely it is that consumers will make purchasing decisions based on the environmental efficiency of an appliance.

Increased competition and consolidation
Over the past two years, many markets around the world have experienced a steady decline in LCD and plasma TV prices owing to increased competition among the major players. This price decline has been exacerbated by a rush of new competitors entering the market, many of which are from China, Taiwan and Korea. These low-cost Asian suppliers are not only providing their own branded products, but also supplying major global retailers with competitively-priced private-label TVs.

74 Euromonitor (2008a)
Rising research and development costs are a major issue for many consumer electronics makers, particularly as price wars have forced companies to operate on limited margins. This has resulted in a growing number of joint-development and joint-production agreements between companies in order to lower costs. These types of strategic alliances are particularly evident in the television field given the significant expense of manufacturing liquid crystal displays. A good example of this is the existing joint venture between Netherlands-based Philips and LG of South Korea.

4.2.2 Overview and development: Turkish consumer electronics sector

Development

The Turkish consumer electronics industry has its origins at the end of 1950s. In 1959, the first washing machines were produced. In the 1960s, TV production started, based on the assembly of imported components. Demand for TVs increased with the start of colour television broadcasting in 1982, and the expansion of the broadcast area further fuelled growth. Private channels began to develop in the 1990s, increasing demand for colour TV receivers at the expense of demand for video players, which had been popular in the 1980s. Consequently, production of consumer electronics has grown impressively since the late 1980s. Exports of both white goods and TVs increased steadily in the second half of the 1990s, and then exploded after 2000.

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>White goods</td>
<td>986</td>
<td>970</td>
<td>1'274</td>
<td>1'385</td>
<td>1'764</td>
<td>2'002</td>
<td>2'832</td>
<td>4'382</td>
<td>6'012</td>
<td>7'211</td>
<td>7'383</td>
</tr>
<tr>
<td>TV</td>
<td>980</td>
<td>1'204</td>
<td>2'658</td>
<td>4'939</td>
<td>5'619</td>
<td>7'163</td>
<td>7'155</td>
<td>11'452</td>
<td>13'558</td>
<td>17'829</td>
<td>16'416</td>
</tr>
</tbody>
</table>

Exhibit 73: Turkish TV and white goods exports in 1000 units 1995-2005

At the end of 2004, Turkey became Europe’s largest manufacturer of TVs and the third largest manufacturer of white goods. Later, white goods continued to grow but the TV sector encountered problems with the transition to digital TVs. Turkish companies lost market share, and some had major financial difficulties. As of 2008, a certain stabilisation had taken place.

75 Sanir (2007)
Until 2002, the domestic market was more important for white goods (deducting export units from total production). However, since 2002, exports have been the source of production growth. For TVs this was the case much earlier as high export volumes had already been reached by the end of the 1990s.

Turkey is a small market, with only 2% of total world sales in TVs and white goods. In value terms, the percentage is even lower as the average unit price is low in Turkey. In export units we see that Turkey has a 2% share in white goods and a 7% market share in TVs. However, currently the white goods share is increasing, while the TV share is falling.

**Companies**

The main Turkish consumer electronics companies are Arcelik-Beko (Koc Group), Vestel (Zorlu Group) and Profilo-Telra. Arcelik is the leader in the white goods segment and its brand Beko is the second in brown goods. Vestel, on the other hand, is the leader of the brown segment and number three in white goods. There is a

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76 Turkish Electronics Association – TESID (2008) and Association of Turkish Household Appliance Industrialists – TURKBESD (2007)
77 Euromonitor (2008b)
duopoly of Arcelik and Vestel in Turkey. In white goods, a number of foreign companies have domestic operations in Turkey, the largest being BSH, a joint venture between Siemens and Bosch.

Recently, there has been a shake-up in the brown goods segment, which bankrupted the number three Profilo-Telra and ended Beko’s independence as a company. Arcelik, the parent company, completely took over Beko. Vestel has also been hit hard but managed to survive owing to its more diversified structure. White goods companies, on the other hand, have continued to grow and have shown no signs of problems.

**Customers**
For both segments Europe is the main export market. Turkish companies either sell under their own brand names directly to retailers in Europe, or produce for other brands. This production is either for so-called B-brands, which are the own brands of retailers, or for A-brands, which are premium brands that have outsourced production. A-brand business is less volatile and has higher margins than production for B-brands. Recently, Turkish companies started selling goods to Russia and neighbouring countries to the east. Some Turkish companies also set up production units in Russia. Sales to these countries are mainly under own brands and the margins are higher than production for A-brands.

**Suppliers**
The supply chain structures for white goods and brown goods differ significantly. Brown goods manufacturers need to import most of the parts from East Asia or Eastern Europe as there is no production in Turkey. Only plastic parts are produced domestically. White goods producers, on the other hand, can source most of the parts domestically. There are more than 500 white goods supplier firms in Turkey. These companies also export directly to other European producers.

**4.2.3 Turkey’s competitive position and the impact of the customs union with the EU**
There are significant differences in the competitive position of the two subsectors. The white goods sector has a well-developed local supplier base in Turkey. In
contrast, brown goods manufacturers need to import all components from the Far East. Owing to this structure, the margins of brown goods manufacturers are very low and they are dependent on their East Asian suppliers. In terms of technology, white goods manufacturers have closed the gap with their international peers since the technology development cycle of the industry has been slow. This contrasts with the trend for the brown goods subsector, where the leading international companies have made enormous investments in technology, thereby making direct competition very difficult.

Another important factor is that Turkish white goods have a competitive advantage over Far Eastern competition owing to the size of the products. For the main export market, Europe, it is currently very costly to ship white goods from the Far East. As long as freight costs remain at a similar level, Turkish white goods have an advantage. As brown goods are smaller and lighter, the freight costs are less significant, and the Far Eastern competition is greater.

Against European competition, one significant advantage enjoyed by Turkish producers is their high labour productivity. For instance, the relative labour productivity of the TV/radio receivers sector shows that the level of productivity in Turkey clearly exceeds that in East European countries and Spain. Moreover, Turkish productivity is at the same level as that in developed countries like Germany, and higher than productivity in Korea and Singapore. According to Taymaz and Yilmaz (2008), these results reflect the outstanding productivity growth performance of the Turkish consumer electronics industries in the second half of the 1990s.

In terms of wages, relative wages in the Turkish TV sector are higher than those in Eastern Europe and less developed countries, but substantially lower than in Western European EU countries and Korea. However, in combination with high productivity levels, the unit labour cost in Turkey is lower than in all European countries. Only a few less developed countries, such as Mexico, India and Indonesia (and China), have lower unit labour costs owing to their low wage levels. This enabled Turkish TV producers to rapidly increase their exports to the EU in the second half of the 1990s and early 2000s (Taymaz and Yilmaz, 2008).
Another advantage in terms of competition against Far East producers is Turkey’s production flexibility advantage. Owing to their geographical proximity, Turkish producers can react much faster to the demands of their European customers. The delivery time to Europe is 1-2 weeks for Turkish companies, but 1.5-2 months for Chinese producers (Karabati and Tan, 2005). Moreover, Turkish companies are more flexible in terms of the production of low-volume orders.

**Impact of the EU customs union on Chinese competition**

In 1996, Turkey entered a customs union with the European Union. Turkish industrial products have been exempt from import duties to the EU from the early 1970s onwards. Therefore, the customs union did not offer additional benefits in this area. However, the harmonisation of all trade policy measures including legislation had a positive impact on trade. Moreover, being part of the customs union and following all European trade-related legislation gave Turkish companies a competitive advantage over non-European producers.

One good example is the difficulties that Chinese white goods producers recently faced. According to Dan (2008), “The main factors affecting China’s exports to the EU are not tariffs but other trade barriers – technical, environmental and Intellectual Property (IP) barriers. Between January 2003 and September 2005 the EU issued or revised 490 directives, 107 of which were on environmental issues. Standards and regulations affecting the white goods sector, such as the directives on Waste Electronic and Electrical Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and Eco-Design of Energy-Using Products (EuP), have directly impacted on China’s white goods exports to the EU. Exports started to fall after the publication of the WEEE and RoHS directives in 2003. RoHS sets more stringent requirements for the materials, components and design of white goods on EU markets, forcing a number of small and medium manufacturers to pull out of the European market and increasing costs for Chinese firms” (p. 10).

Although not aimed at the Chinese, these directives have had a very negative impact on their sales. Turkish authorities, on the other hand, had complied with these standards much earlier and were therefore ready for the transition.
In the TV market, Turkish producers profited more from the EU’s anti-dumping duties against Chinese producers than from the customs union itself. In fact, in the customs union agreement, the EU had reserved the right to levy anti-dumping duties against Turkey. The EU even started such investigations against Turkish firms but decided against imposing sanctions. In 1995, the European Commission imposed 44.6% anti-dumping duties on colour TV receivers originating in China, Malaysia, Korea, Thailand and Singapore. This gave Turkish producers a significant advantage since even when they purchased the colour tube of the TV sets from one of these countries, they would still pay no more than a 24.5% duty when the final set was assembled in Turkey (Taymaz and Yilmaz, 2008).

This anti-dumping duty acted as an infant industry protection mechanism until Turkish producers could increase their efficiency. In Vestel’s CTO Cengiz Ultav’s words:

“In Turkish there is a saying ‘you have to crush a snake’s head when it is small…’ In 2000 (the quote is from 2004), if the additional taxes to Chinese producers had been lifted, it would have been devastating for Vestel. With our current size, sourcing power, flexibility, quick response and point delivery capabilities, we have made the European market a very difficult place to compete for other manufacturers; no Chinese manufacturer can compete with us in the European market…” (Karabati and Tan, 2005, p. 7).
4.3 Case study unit: Vestel Electronics

4.3.1 Introduction and background 

Vestel Electronics, located in Manisa, Turkey, is Europe’s biggest supplier of TV sets. In 2006, it had a 28% share of the European TV market. Its main products include DVD recorders, satellite receivers and notebook computers. Vestel is also one of Europe’s biggest white goods manufacturers, producing washing machines, refrigerators, dishwashers, air conditioners and cookers. In this segment it has an 11% market share of the European market.

The brand name ‘Vestel’ is not exactly a household name in Europe. This is due to the fact that Vestel manufactures TVs and white goods mostly for other companies such as Toshiba, Sharp and JVC which label them under their own names. Moreover, if Vestel sells directly, it sells under different brand names such as SEG in Germany and Teletech in Britain (Kuser, 2006). Nevertheless, Vestel has started to gain international recognition of late. The Boston Consultancy Group (BCG) included Vestel on its list of ‘new global challengers’, which identified the top 100 companies from developing countries that are changing the world. BCG notes that Vestel is one of the internationally ‘low-profile’ fast followers (Kuser, 2006).

Vestel manufactures its products at three facilities, two located in Turkey and one in Russia. The Russian operations are relatively new and mainly serve the Russian, Ukrainian, Belarusian, Kazakh and other CIS markets.

In 2006, Vestel had net sales worth US $3.6 billion. This puts the company in the list of the top 250 global consumer products companies, ranking 164th in 2006 (Deloitte, 2006). Vestel is an export-driven company, exporting 70% of its production, mainly to Europe. It is also the most important exporter in the Turkish consumer electronics sector. In 2006, Vestel's share of Turkey's TV exports was 60%, and its share of white goods exports was 30%.

Vestel Electronics has been quoted on the Istanbul stock exchange since 1990, and its white goods arm was quoted as a separate entity in 2006.

78 Vestel (2006)
Background

Vestel Electronics belongs to the Zorlu Group of companies. The Zorlu Group is one of the new industrialist families in Turkey. Its story goes back to a small textiles atelier in Denizli province, now an industrial city in the west of Anatolia. In the early 1950s, Zorlu started producing textiles, later moving into TVs and digital products through Vestel. The focus of our case study, Vestel Electronics, was founded in March 1983 as Ferguson Electronics Corporation. A year later, it was acquired by the Polly Peck Group and was renamed Vestel. Following the collapse of the Polly Peck Group, the company was placed in administration and in 1994 was bought by Ahmet Zorlu.

After a decade of growth with Vestel, the Zorlu Group moved into banking, energy and construction and became one of the major conglomerates in the Turkish economy. Along the way, Mr Zorlu also became one of the richest people in Turkey with an estimated net worth of US $1.6 billion (Mavi et al., 2007).

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79 Vestel (2006)
80 Vestel (2006)
Vestel produces a wide range of electronic products. The most important category remains the television sets, with 61% of revenues coming from this segment. In addition to TVs, Vestel produces DVD players, satellite receivers and internet access devices. This segment, which Vestel categorises as ‘digital’, brought in 22% of its revenues in 2006. More recently, the company started producing notebook computers.

Another very important category for Vestel is white goods, which includes refrigerators, dishwashers, cookers and air conditioners. In 2006, this segment contributed 11% of total revenues. However, the net profit contribution of this segment was higher owing to the better margins.

In addition to these core businesses, Vestel entered a number of new fields. These include healthcare software, fuel cell research and defence electronics systems. Overall, Vestel concentrates its activities on software, electronics and energy, supporting the Zorlu Group’s other activities.

**Supply chain**
The components of TV sets are produced mainly in East Asia. Turkey has no component industry of its own, and all the parts that Vestel uses for a TV set are

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81 Vestel (2006)
imported and shipped from Asia to Turkey. Consequently, Vestel is mainly an assembly company that brings together the parts it purchases in the market and then ships the product to European end-customers. One result is that the added value from production is rather low for Vestel, and so ultimately the profit potential is limited.

The white goods supply chain is, however, quite different to that of TVs. The component production is much more localised, with Turkey being one of the leading countries in this sphere. Vestel is able to source most of the parts locally. This increases the profit margins and decreases competitive threats. Moreover, Turkey has built considerable R&D know-how in this area through the market leader Arcelik.

**Customers**

Vestel is a so-called OEM and ODM. An Original Equipment Manufacturer (OEM) is one that produces for another company precisely according to its specifications, whereas an Original Design Manufacturer (ODM) is one that manufactures according to its own design capabilities. Vestel works as both OEM and ODM, having developed design capabilities in the past decade.

We can group Vestel’s customers into three main categories: the A-brands, the B-brands and the end-consumer market. The A-brands are the premium brands in the electronics industry. In this category, Vestel works for companies like Toshiba, Sharp, Sanyo, Hitachi and JVC. Vestel produces electronics devices for these companies for the European market. It also takes over the whole process from production to logistics, delivering the products to the end-consumer. For this segment, the quality and the stability of partnerships are important factors as they decrease short-term competitive threats and increase margins.

The B-brands are the retailers or mail order companies like Carrefour or Aldi. Vestel produces for these companies’ own brands. The bulk of Vestel’s production comes from this segment. This is a highly-competitive, volume-intensive business, and margins are very low.

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82 An exception used to be the TV tubes for the CRT TV sets, which were produced in Eastern Europe.
Vestel also sells its products in the end-consumer market under its own brands. The end-user markets of Europe, Turkey and neighbouring countries are target markets. In Europe, Vestel mostly uses the SEG brand in Germany and Teletech in UK. In 2006, it purchased the brands Finlux and Luxor for the Nordic markets. In Turkey and neighbouring countries, it uses its own brand name. Indeed, Vestel is a very strong brand in Turkey, and has a good market position.

However, around 80% of Vestel’s production is for the export market and, of that, a high percentage is for B-brands. This makes Vestel dependent on the highly-competitive European retail market.

4.3.2 Competitive analysis and role of innovation

Vestel’s competitive advantages
Vestel’s most important competitive advantage against Far Eastern competition is Turkey’s customs union agreement with the European Union, which allows Vestel to export tariff-free to EU countries (Harris, 2006). In order to enjoy this tariff-free access, however, Vestel has to source TV picture tubes within the EU. It was able to import these tubes from factories located in Eastern Europe, and to purchase the other components from East Asia. The 14% tariff protection provided Vestel with a clear relative advantage against Asian imports.

The emergence of LCD TVs changed this situation in the beginning as there were no LCD TV producers in Europe. In order not to pay the tariff, Vestel responded by producing all the elements of LCD panels except the glass cell in Turkey. This enabled Vestel to make its LCD TVs qualify as ‘Manufactured in Turkey’, since a greater percentage of the displays were ‘Europeanised’, and this qualified the TVs for customs duty exemptions. Consequently, Vestel acquired the ability to sell duty-free LCD TVs in Europe, as was the case with the older CRT TVs before (Vestel, 2006). For white goods, the tariff protection has been much less of an advantage since the tariff is only around 6-8% (Harris, 2006).
Another advantage of the home country is its location. The proximity of Turkey to the European market offers important logistical advantages and allows Vestel to satisfy customers’ needs faster. In the white goods business, proximity is a significant advantage owing to the large size and weight of the products, which make them unprofitable to ship over large distances.

Vestel’s third strength comes from its manufacturing capabilities. Vestel prides itself on being the world’s most flexible manufacturer of consumer electronics. The company has the ability to tailor its mass production activities on an individual order basis. According to Dr Seref Hamarat, the VP in charge of manufacturing, Vestel will not be highly affected by Chinese rivals, at least not in the near future, as its Chinese competitors are not as effective at producing customised TV sets and not as flexible about production volumes. Vestel’s flexible manufacturing system can accept orders as small as one full 20ft container or 100 TV sets (Karabati and Tan, 2005). Currently, Asian competitors do not have the production and design flexibility to meet the highly-segmented requirements of European customers since they generally offer a limited number of models through a small number of distribution channels in Europe (Yüksel, 2006).

As one of the top three assemblers of televisions with a growing production in white goods, Vestel also enjoys economies-of-scale benefits. This brings important advantages when it procures the components that are the prime determinants of cost in the manufacture of brown and white goods.

**Threats to Vestel’s business model**
The most significant threat to the Vestel business model comes from Chinese competition. As Merrill Lynch analyst Michael Harris (2006) summarises, “Beyond the lower cost base (with manufacturing wages less than 1/3 those in Turkey), numerous Chinese producers now enjoy comparable scale to Vestel’s 10mn units of production. Further, the Chinese supply chain for TV producers has become more highly localised than in Turkey. Indeed for the picture tube/screen which is the most costly input, the Chinese producers are supplied locally by China based Japanese subsidiaries or regionally in the case of flat screens. Vestel by contrast must import
all its picture tubes from Europe (and most flat screens from Asia) as there are no Turkish picture tube suppliers” (p. 6). The Chinese threat is also strong since such a high percentage of Vestel sales comes from products manufactured for B-brands. These companies focus solely on price and are very quick to change suppliers. Work with A-brands tends to be more stable in the medium term.

Currently, Vestel is protected from Chinese competition by EU import tariffs. However, it is possible that the tariffs might disappear, exposing Vestel to direct competition. For instance, if there were no European producers left to protect, the EU might decide to eliminate the tariff. Since Turkey is not a member of the EU, it would not be able to prevent this. Currently, however, there is still significant production in Eastern Europe by Western European companies, which lobby for the import tariff. This situation applies only to Vestel’s TV segments as white goods production would be able to compete against Chinese producers even without the help of tariff protection.

Another weakness is the currency risk that Vestel’s operations carry. In the past, the sustained appreciation of the Turkish lira hurt Vestel’s margins. The appreciation of the Turkish Lira decreased the value of receivables denominated in foreign currency, which resulted in lower profit margins. This problem increased as the unit prices of LCD TVs also fell at the same time. In other words, Vestel first invested in production when prices were high, but by the time it could sell the end-product, prices had fallen.

As one of the main producers of the old-generation CRT TVs, Vestel is also vulnerable to the transition to LCD TVs. The production facilities for CRT TVs are becoming increasingly obsolete. The fact that Vestel has no strong brand presence also hurts the company in the new LCD segment. When a new technology is introduced, strong brands tend to profit first. This is because of the fact that early adopters are very sensitive to technological differences, design and, accordingly, brand (Harris, 2006).

Vestel is also vulnerable owing to its low profitability, which decreases its investment possibilities and ability to cope with crisis. As Cenk Orcan, co-head of research for HSBC in Istanbul, puts it, “Vestel has been growing its top line well, but it works on
extremely low margins, as is true with all consumer electronics producers. What’s more, an oversupply of flat-panel TVs this year and brutal competition in conventional TVs is forcing down prices and exerting additional pressure on margins” (Kuser, 2006, p. 1).

Owing to these threats at the end of 2007, the rating agency Moody’s downgraded Vestel’s debt with the following explanation: "Firstly, Moody’s recognizes the continued deterioration in the company's margins, which is largely due to increasing competition, market saturation for CRT TVs, the fact that LCD TV prices are still showing a declining trend although they are starting to stabilise, and negative foreign exchange movements, which continued throughout the first half of 2007. The outlook change also reflects the negative impact of lower production volumes on profitability and ultimately on the company’s cash flows and the expectation of continued weakness in domestic demand for TVs. With the decline in demand for CRT TVs unlikely to be fully offset by a similar increase in LCD TV sales in the short to medium term” (Kayral and Staples, 2007, p. 1).

As seen in this section, Vestel’s success is far from ensured. Chinese competition, low margins and currency movements make the company vulnerable. The next section investigates whether learning and innovation play a major role in Vestel's strategy.

**Vestel’s strategy and the role of innovation**

In 2004, according to the CEO of Vestel, Ömer Yüngül, Vestel’s competitive strategy was as follows “Europe will remain as the major target market. New markets in Turkey’s south and east will be explored to achieve diversification of markets...The share of A-brands in the overall product portfolio will be increased. More emphasis will be placed on original design manufacturing (ODM) and related services. Research and development investments will be increased...The share of Japanese customers in the total sales will increase from 19% to 25%-30%...The growth in the export sales are expected to be in TVs, refrigerators, and digital product areas,” (Karabati and Tan, 2005, p. 5).
In 2005, Vestel promoted Levent Hatay, who had been responsible for the domestic marketing organisation, to lead brand development in Russia, the CIS and the Middle East. Mr Hatay has been one of the most successful executives in Vestel; therefore, his position seems to reflect the importance of this new strategy.

Vestel has recognised that its dependency on production for B-brands is not a sustainable strategy. Therefore, the company is focusing on developing its brand in a carefully selected region. The challenges of developing an international brand are high even if Vestel tries to minimise them by concentrating on neighbouring countries. Brand development is an area of expertise that is very different to manufacturing. So far, Vestel has done a good job in Turkey in establishing its brand. It has made clever use of nationalistic sentiment in Turkey by advertising its sizable exports and new product innovations. It even created the slogan ‘Technology in Turkish’, positioning Vestel as an innovator that makes Turkish people proud.

However, this success will not be easy to transfer to other markets. Vestel will not be able to play the nationalistic card in other countries, and will also have difficulties in maintaining an innovative image. After all, it will be competing head-to-head with Japanese and South Korean brands. Vestel’s R&D budget is just a fraction of those brands’ budgets, making it very difficult for the company to establish and maintain an innovative image. Therefore, Vestel will need to continue to learn and develop itself if it wants to succeed in this expansion policy. The existing capabilities will not be sufficient.

4.3.3 Development of Vestel Electronics

When Mr Zorlu bought Vestel in 1994, the company was a white-label manufacturer for European B-brands. Its production volume was 360,000 units per year and it had exports worth US $60 million. In 2006, the company achieved 20 million annual production and over US $2 billion worth of exports.

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>1'416</td>
<td>2'247</td>
<td>3'296</td>
<td>3'321</td>
<td>3'659</td>
<td>3'558</td>
</tr>
<tr>
<td>Net profit</td>
<td>25</td>
<td>50</td>
<td>62</td>
<td>62</td>
<td>2</td>
<td>14</td>
</tr>
</tbody>
</table>

Exhibit 78: Sales and profit (in million dollars)

83 Vestel (2006)
From the table, we can see that profit increased in parallel with sales, reaching a peak in 2005.

**Overview of the development of Vestel**

Exhibit 79: Overview of the development of Vestel 85

Vestel has followed an expansion path along three dimensions: products, markets and technology. The diagram shows that Vestel diversified on the product side by selling different product categories such as white goods and notebook computers. On the customer side, it started with retailers first, then moved into production for premium brands and its own brand. On the market side, it started with Europe and then the region surrounding Turkey, and it has recently moved into markets further afield.

---

84 Vestel (2007)
85 Adapted from Vestel’s growth strategy according to Vestel CTO Cengiz Ultav (Karabat and Tan, 2005, p. 5).
During the past decade, Vestel started with a TV-focused portfolio, then moved into digital products such as DVD players, and later entered the white goods market. This decreased its dependence on the TV market. In the coming years we can expect this trend to continue, with growth in the digital segment through notebook sales, and with increased white goods production.

Since 1994, Vestel has focused mainly on exports, and its main market has been Western Europe. Only later did Vestel start to place importance on the domestic market, and then on other markets in the Turkish time zone. As seen in the table above, whereas Western European international sales dropped significantly in 2007, Russian and CIS sales more than doubled. Turkish domestic sales were not impacted, and continued to grow. This proves the advantage of having a geographically-diversified portfolio.

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86 Figures until 2003 are cited from a presentation “A case for global competition” by Cengiz Ultav, Vestel Group Member of Executive Committee (Ultav, 2004). Figures after 2003 are from Vestel Annual Reports (2006, 2007)
87 Turkish Stock Exchange (2008)
88 Vestel (2007)
The figure above roughly illustrates Vestel’s expansion path. While not completely accurate (as the phases do overlap in certain cases), it shows that after 1995 Vestel started focusing on Europe first, and then expanded to geographically close regions. Currently, Vestel is a regional player but the company has started exporting to other regions.

Technology: Vestel’s innovation phases

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<tbody>
<tr>
<td>Technology</td>
<td>Basic application</td>
<td>OEM</td>
<td>ODM</td>
<td>ODM</td>
<td>OBM</td>
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<tr>
<td></td>
<td>/assembly</td>
<td>process development</td>
<td>own design capabilities</td>
<td>own tech development</td>
<td>product R&amp;D</td>
</tr>
</tbody>
</table>

In the first development phase, 1994-1997, Vestel focused on production and application engineering. Vestel’s management discovered that in order to compete with Chinese producers, it had to become much more flexible than them. It had to satisfy the diverse wishes of its customers. Consequently, the company started producing up to 1,000 different models at the same time, while the Chinese produced an average of 30-40. This enabled Vestel to increase its customer base significantly. Cengiz Ultv, the CTO of the Vestel Group, explains, “In the first phase of development between 1994 and 1997 our main focus was on CRT televisions. We used application engineering to implement technology and targeted the B-segment of the market” (Karabati and Tan, 2005, p. 5).

In the second development phase, 1997-2000, Vestel began investments in development engineering and also established its first R&D unit in California’s Silicon Valley.
Valley. During this period, Vestel started licensed production, developed smaller companies and brought in foreign scientists. The company started to follow market trends closely and tried to increase the efficiency and effectiveness of its manufacturing operations. On the consumer side, Vestel began manufacturing products for A-brand manufacturers such as Mitsubishi, Hitachi and JVC. This was made possible by its investment in manufacturing capabilities (Cengiz Ultav, personal interview, 2006).

### R&D unit development

<table>
<thead>
<tr>
<th>Year</th>
<th>Vestel USA mainly benchmarking</th>
<th>White Goods Manisa development</th>
<th>Cabot UK digital products software</th>
<th>Urla Izmir High Technology Institute digital software</th>
<th>Vestek Istanbul in ITU University campus digital TV image enhancement</th>
<th>Taiwan benchmarking notebook</th>
<th>Vestel Digital R&amp;D Manisa notebook development</th>
</tr>
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<tbody>
<tr>
<td>1998</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1999</td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>2001</td>
<td></td>
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<tr>
<td>2004</td>
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<td>2006</td>
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</table>

Exhibit 85: Vestel R&D units opened per year

In the third phase, 2000-2006, Vestel began to develop its own technology by setting up its own R&D units. In 2001, it purchased Cabot Communications, a digital set-up box software company, and it later opened a Turkish unit in the same area. In 2005, it opened a TV image software enhancement unit at the Istanbul Technical University (ITU) university campus in Istanbul. This period also saw the first Vestel patents being registered, first in white goods and later in software.

In the fourth phase, from 2006 onwards, research has become much more important for Vestel. Software research especially has become very important as the new LCD technology has opened up many new possibilities for development. In 2007 and also in the first half of 2008, Vestel registered significantly more patents than ever before.

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</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D expenses as % of sales</td>
<td>0.99%</td>
<td>0.94%</td>
<td>0.20%</td>
<td>0.24%</td>
<td>0.46%</td>
<td>0.71%</td>
<td>0.85%</td>
<td>1.1%</td>
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Exhibit 86: Vestel’s R&D expenditure as percentage of sales, 1995-2006

91 Author’s illustration
As can be seen, after the peak in R&D spending resulting from its entry into the export market under a new strategy, Vestel decreased its spending. After 2000, R&D spending picked up again, especially after the transition to digital technology gained pace.

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<tbody>
<tr>
<td>Total patents</td>
<td>19</td>
<td>30</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>5</td>
<td>18</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Brown</td>
<td>14</td>
<td>10</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Defence</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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Exhibit 87: Vestel’s patent application development, 2008 until July

Increased R&D spending after 2002 has also resulted in increased patent applications. Until 2006, most of the patents were in the white goods segment; however, TV and other communication equipment patents have recently surpassed those in the white goods segment.

4.3.4 Organisational learning at Vestel

This section provides a closer look at Vestel, in order to examine its learning capability.

4.3.4.1 Introduction

Factors that impact organisational learning capability

In order to assess Vestel’s learning capability, this section focuses on the factors that impact organisational learning. For this purpose, we use the framework developed by Jerez-Gomez et al., (2005).

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The following areas are investigated:

1. management commitment to learning
2. systems perspective
3. openness and experimentation
4. knowledge transfer and integration

4.3.4.2 Management commitment to learning

Findings: management’s attitude towards change
An interview with the chairman of Vestel, Ahmet Zorlu⁹⁴, reveals certain characteristics of top management’s attitude. When asked what exactly is the ‘best’ he aims to achieve, he answers “The best is not an end; it is a race which we have to run at the top and never get left behind,” (Capital, 2004). In another interview, he says:

“Good is the biggest enemy of perfect…the biggest strength of our group is that we can decide and act fast. Actually, we are probably the fastest acting company in the world…Our model changes all the time, if change is necessary it will happen. We always make changes in our companies, and train new people to climb up the career ladders…” (Haber, 2004).

This presents the picture of a person and company very comfortable with change and continuous improvement. Other interviews support this impression. The VP for marketing at the domestic marketing organisation, Arif Sankul, explains that management is continuously in search of new ideas and projects:

“Vestel’s speed comes from this attitude. There are no committees and instead there is active execution”. (Arif Sankul, personal interview, 2006).

⁹⁴ The founder of the Zorlu Group which owns Vestel.
The rationale for Vestel’s interest in new ideas and projects is explained as follows:

“Most of the growth of the company comes from new products; thus, there is a great interest in new ideas”
(Arif Sankul, personal interview, 2006).

Overall, interview partners rated the company highly in terms of the management’s attitude towards change (highest or second highest grade).

**Findings: employee learning investment**

During its early stages of development, Vestel’s employee learning investment was mainly in R&D personnel, focusing on technology adaptation. Company-wide learning initiatives started in 1999 under the leadership of the CEO of the time (Arif Sankul, personal interview, 2006). However, it was not until 2006 that the local marketing organisation established a structured education programme for the company. Up to that point, all training was on the job. It was in 2006 that we first see the topic of employee education mentioned in Vestel’s annual review (Funda Inal, personal interview, 2006).

According to the 2007 Vestel annual report, in the period August 2006 to December 2007, Vestel Group employees received an average 16 hours of training. Training has been in technical and corporate development as well as management. A total of 1,512 employees took at least one training course. According to Vestel’s human resources manager, Funda Inal, the domestic marketing organisation’s yearly training expenditure is about 150-400 YTL per person per year. This training comprises 80 hours in total, with 5 sessions. The target is that all white-collar employees receive 1-5 training courses per year.

“It was during the last three to four years that Vestel started using professional human resources practices. For instance, Vestel started regular appraisal reviews with employees and introduced career planning” (Metin Nil, personal interview, 2008).
At the end of 2005, Vestel started a talent development programme which is structured as a joint Master’s course with Bilkent University. The programme is called “Vestel Human Power” and its initial enrolment comprised 25 promising employees. The objective of the programme is to produce trained 250 employees within 10 years who will constitute the future management team and have a shared ‘Vestel’ culture (Zorlu Dergisi, 2006). In April 2006, Vestel also started a programme called ‘Vestel Management Power’. This programme targets existing management and is also a joint project with Bilkent University. According to Necmi Kavusturan, who is responsible for human resources development for the whole Zorlu Group: “With this project we would like to show our employees that we value them and that we are investing in them. We also want to show that we are thinking long-term” (Bilkent University, 2008).

On the R&D side, Vestel offers R&D and production personnel the possibility of continuing their Master’s or Doctoral studies. According to Mr Ultav, Vestel’s CTO, in 2006 they had 4 doctoral and 10 master students. Mr Ultav also mentions the difficulties in getting qualified software engineers:

“Unfortunately we do not have access to enough software engineers and need to import from India” (Cengiz Ultav, personal interview, 2006).

Overall, interview partners rated the company highly on employee learning investments (highest or second highest grade). (Note that the interviews were conducted in 2006, before the start of the new training activities.)

**Findings: staff involvement**

With regard to staff involvement, there are differences in perception according to the position of the employee. Both the CTO of Vestel and the VP for marketing for the domestic organisation rated staff involvement as very high. According to the CTO:

“There is very high empowerment in Vestel” (Cengiz Ultav, personal interview, 2006).
According to the VP for marketing for the domestic organisation:

“Product management has very high responsibility. They work as entrepreneurs with a ‘businessman’ approach” (Arif Sankul, personal interview, 2006).

On the other hand, the interviewed product manager rated the company below average for staff involvement, showing that there are differences in perception according to the position (Ceyda Ertek, personal interview, 2006).

With regard to staff involvement, all interview partners rated the company highly (highest or second highest grade,) but did not mention any formal mechanism.

**Findings: innovation rewards**

In terms of innovation rewards, there are no formal rewards for the marketing organisation. However, the fact that there is 35% variable pay shows that there are enough incentives to innovate.

“The CEO has even direct contact with product managers, making bringing forward new ideas possible. Even sales personnel get 25% bonus from new ideas. For marketing, this is even 45%. For the whole company, 50% of the sales come from new products” (Arif Sankul, personal interview, 2006).

Although all interview partners rated Vestel high on innovation rewards, the lack of formal incentives show there is more potential in this area.

“For innovation rewards we could make more daring experiments” (Cengiz Ultav, personal interview, 2006).

**4.3.4.3 Systems perspective**

According to the company’s chairman Mr Zorlu, Vestel’s goal is “to be a player that shapes markets not just in our own country Turkey but in the global arena” and “the
vision is no longer just ‘digital’ but the ‘advanced digital home’. The advanced digital home will not be limited to products in which information, communication, and consumer technologies have converged but will go far beyond that with products and services in the areas of health, assisted living, and alternative energy sources” (Vestel, 2006, p. 18).

Vestel’s executives are very open about their plans and strategies and publicly share this information through interviews with the press.

Exhibit 88: Press excerpts of Vestel executives sharing their strategies

In addition, all Vestel employees, including the factory-floor workers, receive a copy of the Zorlu magazine (Ayaz, 2006).

Exhibit 89: Photo of Zorlu Group company magazine

Vestel’s organisational structure consists of only three levels, making it a very flat company. According to the company chairman, Mr Zorlu, “the concept of centralisation has lost its importance; our system is more decentralised and bottom up.” (Capital, 2004).

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95 Vestel (2006)
Exhibit 90: Vestel’s organisational structure

This organisational structure is valued by many employees and is one of the components of its success. “There is an entrepreneur, businessman approach in the firm; there is active execution and high empowerment (Arif Sankul, personal interview, 2008).

When explaining what the Vestel brand means to him, Mr Hatay, who is responsible for the brand, mentions how fast-paced and dynamic Vestel is. He specifically mentions how there are no “hierarchies” in Vestel (Capital, 2006).

Overall, interview partners rated the company highly on this point (highest or second highest grade).

4.3.4.4 Openness and experimentation

Vestel is very engaged in experimentation and has recently increased its R&D efforts to develop new technologies. According to Vestel White Goods CEO, Nedim Sezer, “Today, competition is on new technology development…We conduct a wide area of research and development activities and in order to protect the result of our work we apply for patents” (Vestel, 2008a). Vestel’s CTO commented, “Hierarchically, Vestel’s R&D director was the second-highest ranking executive of the firm, representing the high importance attached to this topic” (Cengiz Ultav, personal interview, 2006).

It is also possible to discern a very open communication policy in Vestel. In sharing information for the purposes of this dissertation, Vestel was much more open than the other case study company. Recently, the readiness to share knowledge seems to have increased.

96 Ultav (2004)
“The attitude of employees (R&D) towards sharing information has changed over time. In the past, employees have been insecure in their jobs and were afraid that sharing their knowledge would make them disposable. After the company grew and became more institutionalised, this fear decreased. Moreover, Turkey’s improving economy also increased the confidence of employees. As a result, a more open communication and knowledge sharing approach are currently visible” (Metin Nil, personal interview, 2008)

Mr Sankul also describes Vestel as open for knowledge sharing: “the management’s door is always open, even that of the CEO”.

Overall, interview partners rated the company highly on all accounts except “experiences and ideas from external sources such as advisors, customers, training firms.”

4.3.4.5 Knowledge transfer and integration

Findings: tolerance of failure, teamwork and socialisation
According to marketing VP Arif Sankul, there is high tolerance of failure in Vestel.

“We encourage employees to take risks. We have a ‘try and make mistakes’ culture” (Arif Sankul, personal interview, 2008).

Mr Sankul thinks that there exists a certain reservation in Turkish culture that does not allow everyone to communicate openly. The interviews showed that Vestel employees see themselves as engaged in teamwork. This was also true for those in non-management positions.

Findings: knowledge-sharing instruments
In a company of Vestel’s size, it is important that there are tools and processes that allow individual knowledge to be accessed collectively. For instance, when an employee leaves the company, his knowledge should not just disappear with him. It is on this account that Vestel’s domestic sales force are issued with notebook
computers to gather insights, and the data are centrally kept. A data warehouse includes all competitive information. However, beyond this, Vestel seems to be weak in knowledge-sharing instruments. In response to the question of whether the firm has instruments that allow what has been learnt in past situations to be kept, all interview partners gave the lowest grade.

4.3.5 Innovation indicators

In the case study, learning capability survey data are complemented by innovation indicators that are used in the innovation system research stream.

The following areas are assessed:

1. new technologies, business areas and markets
   a. transition to LCD technology
   b. environmentally-friendly products
   c. new businesses
   d. new markets entered
2. R&D investments
3. patents and patented products and product awards
4. benchmarking and cooperation

4.3.5.1 New technologies, business areas and markets

Currently, there are two important trends shaping the consumer electronics industry. On the brown goods side, there is the shift from analogue to digital, with the transition from traditional CTVs to digital LCD technology TVs having the most significant impact. On the white goods side, the most important trend is the focus on environmentally-friendly, energy-saving products.

This section assesses Vestel’s adaptation of these two technologies.

Transition to LCD technology

The TV market has been going through rapid transition in recent years. Sales of LCD TVs have increased rapidly whereas those of CRT TVs have decreased significantly. This market trend has poised a serious threat to Vestel since its production and
supply chain was based mainly on traditional TV sets. After a brief period of struggle, the company was able to react to this changing market condition. Early in 2007, it opened an LCD module factory that allowed the integrated production and assembly of all units in a single place. This production allowed Vestel to increase the Turkish value-added to the display, which (according to the company\(^97\)) qualified them for customs-duty exemptions and enabled duty-free LCD TV sales in Europe. We see that Vestel was able to increase its LCD production/sales significantly but not fast enough to compensate for the decline of traditional TVs.

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2006</th>
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<tbody>
<tr>
<td>TV</td>
<td>8.7</td>
<td>10.9</td>
</tr>
<tr>
<td>CTV</td>
<td>5.5</td>
<td>8.7</td>
</tr>
<tr>
<td>LCD</td>
<td>3.3</td>
<td>2.2</td>
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Exhibit 91: Vestel's TV production by technology\(^98\)

Competitors to Vestel, such as the Chinese company TCL, have similar or even bigger problems. TCL had been the world’s largest manufacturer of TVs until transition to LCDs started. Its 2006 TV unit sales stood at 22 million, whereas in 2007 this number had declined to just 15 million units (TCL Electronics, 2007).

If we compare Vestel with a group that consists of TCL, Arcelik and the market leader Samsung, Vestel has fared well and is already one of the largest producers of LCD TVs. However, compared with the LCD market leader Samsung, Vestel has a much lower share with its new technology sales (there is more on this topic in the Summary and Findings section of this dissertation).

Overall, Vestel has been relatively fast to react to changing market conditions but was not able to stay ahead of the changes with LCD technology in the beginning. Like most of the industry, it underestimated the speed of the shift from CRT to LCD TVs.

**Environmentally-friendly products**

Another important trend, which is especially shaping the white goods industry, is consumers’ preference for environmental products. This trend is coupled with the active regulatory practices of European authorities. Until very recently, Vestel has followed these trends from the regulatory or compliance side. In 1998, it obtained the

\(^{97}\) It was not possible to cross-check this claim, which is in the annual report 2007.

\(^{98}\) Vestel (2007)
ISO 14001 Environmental Management System Certificate that focuses on continuous environmental improvement. Vestel has committed itself to undertaking projects to decrease waste, save energy and decrease the use of harmful materials (Vestel, 2007).

In 2005, Vestel produced a number of products that fulfilled the EU’s upcoming environment regulations. The 2005 Vestel annual report mentions that “Vestel White Goods was the first in Europe to produce and offer no-frost models with environment-friendly R600 refrigerant” and “the new oven designs also took into account environment and safety directives (RoHs, WEEE, etc) that were still in draft form at the time and were scheduled to go into effect in 2006 with the result that the products already complied with the directives when they went on the market” (Vestel, 2005).

As can be seen, until very recently Vestel did not consider the environmental trend as an opportunity but, instead, approached it from a compliance angle. For the first time in 2008, Vestel moved beyond compliance, and publicly disclosed its plans to launch environmentally-friendly, low energy-consuming white goods. In comparison, in 2004 Arcelik had already been the recipient of awards for its energy-saving white goods, and it is currently one of the major producers of environmentally-friendly white goods.

**New business areas entered**

After 2000, Vestel started to go beyond its core businesses and began investing in new fields. The most significant investment was its entry into the computer industry in 2006 when it set up Europe’s only notebook computer factory. In order to gain the necessary know–how, Vestel entered into partnership with Intel and was able to commence production within eight months. Vestel’s R&D manager Ihsan Alkim explains the importance of this investment for the company:

> “Notebooks could become more important than TVs. We have the ambition to be one of the leaders in Europe also in this field...Vestel is a very important procurer of electronics. Due to this strength it is possible to purchase notebook components from the same suppliers at very
favourable conditions. This enables us to have the same scale advantages as in TVs” (Haber Express, 2006).

Vestel commenced notebook production in 2006. The company reports that it was able to increase its production three-fold and export revenues ten-fold in 2007 (Vestel, 2007). Figures for sales or export revenues are not available but the total production capacity of the notebook plant stands at 500,000 units. It is realistic to expect that the factory is not yet utilising its full capacity. Therefore, it is too soon to conclude whether or not Vestel has been successful in this business venture.

Another important area in which Vestel has made continuous investments is white goods production. The company began producing refrigerators in 1999, split air conditioners in 2000, washing machines in 2003, cookers in 2005 and dishwashers in early 2007. In 2006, Vestel entered into a long-term strategic business partnership with Whirlpool, the world’s leading maker of home appliances. Whirlpool products are now being sold in Vestel ‘concept stores’ in line with its multi-brand strategy. Moreover, there are plans for Vestel to supply the production of the entire European operations of Whirlpool. This move would make Vestel one of the largest producers of white goods, just as in the TV segment (Whirlpool, 2006).

<table>
<thead>
<tr>
<th>Vestel white goods</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production million units</td>
<td>2.4</td>
<td>3.1</td>
<td>4.3</td>
</tr>
<tr>
<td>Sales million USD</td>
<td>598</td>
<td>783</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 92: Vestel’s white goods sales, 2004-2006

According to the definition of innovation indicators, “sales from products new for the company” covers those for a period of three years. That would mean that most of Vestel’s white goods production would not qualify as new for the company. However, as the research focus is not only on the current situation of the company, but also on its development, white goods can be classified here as new for the company.

Vestel is also investing in a variety of fields that can be considered long-term projects. For instance, in late 2003, Vestel made its first venture into the defence industry through the newly set-up Vestel Defence Industries Inc. In 2005, Vestel

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99 Vestel (2006)
acquired Aydin Yazilim ve Elektronik Sanayi AS, a software and electronics company, in order to support its defence ventures. Vestel also started working on portable battery technology; its R&D work on hydrogen fuel cells began in 2005 and prototype production has been completed. In 2006, Vestel acquired a stake in Birim Bilgi İşlem Afi, a company that produces software for the health services industry.

Another new area for Vestel is convergence products that combine different technologies such as broadband communications, receivers or recorders. “Combining the advantages arising from its flexible production model in consumer electronics and from its ability to produce embedded software for telecommunication applications with the strength in information technologies that it has gained from making laptop computers, Vestel is moving decisively towards its targeted position in convergence products” (Vestel, 2006, p. 17).

**New markets entered**

Vestel’s strategy is not to compete with its customers in the European market but to sell its Vestel-branded products in Turkey and the countries eastwards. Following this strategy, Vestel opened a TV factory in Russia in 2004 and a white goods factory in 2006. Vestel also created a brand development position that focuses on Turkey and countries in the same time zone. Levent Hatay, who had been responsible for the Turkish marketing organisation, became responsible for brand development in these countries. Mr Hatay describes his new job: “I have been responsible for developing the Vestel brand in Turkey. This position included all the sales, marketing operations, as well as brand communication, and public relations activities. In my new job I will do the same activities for these countries” (Capital, 2006).

According to this strategy, Vestel invests in image campaigns and advertising in key markets like Russia. It has also established its own distribution and service channels in countries such as Azerbaijan, Georgia and Iran. The main objective for Vestel is to build significant market share with its own brand in these countries. For instance, in Russia, Vestel’s target remains 20% for both white goods and TV sales. According to Mr Hatay, this target had already been reached for the TV segment in 2006. Vestel was able to increase its sales in Russia and the CIS from US $54 million in 2006 to US $110 million in 2007. Clearly, sales in this region have so far been a big success.
for the company. The fact that sales in this region are under Vestel’s own brand name makes this even more significant.

In 2006, in order to increase its branded product sales, Vestel acquired the rights for Finlux and Luxor; two well-known brands in Scandinavia and Northern Europe.

4.3.5.2 R&D investment
In 2006, Vestel employed a total of 930 engineers (including personnel at defence and health software) in its 11 R&D centres. In the same year, R&D investments amounted to US $40 million, a figure that corresponded to 1.1% of total sales.

Vestel Electronics’ R&D activities in 2006 were carried out in Manisa, in Izmir at Vestelkom and Cabot Izmir, at Vestek in Istanbul, at Cabot UK in Bristol, UK, and at Vestel USA in San Diego, California. Research and development for TV sets takes place at the main production facility in Manisa. In 2006, a total of 275 people were engaged in R&D activities. According to Vestel, one outcome of the success and effectiveness of Vestel R&D efforts is that the company presently controls an 11% share of the European market in LCD products. Another R&D team of 90 specialists works for Vestelkom, focusing on broadcasting and communication technologies. Manisa is also home to Vestel Digital’s R&D activities, which focus on technological developments in the new notebook line of business. The white goods segment also has its own R&D staff. The total number of R&D personnel in 2006 was 130 (Vestel 2006). The success of Vestel’s white goods R&D efforts was acknowledged in 2008 by the Turkish Patent Institute when it awarded Vestel the Patent Award for the second time.

There is also an R&D centre in Istanbul, called ‘Vestek’, which in 2006 employed 52 researchers. The focus of this section is the development of new technologies. The current focus is image processing, image quality enhancement, audio and video data compression and decompression, embedded multimedia systems, and home entertainment network development. The company is also working on energy distribution management software.
According to Vestel’s foreign trade division head Turan Erdogan, “You have to have your own software capabilities, because that’s becoming more important. Engineers are working on everything from on-screen menus to electronic programming guides – capabilities Vestel hopes will give it an edge with consumers” (Kuser, 2006, p. 1).

4.3.5.3 Patents, patented products and product awards

Vestel’s R&D efforts seem to be fruitful, as the newly developed and patented image quality software ‘Pixellence’ shows (Çelebi, 2008). Software development is critical: since most manufacturers use the same hardware, the real difference in image quality is due to software. For instance, Sony has its Bravia engine, LG its XD engine, and Samsung a range of image quality enhancers. According to Vestel White Goods CEO Nedim Sezer:

> “Today, competition is on new technology development...We conduct a wide area of research and development activities and in order to protect the result of our work we apply for patents” (Vestel, 2008a, p. 17).

### Patent development

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<tr>
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</tr>
<tr>
<td>Brown</td>
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<td>3</td>
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<td>3</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Exhibit 93: Vestel’s patent application development, 2008 until July

### Product (design awards)

Vestel’s 2007 annual report mentions various test awards that products manufactured by Vestel received. Most of these awards come from consumer test magazines and focus on image and sound quality. However, these awards are not for the Vestel brand, but its OEM partners. Currently, it is not possible to find an award for a brand owned by Vestel.

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100 European Patent Office Database (2008)
4.3.5.4 Benchmarking and cooperation

Vestel is engaged in knowledge-sourcing activities both in Turkey and on a global scale. Historically, Vestel has been more active internationally. After the basic technology adaptation period in the 1990s, it purchased the UK-based software company Cabot Communications in 2001. By 2006, Cabot was employing a team of more than 100 people in its Bristol and Izmir centres to produce all the software required for digital devices while also selling its output to the world’s major home electronics makers. Another R&D unit is located in the United States in San Diego. Vestel USA’s R&D unit keeps a close watch on developments in world markets and technologies so as to contribute to the competitive advantages of Vestel products. It also coordinates the development of products intended for the North American market (Vestel, 2006).

In 2006, Vestel entered into cooperation with Intel, the key manufacturer of computer processors, to supply the necessary know-how for producing notebook computers. In addition, it set up a subsidiary in Taiwan to follow the developments in the computer market and obtain insights for the notebook division. Also in 2006, Vestel announced that it was cooperating with the BBC on digital recording that enables on-demand television (Radikal, 2006).

Although Vestel has been active internationally, its knowledge-sourcing activities and links with universities at home have been less significant. “The cooperation between the companies and the universities used to be very weak. Actually, we would need both sides to work on making these links stronger” (Zorlu Dergisi, 2006). Interviews with local marketing present the same picture. According to marketing VP Mr Sankul, Vestel’s most important knowledge source is local dealers. They also use Millward Brown for market research and occasionally Turkish consulting companies. Mr Sankul finds university cooperation very weak. Other interviewees also rate the use of external information as being only average.

Recently, however, Vestel started to become much more active with regard to university cooperation. The most important activity is Vestel’s R&D centre ‘Vestek’, located in the ARI techno-city on the Ayazaga campus of Istanbul Technical
University. Vestek’s mission is to “research emerging technologies and trends in consumer electronics in conjunction with its partners in universities and research organisations, and turn this research into applicable results in the form of systems, products, components, and intellectual property that is patented and licensed internationally” (Vestek, 2008). As a result of these efforts, in 2006 Vestek created an image-processing engine, later branded ‘Pixellence’. The content of this engine consists of image enhancement algorithms which were developed by Vestel and are protected by more than 30 patents (Vestel, 2008b). With this, Vestel became one of few companies in the world with in-house image enhancement software development.

4.4 Case study unit: Arcelik

4.4.1 Introduction and background

Arcelik, located in Istanbul, Turkey, is Europe’s third biggest supplier of white goods and second largest TV manufacturing company (2006). Arcelik’s main products are refrigerators, washing machines, dishwashers, dryers and ovens in the white goods segment, and TVs in the electronics segment. These products are sold in 100 countries through its 13 international companies. Arcelik has 10 production facilities located in Turkey, Romania, Russia and China.

80% of Arcelik international sales come from branded products. It has a 10% market share with its own brands in the region that consists of Europe, Russia and Turkey. Arcelik owns a number of international brands, including Beko, Blomberg, and Grundig.

Arcelik dominates the domestic markets with a market share of over 50% in white goods. Moreover, being very much a global company, 48% of its total sales in 2007 came from international markets.

101 If not specifically quoted, the source is Arcelik (2007a).
Ownership
The company’s main shareholder is the Koc Group with a 56.37% stake in the company. Others are Teknosan with a 14.68% stake and Burla Ticaret with a 7.66% stake. The remaining free float stands at 21.29%. The Koc Group is the largest industrial conglomerate in Turkey. In 2007, it had consolidated revenues of US$39.5 billion and US $2.7 billion net operating profit. Its combined revenues constituted 9% of Turkish GDP and its exports constituted 11% of total Turkish exports. It is the only Turkish company in the Fortune Global 500, ranking 190 in 2006 and the only Turkish company in the world’s most admired companies list. In 2007, it employed 85,000 people. Koc Holding operates in four main areas: automotive, consumer durables, finance and energy (Koc Holding, 2008a).

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102 Arcelik (2007a)
4.4.2 Competitive analysis and role of innovation

This section focuses on the strengths and weaknesses of Arcelik compared with its competitors.

**Arcelik’s competitive advantages**

Arcelik has a combination of advantages compared with its global competition, especially in the white goods segment. Against East Asian competition, its biggest advantage is logistics. Arcelik’s main production bases are located around Europe, enabling it to deliver products in a short time and at low delivery cost. As size and weight are determinants of freight costs, they play a significant role for large home appliances like refrigerators or washing machines. Turkey’s location between Europe and the faster-growing East also constitutes a long-term advantage.

Compared to European rivals, Arcelik has the advantage that it manufactures all products in low-cost countries in new facilities. It does not produce in Western Europe. In contrast, its competitors still have considerable amounts of production in higher-cost countries.

Arcelik also has the advantage of size: it matches even the biggest competitor by operating larger plants under one roof, in addition using a smart capacity utilisation model under which it outsources products of low value-added (European Securities Network, 2008). It is the third largest household appliance and second largest TV manufacturer in Europe with 10.3% market share. Often, such cost advantages come with inferior technology. However, in the case of Arcelik there is no gap between it and its competitors in terms of R&D. Arcelik has been able to develop in-house capabilities that match global competition. The number of patents and awards won, as well as the level of spending, all match those of the competition. Another advantage for Arcelik is that it invested in green technology early on, and has received many awards for its energy-efficient machines.

One advantage held by Arcelik is that it dominates a large and fast-growing domestic market. It has the strongest brand name in Turkey. According to a Nielsen research report in 2007, Arcelik was the most recalled brand in Turkey, among all product
categories. In addition, it was also the brand people feel ‘most close to’. Moreover, it has the strongest dealership and service network in the country. Arcelik operates through a unique distribution network of 4,800 dealers in Turkey, with more than 70% of its dealers under an ‘exclusivity’ agreement, which serves as a barricade to incoming chains and minimises the end-client risk. Arcelik is trying to replicate the same strategy in emerging Europe and countries east of Turkey. Currently, it has a total of 300 exclusive dealers in 28 countries (Koc Holding, 2008a). The domestic strength matters since the Turkish market offers higher margins and better growth prospects than Western Europe. Arcelik can use the healthy revenue streams from Turkey to finance its international expansion.

As evidenced, Arcelik has a very solid competitive situation in the white goods segment. The company uses this strength to help its weaker position in the TV business. Arcelik can use its bargaining power with distribution channels to make them sell other products like TVs.

**Threats to Arcelik’s business model**

As mentioned above, one of the main strengths of Arcelik is its strong position in Turkey. Yet this strength also incorporates a possible threat. Turkey is a crisis-prone country, and a long period of instability can have an adverse impact on Arcelik as a high percentage of its sales and even higher percentage of its profits come from Turkey. Nevertheless, as Arcelik increases its international sales, the significance of the threat also decreases.

The second weakness is Arcelik’s position in the TV segment. This segment is large in terms of revenues but has not been profitable. Arcelik does not have the logistics and cost advantages that it enjoys in white goods. It is dependent on East Asian suppliers. Moreover, it cannot compete with the global leaders in technology. The current strategy is to use the channel power from white goods to push its TVs. Moreover, the company is trying to develop Grundig as its premium brand. However, the competition in this segment is fierce and Arcelik is still a white goods producer at heart. Without full commitment by Arcelik and the Koc Group, it is possible that it would need to divest itself of its consumer electronics business in the long run. The
Koc Group is active in much more profitable segments such as energy and finance, and therefore it does not seem likely that it would invest large amounts in a risky and ambitious strategy. On the other hand, disposal of the TV business would be costly, and would significantly drag down Arcelik’s profitability.

Another threat to Arcelik is the positioning of its brands. Although it has a portfolio of well-known brands, it lacks a premium flagship brand. Bosch or Whirlpool is better positioned to capture market share in the very profitable premium segment in developing counties such as those in the Middle East or China. The same applies to the consumer electronics segment. It will be very challenging for Grundig to recapture its past glory and even more difficult for it to become established in new markets.

**Arcelik’s strategy and role of innovation**

According to CEO Gündüz Oezdemir, Arcelik’s vision is to make Beko one of the top ten global brands by 2010. In order to achieve this goal, their aim is to grow on average 12% annually, reach sales of 6 billion Euros and capture a global market share of 2%.

The Koc Group presents Arcelik’s strategy as follows:

- grow globally through acquisitions and organic growth
- leverage technology development capabilities to improve brand positioning.
- increase R&D capabilities, and focus on product development
- maintain domestic market leadership
- improve operational efficiency in domestic and international operations to restore profitability in consumer electronics.

Arcelik has recognised that it needs to invest even more in technology and innovation in order to improve the position of its brands. This ensures a clear commitment to learning and even stronger efforts to upgrade its knowledge base. The need to improve operational efficiency in consumer electronics means that Arcelik needs to

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103 Koc Holding (2008a)
intensify learning efforts in this area as well. In conclusion, we can state that Arcelik’s ambition to create a strong global brand ensures a clear commitment to innovation.

4.4.3 Development of Arcelik

Production and exports
Although Arcelik’s brown and white goods segments have been roughly the same size, of late the white goods segment has become more important. In terms of profitability, white goods dominated from the beginning. Until recently, Koc Group’s brown goods business was operated through a separate company, Beko. In 2005, following Beko’s financial problems that resulted from the transition to LCD technology, Arcelik took over Beko completely.

After reaching a considerable size in the domestic market (US $950 million, end-1993), Arcelik started international expansion during the mid-1990s.

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales in million euros</td>
<td>2'082</td>
<td>2'686</td>
<td>3'741</td>
<td>3'873</td>
<td>3'725</td>
</tr>
<tr>
<td>International sales</td>
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<td>1’170</td>
<td>1’865</td>
<td>1’867</td>
<td>1’875</td>
</tr>
<tr>
<td>International % of total sales</td>
<td>48%</td>
<td>44%</td>
<td>50%</td>
<td>48%</td>
<td>50%</td>
</tr>
<tr>
<td>Net profit %</td>
<td>4.50%</td>
<td>5.90%</td>
<td>4.20%</td>
<td>4.70%</td>
<td>2.40%</td>
</tr>
</tbody>
</table>

Exhibit 95: Arcelik’s sales and profit, 2003-2007  
In 2005, the Beko brand was fully consolidated into Arcelik, explaining the sudden increase in sales figures.

The importance of international sales has grown constantly; in 1992, only 3% of Arcelik’s sales were coming from abroad. After the 2001 domestic crisis, Arcelik’s international sales grew even more rapidly.

104 Arcelik (2007a)
R&D Investments

After the establishment of the R&D department in 1991, and especially after 1995, technology development activities increased.

“Arcelik started investing in R&D in the early 1990s since it had become a large company by capturing most of the domestic market and in the process of customs union with the EU getting foreign licenses had become difficult. As a consequence, Arcelik started developing its own technology” (Cemil Inan, Arcelik’s R&D director, written interview, 2008).

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<tbody>
<tr>
<td>% of sales</td>
<td>0.8%</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.3%</td>
<td>1.1%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

Exhibit 96: Arcelik’s R&D expenditure (% of sales, 1995-2006) ¹⁰⁵

The lower R&D spending as percentage of sales after 2000 can be explained by the rapid increase in sales during that period (R&D spending remaining more stable).

In 1996, the first patent applications by the company followed. Until the end of the 1990s, Arcelik continued to invest constantly in R&D and started reaping the benefits in the 2000s. Quality, design and innovation rewards and an increasing number of patents are the results of these efforts.

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<td>Grundig</td>
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</table>

Exhibit 97: Arcelik’s patent development, 2008 until July ¹⁰⁶

Supported by these technology development activities, Arcelik started an ambitious internationalisation strategy after 2000. Technology development in the past has given the company the foundation to follow an own-brand strategy.

¹⁰⁵ Turkish Stock Exchange (2008)
¹⁰⁶ European Patent Office Database (2008)
Innovation phases

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<tr>
<th>Year</th>
<th>Type</th>
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<th>Focus</th>
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<th>Product R&amp;D</th>
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<td>1955</td>
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<td>Focus on process improvement and quality</td>
<td>Design and own technology development</td>
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<td>ODM</td>
<td>OBM</td>
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<td>OBM</td>
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<tr>
<td>2000</td>
<td>OBM</td>
<td>OBM</td>
<td>OBM</td>
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</tbody>
</table>

Exhibit 98: Arcelik's innovation phases

In summary, Arcelik initially prospered in the domestic market using foreign technology. During the 1990s, it began entering the international market. Owing to its considerable size and the customs union process with the EU, Arcelik’s access to foreign technology became difficult. In reaction, Arcelik started to develop its own technology after the mid-1990s. After acquiring its own design capabilities and its first patents, Arcelik started an international expansion strategy with its own-branded products.

4.4.4 Organisational learning at Arcelik

This section looks more closely at the company, in order to reveal more about Arcelik’s learning capability. It looks at the following aspects:

1. management commitment to learning
2. systems perspective
3. openness and experimentation
4. knowledge transfer and integration.
4.4.4.1 Management commitment to learning

Findings: management’s attitude towards change
Arcelik’s management has been committed to organisational learning for the past 10 years. The aim of management has been to increase the competitiveness of the company. Ultimately, the objective has become to join the global top 10 and the top 3 in Europe. One of our interview partners mentioned continuous SWOT (strength-weakness-opportunity-threat) analysis as proof of management staying ahead of changes (Dilek Temel, personal interview, 2006).

Other evidence of the management’s attitude towards change is its approach to partnerships. When announcing Arcelik’s partnership with British low-cost TV manufacturer Alba, an Arcelik manager emphasised that Arcelik (Beko) had much to learn from the partnership with Alba: "We have the know-how and expertise in technology...We know how to manufacture and be competitive. Alba has great experience in marketing, sourcing and quickly adapting to the changes in the market in Europe" (Boulden, 2005, p. 1). This can be seen as evidence for the fact that Arcelik took a deliberate path to upgrade its knowledge base in marketing and sourcing.

Overall, interview partners rated the company highly on this point (highest or second highest grade). Only one exception was specifically mentioned: Arcelik did not move quickly enough in its transition from CTVs to LCDs.

Findings: employee learning investment
Arcelik states the importance it gives to employee learning in its corporate website:

“We are aware of the fact that one of the most important factors in realizing Arcelik’s vision of becoming a leader in international markets is ensuring the continuous development of our employees who constantly review their jobs and seek better and newer methods” (Arcelik, 2008).
One of our interview partners mentioned that Arcelik uses industry benchmarks for comparison to see if its training is at the highest standards; his opinion was that the current level is very close to the European benchmark (Dilek Temel, personal interview, 2006). According to another interviewee, Arcelik employees receive 45-50 hours of training per year (Bahadir Akin, personal interview, 2006). The 2007 Arcelik annual review states that employees received a total of 5,244 training hours in ecology and a total of 11,725 training hours in workplace health and safety.

Arcelik offers a variety of training to its employees. It includes training on TPM, Six Sigma, environment training, and health and safety training. It has an e-learning portal that provides a variety of training including English courses (Kurumsal Portal, 2004).

Arcelik’s profits from being part of the Koc Group, and is able to make use of its education and training infrastructure. For instance, there is a human resources platform called ‘Koc Academy’ where employee development plans are devised and electronically tracked. Here, employee data such as needs, wants and capabilities are entered and a personal development roadmap is created. Performance evaluations are also available on this platform (Koc Holding, 2008b). Arcelik also works with Koc Holding’s in-house training and development centre i.d.e.a (formerly KOGEM). Founded in 1982, i.d.e.a is Turkey’s first employee training company (Koc Holding, 2008c).

In summary, Arcelik has an established employee training and education infrastructure. Overall, interview partners rated the company highly on this point (highest or second highest grade). All interview partners thought that Arcelik regards the learning capability of its employees as important, and that it invests in them.

However, one of the interview partners remarked on Turkish companies in general:

“in Turkish companies employee learning is seen as expense rather than investment.” There is a common perception in Turkey that foreign companies give more importance to their employees (Taner Kaya, personal interview, 2008).
Findings: staff involvement
This is an area where most of the interview partners graded Arcelik as being only average. Difficulties owing to size and recent restructuring activity were mentioned. It seems that owing to the size of the company, not all staff feel involved in company decision making.

The sales manager who was interviewed graded the company more highly than the others, as his opinions seem to have been treated with much importance. In Arcelik, there are project groups where R&D, product management and sales come together. The management listens to the feedback and ideas of sales people especially since they know that they would lose market share otherwise. In particular, key account management’s thoughts are taken seriously since they reflect the customer’s view.

Findings: innovation rewards
In Arcelik, there are no monetary rewards for innovation. The company has significant variable pay for upper management only. However, innovation performance is considered in career development and future pay rises (Dilek Temel, personal interview, 2006). Since 1999, Arcelik has held an annual innovation reward ceremony, called ‘invention day’. In 2008, a total of 185 inventors received awards at the ceremony, which was attended by the CEO of Arcelik (Arcelik, 2007b).

For innovation rewards, all interviewed Arcelik employees gave the company the highest grade. They mentioned that innovation was rewarded with career advancement and recognition.

4.4.4.2 Systems perspective

Findings: shared objectives, company interconnection and coordination
According to one interviewee, not all units know how they contribute to the company’s objectives and they would rather just execute orders. Orders are not to be questioned and general strategies are not shared widely. Some units, such as the marketing and finance departments, understand the overall strategy better (Taner Kaya, personal interview, 2008).
With regard to company interconnection and coordination, all interviewees gave Arcelik a below-average grade. Reasons given include the size of the company, and mergers in 2000 that had an adverse effect on coordination. It seems as if Arcelik’s reorganisation in 1995, which decreased its organisational levels from 9 to 5 to make it a leaner organisation, needs to be looked at (Arcelik, 2008).

One interviewee explains that all units focus on their own targets and do not think about the whole process. (Taner Kaya, personal interview, 2008).

### 4.4.4.3 Openness and experimentation

In general, interviewed employees rate the company highly on this account. R&D is mentioned in particular, but innovation is also promoted in other areas. Mention is also made of there being a ‘pilot’ culture where new ideas are tested in small samples first before being rolled out completely. This enables a certain degree of experimentation as it decreases the risk of failure.

Interviewees mentioned mechanisms for bringing forward new ideas, especially in production. For instance, even the worker on the factory floor can fill in a ‘recommendation form’. These ideas also bring rewards. However, these feedback and improvement processes seem to be limited to production and R&D only, and have not been utilised in other functions such as sales and marketing.

Although all interview partners gave Arcelik a good grade on this issue, one interviewee mentioned that continuous improvement is widespread in blue-collar activity but not in white-collar activity. Whereas the production units have standard processes for improvement, other units such as sales and marketing lack them.

All interviewees gave the best grades on this benchmarking. One interviewee even considered openness towards the outside to be the biggest strength of Arcelik, while adding that it would still be possible to enhance the best-practice implementation process (Taner Kaya, personal interview, 2008).

“Arcelik has separate benchmarking units for the domestic and international segments, and there is even a third one for coordinating the
knowledge acquired by these two units” (Taner Kaya, personal interview, 2008).

4.4.4.4 Knowledge transfer and integration

Findings: tolerance of failure, teamwork and socialisation
Interview partners rated Arcelik highly in this area and spoke of a discussion culture. According to one interview partner, there is a warm culture and open communication. In general, people are accessible, and can be talked to easily. Only top management is less easy to access as managers are frequently out of the office on business trips. Reflecting Turkish culture, people speak using the first person with those of the same age or younger, and use a more polite form for addressing the older or the more senior people. Interview partners also mentioned how failures are discussed and remembered in the future. One interview partner said, “Even if a department that makes a failure might want to forget it, other departments will bring it up next time.” There was also an interesting remark on teamwork: “Teamwork is strong in project groups but is much weaker otherwise as there is strong specialisation. People focus on their own jobs and do less teamwork” (Taner Kaya, personal interview, 2008).

There are also professional team-building processes conducted by specialised external companies.

Findings: knowledge-sharing instruments
Interview results differed widely in this area. Some rated the company as excellent and were able to give examples, whereas others did not know anything. This showed that there were significant differences among departments and people, which indicated a lack of company-wide institutionalisation.

According to one interviewee, there is a database and also a document management database. There is also an intranet where documents are stored. However, the use of the instruments seems to have been left to the initiative of the departments, as not all employees were using them to the same extent.
4.4.5 Innovation indicators

The following areas are assessed:

1. new technologies, business areas and markets
2. transition to LCD technology
3. environmentally-friendly products
4. new businesses
5. new markets entered
6. R&D investments
7. patents and patented products and product awards
8. benchmarking and cooperation

4.4.5.1 New technologies, business areas and markets

Environmentally-friendly products
Arcelik is very strong in energy-efficient white goods. “Its partnerships with European firms and exposure to more developed markets than Turkey’s, combined with a long-standing focus on skills training and engineering, led to leading-edge products such as refrigerators that won the European Energy+ Award for outstanding energy-efficient products. This is again a characteristic of latecomer MNEs that can leapfrog their slower incumbent rivals to read incipient market signals (in this case, the preference for greener appliances) and adopt leading-edge technologies” (Bonaglia et al., 2006, p. 23).

Arcelik also started using energy-saving technology with brown goods. In 2008, it launched an LCD TV that does not consume any energy on stand-by. According to the company, this is a world first (Arcelik, 2007).
<table>
<thead>
<tr>
<th>TV Total</th>
<th>LCD TV</th>
<th>LCD %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vestel</td>
<td>8.7</td>
<td>3.3</td>
</tr>
<tr>
<td>TCL</td>
<td>15.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Arcelik (Beko)</td>
<td>4.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Samsung</td>
<td>27.2</td>
<td>15.5</td>
</tr>
</tbody>
</table>

Exhibit 99: Share of LCD TV sales, selected companies, 2007

Arcelik had major problems in its transition to LCDs. Indeed, these same problems made its formerly-separate Beko brand bankrupt. In comparison with Vestel, Arcelik’s LCD sales share of the total is also lower.

**New business areas entered**
Arcelik is a white goods company with significant presence in brown goods. Its strategy is to supply most of household needs. In 2004, Arcelik entered the home furniture and textiles sector with the brand Arstil. At the end of 2007, Arstil had 90 of its own stores. It also sells PCs and notebook computers under its own brand, without engaging in significant production.

Arcelik is not very active in entering new business fields. A comparison with Vestel would indicate that Arcelik is lagging. However, we need to take into consideration the fact that Arcelik is part of the biggest conglomerate in Turkey, the Koc Group. The latter operates in many diverse business fields and this limits the expansion possibilities for Arcelik. There is, for instance, a defence technologies firm that belongs to the Koc Group, and a whole group of IT companies.

**New markets entered**
Arcelik’s first international sales date back to 1988 when it started OEM production for Sears Roebuck to supply refrigerators under the Kenmore name (Bonaglia et al., 2006).

Real international expansion started in 2002, with the acquisitions of Blomberg in Germany, Elektra Bregenz in Austria, and Arctic in Romania.

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108 Company websites: Arcelik, Vestel, TCL Multimedia, Samsung
In 2006, Arcelik started production in Russia and started exporting to China and the USA. Later, in 2007, Arcelik started production in China and also started production of Tall-tub dishwashers for the US market. From 2000 onwards, it more than doubled the number of countries it exports to – from 55 to 106 in 2006 (Arcelik, 2007a).

In just six years, Arcelik entered more than 50 countries, a clear sign that Arcelik has become an intense learner in terms of market expansion.

4.4.5.2 R&D investment
As of 2006, Arcelik was spending 1% of its sales on R&D (Arcelik, 2007a). In 2007, Arcelik employed a total of 720 R&D personnel. Of these, 538 were working for the white goods division (Meydanli, 2007) and around 180 (Beko Elektronik, 2007) for the brown goods division Beko.

Arcelik’s white goods R&D activities take place in Istanbul and consist of central organisation and product development units. Among this workforce there are 18 PhD and 180 Masters of science holders. The Product Development (PD) departments focus on segments such as refrigerators, washing machines, ovens, dishwashers, dryers, motors and pumps, and compressors. The central R&D department works on developing the capabilities in thermodynamics and fluid dynamics, vibration and acoustics, electronics, materials, washing and cooking techniques, rapid prototyping, structural design and analysis (Meydanli, 2007).

Brown goods R&D takes place in three locations: Istanbul, Izmir and Nürnberg (Grundig), Germany. These units focus on mechanical and electronic equipment as well as software design (Beko Elektronik, 2007).

4.4.5.3 Patents, patented products and product awards
Arcelik is one of the leading technology and patent developing corporations in Turkey:

- 13% of the patents issued during the last three years belong to Arcelik.
- In a recent three-year period, 45% of the international patent applications (PCT) filed by Turkey to the World Intellectual Property Organisation (WIPO) belong to Arcelik (Meydanli, 2007).
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>White goods</td>
<td>420</td>
<td>240</td>
<td>204</td>
<td>128</td>
<td>69</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>Brown goods</td>
<td>26</td>
<td>30</td>
<td>152</td>
<td>86</td>
<td>69</td>
<td>76</td>
<td>40</td>
</tr>
<tr>
<td>Beko</td>
<td>7</td>
<td>15</td>
<td>26</td>
<td>21</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Grundig</td>
<td>19</td>
<td>15</td>
<td>22</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 100: Arcelik’s patent development

As seen in the table, Arcelik has been stronger in white goods patenting activity. It is only after 2004 that we can see a certain dynamism in brown goods patent applications. Arcelik has profited from its R&D efforts in the form of patented technologies that it uses in new products. The following products (Meydanli, 2007) have been mentioned by the company as highlights of its R&D success:

- **Refrigerator**: 19.8 Index: Energy+ Award Winner, Europe’s most energy-efficient refrigerator. The company was invited to the UN Conference on World Climate Change in Buenos Aires to make a presentation on the technology that created ‘Europe’s most energy-efficient refrigerator’.

- **Dishwasher**: the first brushless DC motor application. Arcelik technology has created the world’s quickest dishwasher with a washing performance in 58 minutes for full/daily load.

- **Dryer**: energy-efficient heat pump application (wool dry) heat-pump dryer; 40% more energy-efficient than its competitors (won the Eco Top Ten Energy Award).

- **Turkish coffee machine**: With its own technology, Arcelik developed the Turkish coffee machine ‘Mini Telve’ with a single tank and launched it in 2006. This product is protected with four patents.

### 4.4.5.4 Benchmarking and cooperation

In 2003, Arcelik founded Fusion Digital in the UK for set-top box R&D. In 2004, Arcelik took over the remaining R&D operations of Grundig in Nürnberg, Germany. Arcelik also opened a research centre in Italy to strengthen its relationships with Italian specialised suppliers. It has conducted external knowledge-sourcing through licensing, having agreements with Bosch, Sanyo, GE, LG and compressor supplier Tecumesh (Bonaglia et al., 2006).
In Turkey, Arcelik collaborates with universities and research institutes and TUBITAK. Arcelik also has a protocol with Istanbul Technical University whereby it supports the theses and projects of students. Between 1997 and 2006, the company supported 78 Master’s theses and 26 BS projects. Moreover, 48 of the Master’s students started working for Arcelik after finishing their studies. Arcelik has signed similar protocols with Yildiz Technical University and Bogazici University as well. In 2007, Arcelik reported that 30 such studies were ongoing (Meydanli, 2007).

Arcelik is a member of the European Industrial Research Management Association (EIRMA), an organisation that aims to bring companies together to learn from each other and share experiences. Arcelik also carries out projects within the EUREKA and EU Research Framework Programme Projects. It forged a strategic partnership with Ubicom to develop ‘digital living’ smart appliances and use internet processors and networking software that enables device-to-device communication (Bonaglia et al., 2006).

Arcelik also works in cooperation with the University of Illinois – ACRC, University of Maryland, and Purdue University. Arcelik also collaborates with suppliers such as GE Plastics and Bayer. It occasionally uses consultancies on a project basis.
4.5 Findings and Conclusions

4.5.1 Organisational learning capability

<table>
<thead>
<tr>
<th>Management commitment to learning</th>
<th>Arcelik</th>
<th>Vestel</th>
</tr>
</thead>
</table>
| Clear focus on learning and continuous improvement | • Continuous learning is part of strategy  
• Established employee training and development processes  
• Formal innovation rewards | Very positive attitude towards change  
• Strong at staying ahead of changes  
• Emerging focus on employee training and development  
• No formal innovation rewards |

<table>
<thead>
<tr>
<th>Systems perspective</th>
<th>Arcelik</th>
<th>Vestel</th>
</tr>
</thead>
</table>
| Weaknesses in integration and coordination  
• Internal competition between units  
• Less open communication | Low hierarchies result in better coordination  
• High empowerment  
• Open communication culture |

<table>
<thead>
<tr>
<th>Openness and experimentation</th>
<th>Arcelik</th>
<th>Vestel</th>
</tr>
</thead>
</table>
| Openness seen as one of the big strengths of the company  
• There is a ‘pilot’ culture to test ideas  
• Processes for feedback and improvement | Very dynamic company where initiative-taking is valued  
• Strong at following trends and benchmarking  
• An entrepreneurial spirit  
• Less established processes for feedback and improvement |
| Knowledge transfer and integration | • Project teams are important  
• There are formal socialisation activities  
• Knowledge-transfer infrastructure exists but is not yet institutionalised | • Project teams are important  
• Less formal socialisation activities  
• Elements of knowledge-transfer infrastructure exist but are not yet institutionalised |

Exhibit 101: Summary of the learning capabilities of Arcelik and Vestel

As can be seen, there is evidence of learning capabilities in both companies. These capabilities are not only limited to technological learning but are also present in overall employee development, an open attitude towards knowledge sourcing and knowledge sharing. There is evidence that both companies have deliberately worked on their learning capability in order to remain competitive.

There are differences between these two companies, however. Overall, Arcelik demonstrates a more advanced learning capability. It has established processes for fostering innovation and is more advanced in employee training and development. Vestel, on the other hand, seems to be catching up – as seen from its new employee training programmes. There are areas where Vestel scores better, such as company integration and open communication. Vestel is, overall, less structured, less hierarchical and more dynamic. Nevertheless, innovation is an incremental and long-term process and therefore it is necessary to have institutionalised learning processes in place.

110 Author’s illustration
### 4.5.2 Innovation indicators

<table>
<thead>
<tr>
<th></th>
<th>Arcelik</th>
<th>Vestel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New technologies</strong></td>
<td>• One of the leaders in green technologies</td>
<td>• Faster than direct competition in transition to LCD but still too slow</td>
</tr>
<tr>
<td></td>
<td>• Slow transition to LCD</td>
<td>• Only a follower in green technologies</td>
</tr>
<tr>
<td></td>
<td>• Better in the white goods segment</td>
<td></td>
</tr>
<tr>
<td><strong>New markets</strong></td>
<td>• With expansion to China and USA, first steps toward a global footprint are made</td>
<td>• Strong expansion towards Russia and countries to the East of Turkey</td>
</tr>
<tr>
<td></td>
<td>• Overall more regional than global reach</td>
<td>• Overall more regional than global reach</td>
</tr>
<tr>
<td><strong>R&amp;D activities</strong></td>
<td>• A clear and long-term commitment over the years</td>
<td>• Commitment to R&amp;D increased especially after transition to LCD</td>
</tr>
<tr>
<td></td>
<td>• A slightly declining trend in expenditure</td>
<td>• Some years behind Arcelik in technology development</td>
</tr>
<tr>
<td></td>
<td>• Leader company in Turkey</td>
<td>• More global reach than Arcelik in international benchmarking</td>
</tr>
<tr>
<td><strong>Patents</strong></td>
<td>• Patent champion of Turkey</td>
<td>• First patent in 2000, five years later than Arcelik</td>
</tr>
<tr>
<td></td>
<td>• Continuous and increasing number of patents</td>
<td>• Only after 2006 was there significant patenting activity and this has been increasing steadily</td>
</tr>
<tr>
<td><strong>Design awards</strong></td>
<td>• Design awards for both the TV and home appliances segment</td>
<td>• No design awards</td>
</tr>
</tbody>
</table>

Exhibit 102: Summary of innovation indicators of Arcelik and Vestel

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111 Author’s illustration
Analysis of selected innovation indicators shows a similar picture to that of the assessment of organisational learning capability. Arçelik is a more established company and has been especially innovative in the white goods segment. It has been quick to make the transition to new technologies, has a high number of its own patents and has won design awards. The performance of its brown goods segment is weaker as the slower transition into new technologies and lower patents show. Vestel, on the other hand, has shown that it is a fast-acting company with many benchmarking units but only recently has it become committed to R&D. It is three to five years behind Arçelik on patents and has no design awards. However, the pace of increase over the past few years shows that Vestel is well on its way to catching up.

4.5.3 Innovation indicators in international comparison

Peer group for Vestel and Arçelik

The main starting point of the peer group selection is a study conducted by the Boston Consultancy Group (BCG). The report, entitled ‘Global Challengers’, focuses on the most important companies from developing countries (Aguiar et al., 2006). The selection methodology was based on analysing the data on more than 3,000 companies from 14 major developing countries (following the initial screening of 30). Most had sales of US $1 billion or more, with at least 10% of those revenues coming from outside their home country. The international presence of sales, product development, manufacturing, and other operations was also assessed. This list produced six consumer electronics (brown goods) companies and six home appliances (white goods) companies. Of the six brown goods businesses, four were Chinese, one Indian (Videocon) and one Turkish (Vestel). Of the six home appliances (white goods) businesses, five were Chinese and one was Turkish (Arçelik).
Overview of peer group

<table>
<thead>
<tr>
<th>White goods group</th>
<th>Arcelik</th>
<th>Haier</th>
<th>Mabe</th>
<th>Whirlpool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home country</td>
<td>Turkey</td>
<td>China</td>
<td>Mexico</td>
<td>USA</td>
</tr>
<tr>
<td>Product scope</td>
<td>Mainly white goods, significant brown goods</td>
<td>Mainly white goods, recently entered brown goods</td>
<td>White goods only</td>
<td>White goods only</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brown goods group</th>
<th>Vestel</th>
<th>TCL</th>
<th>Videocon</th>
<th>Samsung</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home country</td>
<td>Turkey</td>
<td>China</td>
<td>India</td>
<td>South Korea</td>
</tr>
<tr>
<td>Product scope</td>
<td>Mainly brown goods, increasing white goods</td>
<td>Mainly brown goods, recently entered white goods</td>
<td>Both brown and white goods</td>
<td>Present in all most electronics segments, less strong in white goods</td>
</tr>
</tbody>
</table>

Exhibit 103: Overview of international peer group for Arcelik and Vestel

For the purposes of comparison, only one Chinese company from each electronics subsegment is selected. In both cases, the largest one is chosen – the largest Chinese consumer electronics company TCL and the largest Chinese white goods company Haier. In addition, the remaining non-Chinese consumer electronics company – Videocon from India – is included. In addition, one white goods company that is not on the list is included. This is the Mexican company Mabe, South America’s largest producer of home appliances. It was not included in BCG’s sample since General Electric (USA) owns 49% of it.

In addition to these developing-country firms, the world market leader of each subsegment is included to provide a benchmark. For brown goods, it is Samsung Electronics from South Korea, and for white goods, it is Whirlpool from USA.

List of learning/innovation indicators in comparison

- R&D investment and activity
- Patent applications
- New technology transition: LCD and environmental
- Expansion into new markets: international sales and production
- Learning in ‘design’: design centres and design awards.

112 Author’s illustration
## R&D investment and activity

<table>
<thead>
<tr>
<th>R&amp;D centers</th>
<th>Arcelik</th>
<th>Haier</th>
<th>Mabe</th>
<th>Whirlpool</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Istanbul, Nürenberg (brown goods)</td>
<td>15 R&amp;D centers, 10 S&amp;T information centers located throughout Europe, North America, and the Asia-Pacific</td>
<td>Querétaro, Mexico</td>
<td>25 R&amp;D centers around the world</td>
</tr>
<tr>
<td>R&amp;D expenditure % of sales (2007)</td>
<td>1%</td>
<td>N/A</td>
<td>N/A</td>
<td>2%</td>
</tr>
<tr>
<td>R&amp;D personnel (2007)</td>
<td>538</td>
<td>N/A</td>
<td>N/A</td>
<td>3123</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R&amp;D centers</th>
<th>Vestel</th>
<th>TCL</th>
<th>Videocon</th>
<th>Samsung</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11 locations, including in USA, UK, Taiwan</td>
<td>Laboratories in Singapore and Indianapolis in the USA</td>
<td>N/A</td>
<td>24 R&amp;D centers, in USA, China, Russia, Israel</td>
</tr>
<tr>
<td>R&amp;D expenditure % of sales (2007)</td>
<td>1%</td>
<td>N/A</td>
<td>Since 2006 company wants to focus on R&amp;D</td>
<td>9%</td>
</tr>
<tr>
<td>R&amp;D personnel (2007)</td>
<td>600 (TV only)</td>
<td>700 (TV only)</td>
<td>N/A</td>
<td>36'000 (total)</td>
</tr>
</tbody>
</table>

Exhibit 104: R&D activity comparison selected international companies

With regard to R&D centres, we can see that most of these companies have locations all around the world. However, Arcelik’s R&D operations are very centralised and lack international posts. Most of the other peer companies have at least ‘listening posts’ in many countries. Regarding R&D expenditure, we can see that the leading brown goods company Samsung spends more than four times as much, in terms of percentage of sales, than the leading white goods company Whirlpool. Arcelik’s spending as a percentage of sales is half that of Whirlpool. However, if we compare the sales of these two companies, we can see that Arcelik’s R&D personnel is not much lower than that of the US company. We have to take into account that while sales figures are comparable, the cost of R&D is considerably lower for Arcelik. That means Arcelik can hire many more R&D personnel with 1% of sales than companies in Europe or the USA. Vestel’s R&D spending level is equal to Arcelik’s. Unfortunately, the spending levels for other developing-country companies were not available.

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113 Company websites: Haier, Mabe, Whirlpool, TCL Multimedia, Videcon, Samsung
### Patent applications

<table>
<thead>
<tr>
<th></th>
<th>Arcelik</th>
<th>Haier</th>
<th>Mabe</th>
<th>Whirlpool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patent applications (2007)</td>
<td>368</td>
<td>537</td>
<td>6</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>Vestel</td>
<td>TCL</td>
<td>Videocon</td>
<td>Samsung</td>
</tr>
<tr>
<td>Patent applications (2007)</td>
<td>10 (TV only)</td>
<td>92 (TV only)</td>
<td>0</td>
<td>32'588 (total)</td>
</tr>
</tbody>
</table>

Exhibit 105: International patent applications in 2007, selected international companies

Although Vestel has international R&D presence, it has been less active in basic research. Even the Chinese competitor TCL is more advanced in this area and made more patent applications. Overall, the gap between developing-country companies and Samsung seems not to be closing. Arcelik, on the other hand, has only one central R&D department located in Turkey, which has a very high output. Moreover, we can observe that R&D output is much higher for developing countries in white goods. The difference between the market leader Whirlpool and followers such as Arcelik and Haier has narrowed. It seems as if these developing-country companies have already caught up with developed-country firms. It has also become clear that catching up in the white goods segment is more possible than in the brown goods segment. Another finding is that the Indian company Videocon and the Mexican company Mabe have no or very low patent applications. In Videocon’s case this could be due to the fact that traditional TVs still dominate domestically and LCD sales are less important for the company.

---

New technology transition

<table>
<thead>
<tr>
<th>Environment friendly technologies</th>
<th>Arcelik</th>
<th>Haier</th>
<th>Mabe</th>
<th>Whirlpool</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of the pioneers, award winning products from 2004</td>
<td>Strong performance: from 2006 on we see patented and award winning products</td>
<td>N/A</td>
<td>No visible dominance of the topic</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transition to LCD</th>
<th>Vestel</th>
<th>TCL</th>
<th>Videocon</th>
<th>Samsung</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was negatively impacted by transition but was able to switch relatively fast</td>
<td>Had huge investments in old CTV technology was very slow to adapt</td>
<td>Had invested in old CTV technology as the transition started</td>
<td>Pioneer and market leader in LCD technology</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 106: Overview of status of transition to new technologies 115

In white goods, the market leader Whirlpool does not seem to have any advantage in terms of new technology introduction. In fact, Arcelik was one of the early adopters in this sphere. This shows how developing countries can catch up with advanced countries in sectors characterised by slower technology development cycles. In brown goods, we can see that developing-country firms are lagging behind leaders like Samsung. It seems very difficult to follow the new trends in this segment.

<table>
<thead>
<tr>
<th>TV Total</th>
<th>LCD TV</th>
<th>LCD %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vestel</td>
<td>8.7</td>
<td>3.3</td>
</tr>
<tr>
<td>TCL</td>
<td>15.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Arcelik (Beko)</td>
<td>4.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Samsung</td>
<td>27.2</td>
<td>15.5</td>
</tr>
</tbody>
</table>

Exhibit 107: Share of LCD TV sales, selected companies, 2007 116

Arcelik, which was a pioneer in environmental technologies, was rather slow to predict the LCD transition trend. This can be considered evidence of sector-specific rather than company-specific differences.

115 Author’s illustration
116 Company websites: Haier, Mabe, Whirlpool, TCL Multimedia, Videocon, Samsung
### International Expansion

<table>
<thead>
<tr>
<th>Company</th>
<th>International Production</th>
<th>Main Markets</th>
<th>New Focus Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arcelik</td>
<td>In Russia, Romania, China</td>
<td>Main market Europe and Turkey</td>
<td>Russia and CIS, USA, China</td>
</tr>
<tr>
<td></td>
<td>In USA, Italy, Pakistan, Jordan and Nigeria</td>
<td>Sales to over 100 countries</td>
<td>Especially USA</td>
</tr>
<tr>
<td>Mabe</td>
<td>In various Latin American countries and Canada</td>
<td>Main market China, Strong in Asia</td>
<td>N/A</td>
</tr>
<tr>
<td>Whirlpool</td>
<td>37 factories in Canada, Mexico, France, Germany, Italy, Poland, Slovakia, South Africa, Sweden, Brazil, China, and India.</td>
<td>Main Market Latin America, Sales to North America, Canada</td>
<td>N/A</td>
</tr>
</tbody>
</table>

#### Vestel
- **International Production**: Russia
- **Main Markets**: Europe
- **New Focus Markets**: Russia and CIS and countries to the east of Turkey

#### TCL
- **International Production**: In Poland, Mexico, Thailand and Vietnam
- **Main Markets**: China, USA and emerging markets
- **New Focus Markets**: Russia and CIS and countries to the east of Turkey

#### Videocon
- **International Production**: China, Poland, and Mexico
- **Main Markets**: Americas
- **New Focus Markets**: N/A

#### Samsung
- **International Production**: 24 production bases in low-cost Asian countries, including China and Thailand
- **Main Markets**: World
- **New Focus Markets**: N/A

---

Exhibit 108: Overview of international expansion, selected companies

It can be observed that Turkish companies have less globalised production than competition. Moreover, Arcelik appears to have global aspirations whereas Vestel is currently more regional-oriented. However, recently Vestel did start exporting to South America and South-East Asia. The Chinese company Haier has become very international and is known to have global aspirations. Indian Videocon has multiple production centres around the world for TV tube manufacturing but not for the TV product. Overall, we can see that developing countries are becoming more and more international.

---

117 Company websites: Haier, Mabe, Whirlpool, TCL Multimedia, Videocon, Samsung
### Industrial design

<table>
<thead>
<tr>
<th>Industrial design centers</th>
<th>Arcelik</th>
<th>Haier</th>
<th>Mabe</th>
<th>Whirlpool</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Industrial design team 33 people (13 for Beko)</td>
<td>Over 30 design centers (whole Haier group)</td>
<td>N/A</td>
<td>Design centers in USA, Italy, Germany and Poland</td>
</tr>
<tr>
<td>Design awards</td>
<td>IF and red dot awards from 2004 on</td>
<td>Various IF and red dot awards</td>
<td>N/A</td>
<td>Various awards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vestel</th>
<th>TCL</th>
<th>Videocon</th>
<th>Samsung</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial design centers</td>
<td>10 people team</td>
<td>Global design center</td>
<td>Design centers in San Francisco, London, Tokyo and Los Angeles, and China</td>
</tr>
<tr>
<td></td>
<td>Cooperations with German and Italian firms and famous designer Giuliano Galeazzi is a consultant</td>
<td>N/A</td>
<td>In 2004 Samsung employed 380 designers</td>
</tr>
<tr>
<td>Design awards</td>
<td>None</td>
<td>Red Dot and IF design awards in 2007</td>
<td>Record number of awards. In 2006 alone 25 IF awards</td>
</tr>
</tbody>
</table>

We can see that learning in design goes hand in hand with performance in R&D. Here Vestel is also lagging behind TCL whereas Arcelik and Haier have both won a number of design awards. Again, Samsung has an incredible lead, whereas Whirlpool lacks such dominance. The Mexican Mabe and Indian Videocon show their lower development level in these areas.

---

4.5.4 Assessment of learning path

Arcelik’s reasons for investing in R&D

Arcelik was founded in 1955. Until the early 1990s, Arcelik acquired technology through foreign licensing. This technology was sufficient for Arcelik to dominate the domestic market and there was no effort made to focus on intensive learning activities. In the early 1990s this status quo came to an end. Arcelik had reached close to US $1 billion in sales from domestic sales where it had captured a commanding position with over 50% market share. A significant production scale had been built up. At the same time, Turkey was opening up to international trade and the discussions for a customs union with the EU were underway. Arcelik had already started exporting as an OEM for international companies.

According to Arcelik’s R&D director Cemil Inan, it was exactly at this point that obtaining foreign licences became very difficult as Arcelik had become a potential competitor to many international firms. Faced with growth limits domestically and deprived of access to foreign technology, Arcelik started to develop its own technology. In 1991, the first R&D department was formed. As the first R&D efforts brought success, Arcelik’s management increased its attention to the topic. As the technology capabilities of Arcelik grew, it also became more ambitious in its international expansion strategy. According to Arcelik officials, the company’s strategy and technological development supported each other. An ambitious strategy required own-technology capabilities, and, in turn, increasing these capabilities enabled more ambitious strategies.

Vestel’s reasons for investing in R&D

Vestel’s faster learning path started in 1994 when new management decided to use a multiple-product and flexible-production strategy to compete against East Asian and Eastern European producers. This strategy required improvement in the production
process, and the first R&D operations started for this reason. Vestel’s desire to improve its margins was another key factor in driving learning efforts. Instead of buying whole parts, it started to design the electronic parts itself and purchase only the components for them. This enabled the company to increase its profitability. According to Vestel officials, during the 1998-2000 period, the advancement from B-brands to A-brands was also supported by R&D efforts. Another important milestone has been the transition from analogue to digital technology in TVs and other devices. During this transition, the importance of software increased tremendously. In 1999, there were 4-5 software developers working for Vestel; by 2008 there were over 150 people employed. R&D efforts increased pace, especially after 2005 when Vestel went through a crisis resulting from the unexpected pace of transition to flat-screen TVs. According to Vestel, this crisis increased the R&D efforts for two reasons: first, it increased the stakes and, secondly, owing to the crisis, Vestel was able to mobilise idle resources to work on R&D development.

In summary, the main reason for Vestel’s learning efforts has been competition and the company’s desire to increase its value-added. It can also be seen that technological opportunities played a major role. For instance, Vestel lacked the means to develop an alternative to analogue TVs itself; however once the LCD technology was established, it was able to develop the software part that allowed it to increase its value-added.

**Arcelik and Vestel patent development over time**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Total Patents</td>
<td>150</td>
<td>420</td>
<td>240</td>
<td>204</td>
<td>128</td>
<td>69</td>
<td>80</td>
<td>40</td>
<td>41</td>
<td>17</td>
<td>13</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>White</td>
<td>135</td>
<td>368</td>
<td>180</td>
<td>152</td>
<td>86</td>
<td>69</td>
<td>76</td>
<td>40</td>
<td>37</td>
<td>17</td>
<td>13</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Brown</td>
<td>15</td>
<td>26</td>
<td>30</td>
<td>26</td>
<td>21</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Beko</td>
<td>10</td>
<td>7</td>
<td>15</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grundig</td>
<td>5</td>
<td>19</td>
<td>15</td>
<td>22</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
</tbody>
</table>

<table>
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<tbody>
<tr>
<td>Total Patents</td>
<td>19</td>
<td>30</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>5</td>
<td>18</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Brown</td>
<td>14</td>
<td>10</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Defence</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Exhibit 110: Arcelik and Vestel’s patent development over time, 2008 until July

In conclusion, competition played a major role in motivating the Turkish consumer electronics companies to learn. As long as easy profits were possible for Arcelik, no big learning effort took place. Only a combination of threats as well as opportunities forced the company to engage in learning activities. For Vestel, the new export markets provided opportunities for the company to grow, but it also meant the company found itself in a very competitive environment in which it had to innovate in order to survive. Therefore, it is clear that Turkish trade liberalisation had a positive impact on the learning of Turkish consumer electronics companies.

Comparison with East Asian learning path

Innovation phases – Arcelik

<table>
<thead>
<tr>
<th>Year</th>
<th>Type</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>Domestic only, licenced technology</td>
<td>Basic application /assembly</td>
</tr>
<tr>
<td>1988</td>
<td>OEM</td>
<td>Focus on process improvement and quality</td>
</tr>
<tr>
<td>1995</td>
<td>ODM</td>
<td>Design and own technology development</td>
</tr>
<tr>
<td>2000</td>
<td>OBM</td>
<td>Product R&amp;D</td>
</tr>
</tbody>
</table>

Exhibit 111: Arcelik's innovation phases

Innovation phases – Vestel

<table>
<thead>
<tr>
<th>Year</th>
<th>Type</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>OEM/licenced technology</td>
<td>Basic application /assembly</td>
</tr>
<tr>
<td>1994</td>
<td>OEM</td>
<td>Process development</td>
</tr>
<tr>
<td>1997</td>
<td>ODM</td>
<td>Own design capabilities</td>
</tr>
<tr>
<td>2000</td>
<td>ODM</td>
<td>Own tech development</td>
</tr>
<tr>
<td>2006</td>
<td>OBM</td>
<td>Product R&amp;D</td>
</tr>
</tbody>
</table>

Exhibit 112: Vestel's innovation phases

120 Author's illustration
From the tables above, we can see that both Turkish companies have moved from simple to more complex activities over time. Both companies began engaging in basic research as they started building their own brands. They both made a journey from OEM to ODM to OBM. However, we can see that Vestel is lagging behind Arcelik by a few years.

Turkish consumer electronic companies have gone through the same learning path as East Asian companies.

Exhibit 113: Latecomer firm learning path

The learning path of both Vestel and Arcelik seems to indicate that the East Asian learning and development path is not a regional phenomenon but can be replicated elsewhere. This also shows that if developing-country firms can achieve inclusion in the global value chains, they are able to develop their capabilities in order to catch up or even surpass global leaders.

121 Author’s illustration
122 Hobday (1995)
5. ASSESSMENT OF THE CASE STUDY COMPANIES IN THE LIGHT OF THE INNOVATION SYSTEM

5.1 Comparing the Development of the System and the Case Study Companies

This section aims to investigate the development of the case study companies and the Turkish innovation system. The objective is to understand if there is a relationship between these developments, or if the companies followed a completely detached path.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey GDP</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>Arcelik sales</td>
<td>38%</td>
<td>9%</td>
</tr>
<tr>
<td>Vestel sales</td>
<td>40%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Exhibit 114: Comparison of Arcelik’s and Vestel’s sales growth and Turkish GDP growth

Both Arcelik and Vestel have grown much faster than the Turkish economy. During the 1997-2002 period, Turkey’s economy grew by a humble 2%, while Arcelik’s sales increased by 9% and those of Vestel by 30%. Vestel achieved growth through exports before Arcelik and was therefore less likely to be impacted by the domestic economy. This explains its higher growth rates. During the period 2003-2007, we can see that both companies grew significantly, while Turkey as a whole grew at a respectable 7%. If we analyse sales for individual years, we can see that that both companies’ sales decreased during the 2000 crisis but rebounded strongly afterwards, mainly through export sales.

123 Arcelik’s and Vestel’s figures from Turkish Stock Exchange (2008), Turkish GDP from OECD (2008b)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey exports</td>
<td>25%</td>
<td>8%</td>
</tr>
<tr>
<td>Arcelik exports</td>
<td>55%</td>
<td>35%</td>
</tr>
<tr>
<td>Vestel exports</td>
<td>33%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Exhibit 115: Comparison of Arcelik’s and Vestel’s export growth and Turkish export growth

The strong export performance of the 1997-2002 period shows that both case study companies were early exporters. Vestel had started focusing on exporting earlier but after 2000 Arcelik put in place an internationalisation strategy. Vestel’s 2003-2007 growth was more in line with average Turkey export growth, while Arcelik, which was more dependent on the Turkish market in the pre-2000 period, expanded its export business significantly. Overall, after 2003, the Turkish economy’s exports and those of the case study companies were at comparable levels.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey as % of GDP</td>
<td>0.8%</td>
<td>0.6%</td>
<td>0.6%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Arcelik R&amp;D % of sales</td>
<td>1.1%</td>
<td>1.1%</td>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Vestel R&amp;D % of sales</td>
<td>1.1%</td>
<td>0.9%</td>
<td>0.2%</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Exhibit 116: Comparison of Arcelik’s and Vestel’s R&D spending as % of sales and Turkish R&D spending as % of GDP

The R&D spending figures show that Arcelik was a pioneer in R&D in Turkey, and had high spending even back in 1996. However, Turkish R&D spending has increased more steadily over time, whereas Arcelik’s has even decreased. Nevertheless, we have to take into account Arcelik’s tremendous sales increase during the same period. In contrast, Vestel seems only recently to have reached the same levels as Arcelik after a period of very low R&D expenditure. Overall, the R&D spending of the Turkish economy as a percentage of GDP and the R&D-to-sales ratio of the case study companies are converging. Although the case study companies

---

124 Arcelik’s and Vestel’s figures from company annual reports (2007), Turkish exports from Turkish Statistics Institute (2008a)
125 Arcelik and Vestel figures from Turkish Stock Exchange (2008), Turkish R&D spending from OECD (2008b)
seem to be pioneers in exporting and R&D investments, the Turkish economy as a whole is moving in the same direction.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TPE domestic</td>
<td>1'838</td>
<td>1'090</td>
<td>490</td>
<td>277</td>
<td>189</td>
</tr>
<tr>
<td>PTE from Turkey</td>
<td>354</td>
<td>269</td>
<td>111</td>
<td>71</td>
<td>N/A</td>
</tr>
<tr>
<td>Arcelik total</td>
<td>420</td>
<td>240</td>
<td>69</td>
<td>41</td>
<td>2</td>
</tr>
<tr>
<td>Vestel total</td>
<td>30</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Exhibit 117: Comparison of Arcelik’s and Vestel’s patent applications; total applications to Turkish Patent Institute and total applications to WIPO from Turkey

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TPE domestic</td>
<td>36%</td>
<td>15%</td>
<td>14%</td>
</tr>
<tr>
<td>Arcelik total</td>
<td>45%</td>
<td>80%</td>
<td>194%</td>
</tr>
<tr>
<td>Vestel total</td>
<td>128%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Exhibit 118: Growth comparison of Arcelik’s and Vestel’s patent applications with total applications to WIPO from Turkey

The patenting activity of Turkey compared with that of the companies shows Arcelik’s pioneer role in Turkish R&D. Arcelik’s applications constitute a high share of total applications from Turkey (PTE from Turkey is only applications to WIPO, whereas Arcelik’s total includes also applications to EPO and USP).

Whereas Arcelik’s patent applications grew fastest after the mid-1990s (albeit from a low base), Turkish patent applications started growing faster after 2003. As for Vestel, it was not until the 2003-2007 period that the company’s patent applications started growing rapidly. This growth is more in line with the surge in Turkey’s total patent rate. Again, the convergence in patent application growth rates is visible here.

Looking at the patent application development by other Turkish companies, we can observe that most of them increased their applications after 2003. There have been only a few examples of companies having more patent applications before 2002 (European Patent Office Database, 2008). A defence electronics company and a

glass manufacturer had more patent applications in the earlier period. However, in most of the companies, especially after 2005, patenting activity surged. The growth has been significant, particularly in the automotive and white goods sectors.

![Design Awards Table]

Design awards show similar trends. Before 2005, no Turkish firms won any of the prestigious design awards, IF or Red Dot. The first company to win one of these was an Arcelik company, Grundig, with a design by the Beko design team. Later, we see porcelain, furniture and even textiles companies winning international design awards.

Arcelik continues to lead the design awards ranking among Turkish companies, as it also holds the patent leaderships. But we can see that a growing number of Turkish companies have developed their own design capabilities. The fact that Vestel has won no design awards can be explained by its intention not to compete with its OEM customers under its own brand name.

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128 IF awards (2008) and RedDot awards (2008)
5.2 Interaction between the Innovation System and the Case Study Companies

Findings from Arcelik case study: cooperation and government R&D support

During the early days of its R&D efforts, Arcelik received consultancy on R&D projects.

“Government support had been useful in establishing project management standards, and in gathering international R&D experience” (Cemil Inan, written interview, 2008).

Later, as Arcelik personnel gained more experience, the cooperation took the form of joint projects and the development of specific technologies. Currently, the focus is on alternative and new technologies, and especially on basic research that supports these technologies. Arcelik cooperates with a number of national universities in this area. Overall, Arcelik states that during the early years its R&D had difficulties owing to the lack of a developed innovation system. The early impact of the innovation system therefore was not positive. However, Arcelik expects a more positive impact owing to the development of innovative activities in Turkey:

“If Turkey had a more developed innovation system, Arcelik’s R&D efforts would have been much easier. Some of Arcelik’s early R&D investments had to compensate for the gaps in the system. Although interaction with the innovation system was not positive during the early days, we expect more positive impulses due to recent developments in the innovation system” (Cemil Inan, written interview, 2008).

In terms of current cooperation, Arcelik works with TUBITAK-MAM on various topics. For instance, Arcelik was able to make use of TUBITAK-MAM’s infrastructure such as its machines and laboratories. There have also been joint R&D projects such as the fuel-cell project. Moreover, TUBITAK-MAM has been involved as the subcontractor in some subprojects within Arcelik’s larger projects. Arcelik has
cooperated with other TUBITAK institutes and national universities on a variety of ventures.

Arcelik also cooperates with universities through the joint-thesis programme. Within this programme, university Bachelor, Master’s and Doctoral level students receive their thesis topic from Arcelik and also receive support from the company. There are protocols for this programme with ITU, BU and YTU. The programme started in 1997, and by 2008 there had been 86 studies at Masters level and above, and 48 at licence level. Moreover, 56 of these students started working for Arcelik after they graduated. By 2008, Arcelik had cooperated with 18 universities on R&D projects.

“One of the most important collaborations is the joint-thesis programme, where university students work on thesis topics which are selected by Arcelik” (Cemil Inan, written interview, 2008).

Arcelik also receives financial support from TUBITAK-TEYDEP for its R&D projects. Owing to the high risk of R&D investments, Arcelik’s management used these funds for long-term projects. Moreover, the first years of R&D government support were especially useful for getting experience in project management and international R&D. As of 2008, a total of 138 Arcelik projects were being supported, and Arcelik was the leading company in terms of TEYDEP projects (Radikal, 2007). According to Arcelik, R&D public support for university-industry cooperation projects also made Arcelik use this mechanism.

Another investigation topic has been the impact of the macroeconomic environment on the innovative activities of case study companies. According to Arcelik R&D management, their operations have not been affected at all.
Findings from the Vestel case study: cooperation and government R&D support

Compared with Arcelik, Vestel has traditionally been less integrated in the Turkish innovation system. As an outsider to the mainly Istanbul-based establishment, the Zorlu Group lacked strong ties with many national stakeholders, at least initially. Moreover, Vestel had focused mainly on the export market, and the domestic market was less of a priority. To a certain extent, the company reflected the self-made attitude of the founder, relying only on its own strength and trying to develop everything by itself.

According to Vestel officials, as time passed and Vestel grew in size and experience, the importance of local cooperation increased. The transition from analogue to digital TVs seems to have been a turning point.

“The fast transition to LCD technology caught Vestel unprepared. It was at this time that Vestel had to recognise that it cannot do everything on its own” (Metin Nil, personal interview, 2008).

Consequently, cooperation between Vestel and various local actors increased significantly. For instance, the successful image enhancement software (Pixellence) was a joint effort. For the development of this software, Vestel worked with Georgia Tech University, where a Turkish professor was an expert in this field, and with seven other local universities. The software development company that Vestel established (Vestek) and that worked on this project is located at the ITU University technopark. Another digital product software development company is located at the technopark at the Izmir Cabot Urla High Technology Institute. Currently, Vestel is working at the ODTU technopark on ASIC algorithms and its own chip manufacturing. Another important project by Vestel was the development of a hydrogen fuel cell. Here it cooperated with Nigde University, which had competencies in this field.

In conclusion, although Vestel came late to cooperation, it is now very much engaged in the national innovation system.
According to Vestel officials, Vestel is also receiving consultancy services from TUBITAK and support on complicated tests. The company has also cooperated with other companies such as Arcelik and Aselsan under the leadership of TUBITAK on compliance with the European Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (ROHS) initiative.

Vestel also receives financial support from TUBITAK-TEYDEP for its R&D projects. As of 2008, a total of 135 Vestel projects were being supported, and Vestel was the second leading company in terms of TEYDEP projects (after Arcelik) (Turkish Science and Technology institute, 2008b).

Vestel recognises the TUBITAK-TEYDEP grants as the most important innovation financing support. However, according to the company officials, accessing the government’s support is not the main factor behind its investments.

“We [Vestel] do not do R&D in order to get financial incentives from the government; we do it in order to survive in international competition” (Metin Nil, personal interview, 2008).

According to Vestel, accessing public support involves a lot of bureaucracy. It takes up to one year to get any support. Moreover, in the past the support funding was very low. Although funds have increased over the past 2-3 years, Vestel reports getting back only around 10% of its investments in terms of government support. “We start R&D projects before applying for any government support, but later apply so that we can cover at least some of our expenses” (Metin Nil, personal interview, 2008).

Vestel has high expectations from the new R&D support law. This law decreases the cost of employment for R&D personnel and increases the tax incentive for R&D expenses. In terms of government initiatives, Vestel finds patent financing is not adequate as the support does not cover international patenting expenses.

Vestel recognises the role of TUBITAK in establishing an R&D culture. During recent years, its cooperation with other companies has improved; so too has the interaction
between companies such as Arcelik and Turkcell. TUBITAK, in particular, has led some of these efforts. For instance, there is an electric-electronic technology platform where companies come together. In the past, there were hardly any occasions that brought competing firms together.

“Sectoral cooperation increased significantly. TUBITAK played an important role in bringing companies together” (Metin Nil, personal interview, 2008).

However, according to Mr Nil, there is not enough cooperation with universities on basic research as the academic success criterion is articles and not the success of projects. According to Vestel, there are still some differences in perception between the industry and TUBITAK as to what R&D is.

Like Arcelik, Vestel says it was not significantly impacted by the 2001 crisis, apart from a brief hiring freeze. After the economy recovered, the R&D department hired even more personnel. Yet it would be wrong to conclude that the macroeconomic crisis did not have any impact on innovation support. As a result of the economic crisis, the government had fewer opportunities to support large innovation projects.

“Arcelik, Profilo and Vestel contacted the government back in 2001 to get financial support to build a joint LCD screen production facility. This would have given the sector the possibility to compete with East Asian manufacturers. However, due to the economic crisis the government could not fund the investment” (Metin Nil, personal interview, 2008).

Another adverse impact of the economic crisis was that it decreased the willingness to share knowledge.

“People were afraid of losing their jobs and were unwilling to share knowledge. They saw knowledge as an insurance against dismissal. Only after Vestel became more institutionalised and the overall economic prospects improved, did people become much more open in sharing their knowledge” (Metin Nil, personal interview, 2008).
6. SUMMARY OF FINDINGS

This chapter of the dissertation focuses on the findings that relate to the first three research questions. The discussion of the last research question is covered separately in the last chapter of the dissertation.

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Exhibit 120: Overview of research questions and their place in the dissertation 129

6.1 Status and Development of the Turkish Innovation System

One of the main focus areas of this dissertation has been the Turkish innovation system. The dissertation has thoroughly assessed the status of the innovation system as well as its development path, and it has provided international benchmarks, wherever possible.

This section presents a summary of findings on the Turkish innovation system, and is structured in three main parts:

1. background conditions for innovation, the education system and government innovation policies
2. international comparison of the innovativeness of companies and other innovation indicators
3. development of the Turkish innovation system.

129 Author’s illustration
6.1.1 Background conditions for innovation, the education system and government innovation policies

Background conditions for innovation
Despite a positive trend, the macroeconomic environment remains one of Turkey’s most significant weaknesses. According to several surveys, such as the World Economic Forum Competitiveness Survey, the perceived risk of Turkey is much higher than comparable countries. Turkey’s inflation rate remains among the highest in emerging countries, and the current account deficit raises cause for concern.

On the more positive side, the Turkish financial system has become much more robust following the banking crisis of the early 2000s. However, the cost of finance remains very high. Turkey continues to have high real interest rates, which has a negative impact on innovation. In a recent IMD survey (2008), Turkey scored significantly lower on the category cost of capital than countries such as Thailand and Poland.

The legal and administrative environment in Turkey can be seen as not yet supportive of innovation. According to the latest ‘Doing Business’ report by the World Bank, Turkey was the 57th easiest country to do business in, which put it behind countries such as Mexico and Thailand. Moreover, IPR protection is not strong enough in Turkey, despite a comprehensive legal framework. IPR legislation is satisfactory, but administrative capacity is not yet sufficient to ensure effective enforcement of intellectual property law.

Turkey’s access to export markets, including to advanced-user markets, has improved significantly over past years. Turkey’s customs union with the EU gives it almost unrestricted access to one of the most advanced markets in the world. Moreover, Turkey has bilateral agreements with a growing number of countries. As a result, Turkish exports have increased dramatically over the past decade. Integration into global value chains has started, and development towards higher value-added is visible. Two of Turkey’s biggest export industries are the automotive and ICT sectors,
which consist of sophisticated, producer-driven global networks. Another positive development is that an increasing number of Turkish firms have begun exporting under their own brand names, which in turn has increased the demand for innovation.

Internally, the intensity of local competition is high. The customs union increased imports, with a positive impact on local competition. Moreover, the competition law and competition authority seem adequate and competent. According to the results of the World Bank survey (2008b), Turkey scored almost the same level as Spain and Korea and higher than Poland, Mexico and Thailand.

With regard to communication infrastructure, Turkey has a rapidly-growing broadband infrastructure, and has high penetration, especially in mobile telecommunication. However, costs remain very high. Overall, Turkey seems more developed than peer countries such as Mexico and Thailand but still behind the OECD average.

**Education system**

Assessment of the education system in Turkey has shown that the current Turkish population is rather undereducated at all levels. In certain areas, such as upper-secondary or university enrolment, it is behind comparable countries. It was not until 1997 that compulsory education increased to eight years. The university-educated population is also very low. However, recent efforts show that Turkey is on its way to tackling this problem. Enrolment rates and the number of graduates have increased at all levels of education.

In addition to low enrolment levels, the quality of education remains an issue for the general schools, and only a small proportion of the population receives good education. An analysis of the skills of 15-year-old pupils (PISA study) showed that Turkey is way behind all OECD countries except Mexico and there is no clear trend of catching up. However, the quality has been roughly at the same level as in other emerging countries, except Poland which has profited from its Soviet-legacy education system. In terms of quality, vocational schools perform less well than general schools. A closer look at the results shows another Turkish reality: that the system has a very elitist character, producing a small number of very good students
but providing poor education for the masses. The quality of education seems to have
decreased because the recent increase in enrolment levels has been very fast and
was not accompanied by a sufficient increase in resources. The only positive finding
on the quality of education is that Turkey has improved its performance in scientific
publishing significantly and is above all peer countries except Poland.

In terms of government spending, Turkey has increased its spending significantly
over recent years. Indeed, as a percentage of GDP, Turkish spending is among the
highest in the OECD. However, we have to put this into context since Turkey has a
growing population, and also starts from a much lower enrolment base. Compared to
an aging European country, Turkey needs to invest more in education. A closer look
at education spending reveals that Turkey spends more on university education and
much less on primary and secondary education. Moreover it spends much more on
elite schools than on general schools.

As a result, access to qualified human resources is an issue, especially at the low-
medium end of the labour market. According to the OECD (Gönenç et al., 2006), “the
most binding human capital shortages are at the middle and low end of the labour
market…the quality of education remains low at the majority of schools, and the
education system focuses predominantly on providing good quality education to the
most able students, who are channeled towards university and work in the formal
sector” (p. 153).

The effectiveness of allocated funds is also suboptimal, as Turkey’s supply of
graduates does not always match the needs of industry. In secondary education,
most pupils graduate from general high schools even though the government aims to
have 65% of the pupils graduate from a vocational school. At university level, most
graduates come from the arts and humanities fields although there is hardly any work
for them. The percentage of science and engineering graduates is not high enough,
with the number of computing graduates, in particular, remaining low.

Government innovation policies
Turkey has significant institutional resources and capabilities in the field of science,
technology and innovation. According to an EU study on innovation in candidate
countries, Turkey is the only country with specialised governmental and non-governmental agencies with a track record of managing funding and delivering assistance to enterprises for innovation. “Although not large in number, given the size of the country, there are private or publicly funded organisations in various regions that provide innovation support to business through technology parks, incubators, R&D centres, and consultancy, training and information dissemination mechanisms” (European Commission, 2003, p. 92).

However, the intensity and quality of linkages between the different actors in the innovation system is not strong enough. For instance, university-industry cooperation is weak but it is improving. Initiatives such as technoparks, academic referees at government-supported projects and industry-university joint research centres have been useful instruments. However, many projects have failed, in particular owing to the cultural differences between academics and business people. The government needs to do more to align the interests of academics and industry.

Innovation finance funding seems sufficient, as the percentage of companies getting innovation support is around the European average. Moreover, during the past decade, the percentage of companies that receive innovation support has increased. However, ease of access and information about availability could be improved. The assessment also shows that the interest and readiness of companies has been more important than the availability of government funds. In the past, the supply of government innovation finance funds exceeded the demand for them. The lack of interest from private companies had been identified as the main obstacle to the development of the innovation system. As previously noted, it was only after Turkey liberalised its trade and stabilised its economy that the private sector’s interest in innovation and innovation finance increased. This shows that the overall business opportunities for companies need to be improved before innovation support finance can produce results.

It has also been mentioned that public R&D has grown substantially, and that, specifically, spending on aerospace and defence technologies increased significantly. There are projects to create national satellites, national tanks, national
navy ships and submarines. Most of the defence projects are conducted jointly with private Turkish companies with support from TUBITAK.

Overall, it is possible to observe that Turkish innovation policy is influenced by the OECD and the European Union. The adaptation of the innovation system approach is a sign of this knowledge transfer, since the OECD has been one of the drivers of this approach.

Current Turkish innovation policy focus areas are: increasing the R&D investments of private companies; increasing cooperation between actors; increasing technology start-ups; and increasing the rate of the commercialisation of the results of R&D activities by research and higher education organisations. This focus has been criticised on a number of accounts. For example, the strong focus on R&D is seen as too one-sided. There needs to be a stronger focus on knowledge diffusion and non-technical innovation. However, the advantage of the current R&D-driven approach is that it produces measurable results such as patents. Moreover, a science organisation such as TUBITAK would be less suitable for supporting non-technical innovation. Here Turkey might need to give the lead to another organisation to promote non-technical innovation and human resource development.

Nevertheless, analysis of the development of Turkish innovation policy over time shows that the policy makers are capable of ‘learning’. Although evaluation mechanisms can be improved, Turkish policy makers have shown a remarkable learning path over recent years. A significant number of gaps identified in the past years, such as weak start-up support or the unattractive venture capital law, have all been addressed.

6.1.2 International comparison of the innovativeness of Turkish companies and other national innovation indicators

Innovativeness of Turkish companies
According to the Community Innovation Survey conducted by the Turkish Statistics Institute in 2006, 35% of Turkish companies were engaged in technological
innovation and 51% were engaged in marketing or organisational innovation. Comparison of the Turkish results with those of other European counties shows that Turkish companies are more innovative than the development level of the country would suggest. Moreover, companies report the positive impact of innovation on a variety of factors and seem to have profited more widely from innovation than other European companies. However, the latest innovation survey indicates that the overall impact of innovation is decreasing. This is especially evident in the category of increased international market share. It seems as if innovative companies reaped the benefits of innovation earlier and are now facing diminishing returns.

At the sectoral level, sectors with strong export growth have increased their innovativeness. Automotive, TV and white goods manufacturers make up the largest share of innovative companies. The important textiles sector has very few innovative companies and shows a negative trend. R&D spending data supports this finding. R&D spending is especially strong in the ICT, white goods and automotive sectors. As for the spending per sector, the automotive sector is leading in R&D spending with 40% of total industry spending, followed by the machinery (including white goods), TV and radio, non-metallic materials and minerals sectors. If we look at R&D personnel figures, the automotive sector spends roughly the same amount on personnel as the other two leading sectors. Not surprisingly, the textiles and food sectors have very low R&D spending.

Overall, there has been a shift in strategy among Turkish companies, and there is more focus on product differentiation and quality. According to Ulusoy and Yegenoglu (2006), the dominant product strategies of the manufacturing sector in Turkey have changed from ‘focus on cost’ to ‘focus on differentiation through product variety’. Innovation, which was the least important factor in explaining success four years ago, is now considered to be a major means of survival.

In terms of investment trends, R&D spending by industry is increasing. The R&D spending of Turkish private enterprises more than doubled between 2004 and 2006. Compared with 2000, both total spending and spending on personnel increased by more than seven times. In international comparisons, we can see that R&D spending is higher than in most of the comparable countries including Poland. However,
Chinese industry’s R&D spending and its development path show that Turkey is still not in a similar catching-up mode.

The innovativeness of Turkish companies and R&D spending has increased in parallel with the increase in comparative advantage in technology-intensive sectors. As a result, compared with 1996, both the unit values and technology content of exports has increased significantly. In terms of export sectors, we can see that while sectors such as apparel or textiles were the most important in 1996, by 2007 automobiles, manufactured machines, and electrical devices had become strong. The percentage increase in higher-technology sectors was much higher than in labour-intensive sectors. Moreover, Turkey’s competitive advantage in technology-intensive sectors has increased over time, whereas its competitiveness in labour-intensive sectors has decreased.

It has also been identified that R&D is crucial for the international competitiveness of Turkish manufacturing firms. Research shows that innovation and R&D activities have a positive impact on exporting by Turkish manufacturing firms. On the other hand, technology transfers through licence or know-how agreements are not significant determinants of export performance. These findings suggest that a national technology policy needs to give priority to promoting in-house innovation.

Although R&D spending by Turkish companies has increased, most of the innovation comes from the use of new advanced machinery. This is especially true for smaller companies whose innovation is mostly related to new machinery. In larger companies, the percentage of in-house R&D has increased whereas the share of new machinery has decreased. Overall, among Turkish enterprises the ability to use the most up-to-date technology to improve processes and products is strong. As the European Manufacturing Survey from 2003/2004 showed, Turkish industry used ERP software more than countries such as Italy and UK, and was among the leaders in the deployment of continuous improvement schemes and teamwork.
With regard to innovation cooperation, the overall level is low: most cooperation is with suppliers and only very few companies cooperate with universities. These findings are similar to data from other European countries which share the same difficulties in promoting university-industry cooperation. However, we also see that larger companies that have in-house R&D departments cooperate more with universities and public R&D institutes.

Cooperation between firms remains low but has increased over time owing to the economic crisis, exports and government initiatives. “Inter-firm cooperation has been difficult for the Turkish business sector due to their conservative structures as family owned and owner-managed companies. However, driving forces such as globalisation, EU candidacy (especially participation in the EU’s 6th framework programme), government initiatives (e.g. incentives for technology development zones) and, most importantly, the effects of the severe macroeconomic crises in 2000 and 2001 (i.e. export orientation of the industry due to narrowed local market) have forced the business sector to become innovative” (Elci, 2003, p. 80).

**Innovation indicators: an international comparison**

One of the most widely-used indicators for comparing countries’ innovation activity is R&D spending as a percentage of GDP. Although it is purely an input factor, it still provides a good overview of the magnitude of technical innovation activity. When we compare Turkish R&D spending as a percentage of GDP, we see that Turkey’s spending and development compare favourably with other developing countries such as Poland, Thailand and Mexico. However, the spending level is still much lower than the OECD average. It is accepted that 1% of GDP is a critical mass that needs to be reached, and Turkey has not yet reached it (it was 0.76% as of 2006).

Another important indicator is business’s (private companies’) share of total R&D spending, as the ultimate aim of most policies is to make companies innovative. If government spending is too dominant, it is accepted as being inefficient. It is common that, in the early stages, government spending dominates, and, as the economy develops, corporate spending takes over. In Turkey’s case, the percentage
of R&D performed by companies is still less than 50% but this has increased steadily over the past few years. Currently, Turkey’s share of private R&D spending is less than that of Mexico but higher than Poland’s.

In terms of the results of R&D, the most significant and best comparable indicator is patents. In Turkey’s case, although the current level is very low, it is growing fast and has an edge over peer countries. Almost all developing countries and even Spain lack significant patenting activity. Among developing countries, only China seems to have made real progress. However, Turkey is rapidly increasing its patenting activity and, if the trend continues, we can expect Turkey to start catching up in this respect.

Another innovation indicator is the international scientific publications that a country produces. Turkey’s scientific publications have been few but are rapidly catching up with developed countries. During the past decade, the growth has been significant and, if the trend continues, Turkey seems to be on its way to catching up with the OECD average. Among other developing countries, only Poland has more articles per million population, but Turkey has been growing at a faster rate.

Royalty receipts show whether a country is producing globally-marketable intellectual knowledge. According to the latest figures, Turkey has no royalty receipts and does not pay many royalties to other countries. The complete lack of royalty receipts shows that Turkey has not yet reached a stage where it can export knowledge. On the other hand, the low spending on licences is mostly due to the lack of significant FDI. Latest research shows that most licence payments are made by foreign affiliates of multinationals, with the aim of repatriating profits.

High-tech exports as a percentage of total exports is also used as an innovation indicator. In this area, Turkey scores lower than all its peers. Part of the explanation is that Turkey has not attracted any FDI in high-tech sectors such as aerospace or semiconductors. Moreover, Turkey lacks national firms that have significant production in such sectors. It is interesting to observe that this indicator does not seem to correlate with the other indicators, as Turkey ranks better on most of the other indicators. In fact, the use of this innovation indicator seems questionable. Foreign affiliates of multinationals in developing countries often do not engage in
technology development but import technology from their home country. As a result, the importance for the local innovation system seems to be insignificant. This situation would explain the otherwise poor innovation performance of countries with high-tech exports such as Thailand, Malaysia and Mexico.

6.1.3 Development of the Turkish innovation system

In the 1980s, Turkey had a relatively stable macroeconomic environment, with stable leadership under one-party rule. There was constant growth until the end of the 1980s. During this period, Turkey switched from import substitution to export promotion and liberalised its trade regime. The government encouraged exporting using low exchange rates and financial incentives. Financial liberalisation at the end of the 1980s attracted foreign capital. However, at the same time, the government deficit and inflation started to increase. On the education side, there has been a stronger focus on university enrolment and graduate education. As for innovation policy, the Turkish government formulated the first real science and technology policy and established an oversight council chaired by the prime minister. However, during this period, there have been few tangible results from this strategy. R&D spending remained less than 0.5% of GDP and private sector spending was virtually non-existent. This period ended with a contracting economy caused by high inflation, large budget deficits and a widening current-account deficit.

The 1990s were a period of very unstable growth, with the high-growth years ending each time with economic crisis. High inflation and large budget and current-account deficits continued. Moreover, this was a period of extreme political instability where short-lived coalition-governments became the norm. In addition, the end of the 1990s brought with it a number of external shocks such as the Russian default, the Asian crisis and two major earthquakes. Within this unfavourable macroeconomic environment, Turkey continued with trade liberalisation. The most significant development was entering a customs union with the EU and becoming a member of the WTO. Exports continued to increase and started to extend beyond the traditional textiles exports. With regard to innovation policy, Turkey adopted the innovation systems approach after the mid-1990s, and started to support company innovation. A number of policies to support innovation and R&D were implemented. In education
policy, the focus on university enrolment continued and, in 1997, Turkey finally succeeded in making eight years of education compulsory for the whole country.

The 1990s ended with economic crisis, the bankruptcy of several banks and a very high debt burden. After 2001, however, Turkey recovered strongly. Following the decade of instability, two successive terms of solid one-party rule began. Under the watchful eye of the IMF, Turkey achieved fiscal discipline. The banking sector was reformed and consolidated. Inflation decreased dramatically from over 100% to less than 10%. Exports showed a rapid increase and became more diverse, with a trend towards higher technology content. Innovation policy in Turkey after 2000 continued to follow the policies of the 1990s but more resources were invested. Funds dedicated to financing the R&D activities of companies increased significantly. There was a stronger focus on public R&D, with Turkey launching national technology development projects, especially in defence and aerospace.

Furthermore, university-industry cooperation and start-up promotion became more important, with the launch of new initiatives to support them. Within this period, the innovative activities of private companies, as well as R&D spending, increased steadily. Patenting activity gained pace, taking off from its negligible levels in the 1990s.

With hindsight, the first successes can be seen to have started with the increase in scientific publications after 1985. This was made possible by a new focus on graduate education in the early 1980s. Enterprise R&D spending increased in the second half of the 1990s and was driven by export-intensive sectors. Patenting activity increased after 2000 as more and more companies discovered the advantage of IPR protection in international competition. Public R&D increased after 2004, reflecting a new focus on innovation.

Three main developments seem to have been critical in recent progress. Trade liberalisation opened up new markets and exposed companies to international competition. This increased the incentives for companies to innovate. In education policy, the focus on graduate education and the use of publications as a criterion for academic promotion created a supply of researchers with the incentive to publish. In
innovation policy, the adoption of the innovation system approach led to Turkish companies receiving better support for their innovation activities.

6.2 Learning and Innovation in Turkish Consumer Electronic Companies

The case study of the two Turkish consumer electronics companies shows that, overall, both companies have developed strong learning capabilities. For instance, the management’s commitment to learning has been strong in both cases, and has been an important part of corporate strategy. Both firms identified staying ahead of changes and continuous learning as key competitive advantages. One of the companies, Arcelik, had professional employee development and training processes in place, and the other company, Vestel, had more recently established professional human resources. In addition, Arcelik had formal innovation rewards in place, something Vestel lacked. In terms of a shared vision and coordination within the firm (systems perspective), the larger and more established company, Arcelik, had weaknesses in integration and coordination between units. Moreover, there seemed to be room for improvement in terms of communication within the company. Vestel scored better on this account since its structure was less hierarchical and had higher empowerment. With regard to openness and experimentation, both companies saw initiative-taking and openness as very important strengths. Arcelik had more established processes for feedback and improvement, while Vestel was more active in the benchmarking of new ideas. As for knowledge transfer and integration, both companies expressed the weaknesses of their knowledge-transfer infrastructure. However, both companies work extensively in project teams, which facilitate knowledge exchange.

The overall positive verdict on the learning capabilities of these two case study companies is validated by analysis of the results of learning efforts. Whereas the learning capability assessment relied only on qualitative data and inputs for innovation, the use of innovation indicators such as patents or sales from new products provided a more tangible and output-based view.
The capability to create patentable technology is regarded as a sign of more advanced innovation activity. Both case study companies have a growing number of international patent applications. Moreover, international comparison shows that most other developing-country firms, except those in China, lack their own patents. This shows that these Turkish companies have been able to reach a stage where they can develop their own technology. This is especially true for Arcelik, which has been applying for patents since the mid-1990s and is the leader in Turkey. Vestel’s first patents came five years later, but the number is currently growing at a faster pace. Overall, in terms of R&D activities, Arcelik has had clear and long-term commitment over the years and reached its current high patent levels after a decade. At Vestel, the commitment to R&D increased especially after the transition to LCD technology, but it is some years behind Arcelik in technology development.

In terms of transition to new technologies, Arcelik has been one of the leaders in green technologies (especially white goods) but it has been slower in its transition to LCD technology. This weaker performance is in line with the fact that Arcelik is a white goods company at heart. Vestel, on the other hand, has only been a follower in green technologies, but has been faster than Arcelik to adapt to the changes in the LCD market. In general, both companies lost significant market share during the transition to digital TVs. However, if we compare their performance to that of Chinese or Indian companies, we can see that Turkish companies were faster to react to these changing conditions.

Design is another field that requires learning efforts. In this area, Arcelik has won international design awards in both the TV and home appliances segments. In contrast, Vestel had won no awards at the time of writing. One explanation is the differences in the corporate strategies of the firms. Whereas Arcelik focuses on a complete own-branded product strategy, Vestel aims to maintain a high OEM sales share. A company’s own design plays a more important role if an own-brand strategy is pursued. International comparison reveals that design awards show a certain correlation with patenting activity. Chinese companies with a high number of patents have all won design awards, whereas companies that lack patents also lack design awards. Therefore, the use of design awards as an innovation indicator seems to be useful.
Development of innovation at case study companies

Arcelik was established in the 1950s and did not have any significant innovation activity until the 1990s. It acquired technology through foreign licensing and did not feel the need to develop its own technology. It was the dominant player in the domestic market and faced little competition. Turkish trade liberalisation changed this stable situation. At the end of the 1980s, after being motivated by the government, Arcelik experimented with exporting and started OEM production. Moreover, the Turkish government expressed its wish to enter a customs union with the EU, following a failed attempt to become a member of the EU. For Arcelik this meant not only access to a large market but also a threat to its dominant position in Turkey, as it entailed a reduction in import restrictions. During the same period, Arcelik started to face difficulties in gaining access to technology as foreign companies increasingly saw the Turkish company as a potential competitor. According to company sources, this was when Arcelik decided to experiment with developing its own technology, and began making its first R&D investments. Encouraged by its first successes, Arcelik continued to invest in technology and applied for its first international patents after the mid-1990s. After 2000, the number of patents increased significantly, reaching a level where the company could compete with the global leaders. Moreover, Arcelik made the transition to green technology earlier than most other companies. Currently, Arcelik is pursuing an own-brand global expansion strategy, with its white goods flagship Arcelik and its Grundig brand in brown goods.

Vestel’s faster learning path started in 1994 when a new management decided to use a multiple-product and flexible-production strategy. This strategy necessitated improvement in the production process, and the first R&D operations began for this reason. Vestel’s desire to improve its margins was a key factor driving learning efforts. However, after the first successes in gaining market share in Europe, the company decreased its efforts. It was producing a mature technology product (TVs) and was successful at it. There seemed to be little incentive to develop new technologies. After some years of neglect, the transition to digital TVs threatened Vestel’s business model. Sales of analogue TVs decreased unexpectedly quickly, and Vestel started to experience financial difficulties. At this stage, Vestel was forced to increase its R&D efforts to develop its own technology for digital TVs. One positive development was that digital technology increased the importance of software, which
had lower entry barriers. As a result, Vestel achieved some successes, and its patenting activity increased.

It can be concluded that competition played a major role in motivating Turkish consumer electronics companies to innovate. As long as easy profits were possible, neither company engaged in intense learning efforts. Only a combination of threats and opportunities forced them to become innovative.

Another interesting finding was that the OEM to OBM learning path is not only an East Asian phenomenon: Turkish companies follow it as well. So far, there have been very few examples showing that the East Asian learning path is replicable in other regions. But this case study shows that the learning path of Turkish consumer electronics companies is very similar to that of East Asian electronics companies before them. Both companies moved from simple assembly operations to basic research and have engaged in OEM production.

Other findings
The case study shows that catching up with advanced country firms has been easier in the white goods segment than in the brown goods segment. In white goods, developing countries have almost caught up with the market leaders in advanced economies whereas in the brown goods segment the gap has not closed. Both Turkish and Chinese companies provide evidence for this.

Another finding is that learning and innovation indicators show high correlation. Overall, the learning effort takes place in many dimensions at the same time. In most cases, companies with strong R&D are better at international expansion, more advanced in terms of product design, and faster in the transition to new technologies and trends.

Moreover, the case study and the international comparison showed that the technological state and development opportunities of the product play a significant role in learning efforts. When Vestel was producing analogue TVs, it focused only on
production efficiency. When the shift to digital technology occurred, Vestel started to develop its own technology.

6.3 Assessment of Case Study Companies in the Light of the National Innovation System

Comparing the development of the innovation system with that of companies
The comparison has shown that both Arcelik and Vestel are among the pioneers of Turkish R&D and innovation. Arcelik, especially, has been the patent champion of Turkey and started investing in R&D almost a decade earlier than other companies. Vestel’s development has been more in line with overall development in Turkey, and after 2006 it increased its pace significantly. As a whole, a convergence of R&D spending and patenting is visible. Although Arcelik is the clear leader, the rest of the industry is catching up. For instance, Vestel has already caught up with Arcelik in terms of R&D spending as a percentage of sales, while total Turkish R&D spending is also increasing. The same is true for design awards: although Arcelik was the first company to win awards, other companies started winning as well after 2005.

Impact of the innovation system on companies
In terms of cooperation with other innovation system actors, both companies have strong ties and cooperation with TUBITAK institutes. Arcelik has joint projects with the institutes and even subcontracts some parts of its larger projects. Furthermore, it has been a major participant in basic research projects such as the national fuel-cell development project. Arcelik is also one of the most important participants in the industry-thesis programme, where students work on topics that are relevant to companies. Vestel is also receiving support from the TUBITAK institutes and it is cooperating with local universities. One example is the cooperation on the development of a hydrogen cell with a local university that had expertise in this field. Vestel cooperates with other universities on chip development and display software. It also profits from the technopark infrastructure and has a number of start-ups operating in technoparks. For instance, Vestel’s image software development unit is located at an Istanbul technopark.
Recently, interaction between companies has increased, and TUBITAK is receiving credit for its activities in this field. For example, technology platform meetings bring together companies such as Vestel and Arcelik or Turkcell (Telecom). According to the case study companies, these platforms are very useful since they would not have other opportunities to get together in this way.

Interaction between innovation system actors and case study companies has increased over time. During the early days of its R&D efforts, Arcelik reports getting consultancy on R&D projects. Later, as Arcelik personnel gained more experience, the cooperation took the form of more joint projects and the development of specific technologies. Arcelik states that, during the early years, Arcelik R&D experienced difficulties owing to the lack of a developed innovation system. The early impact of the innovation system, therefore, was not positive.

Arcelik was a major actor in the innovation system from the beginning, and it had strong ties to government institutions. In contrast, Vestel was initially detached from the national innovation system. Its strong export orientation had decreased the importance of the domestic market and weakened its interactions with local actors. After 2005, the transition to digital technology forced the company to develop its own technology, and during this period Vestel started searching for cooperation possibilities. It was able to establish a number of useful local partnerships, and has been a very active player in the innovation system ever since.

Another important finding is that the financial support from government is not seen as a reason for R&D investments. It is seen as more of a welcome supplement than a significant contribution. Since Arcelik and Vestel are among the biggest beneficiaries of government funds, we can conclude that, in general, innovation support finance has a limited impact on the initiation of R&D investments. It seems to act more as a reward for innovative activities. In addition, it helps the accumulation of R&D project management know-how. Another positive impact of these innovation finance schemes has been that they support university-industry cooperation since academic referees are involved in most projects.
However, cultural problems continue to come between business and academia. It seems that the incentives for academics to collaborate on projects with industry are not strong enough. The academic focus on publications is seen as one-sided and obstructive to cooperation with companies.

Another finding is that the domestic macroeconomic crisis has had little impact on the R&D investments of both companies. Whereas Arcelik reported no impact, Vestel mentioned a brief hiring freeze followed by stronger growth in the number of R&D personnel. One negative effect of the domestic macroeconomic crisis seems to have been a change in attitude towards knowledge-sharing. Over the past few years, Vestel employees have become much more open to sharing their knowledge since they feel their jobs are secure. Willingness to share information seems to decline in crisis times, as employees try to keep knowledge to themselves, as an insurance against potential dismissal.
7. DISCUSSION OF FINDINGS

This chapter is based on the findings of the previous chapter and aims to identify insights for developing-country policy makers.

| Research question 1: status of Turkish innovation system |
| Research question 2: innovation at case study companies |
| Research question 3: interaction between system and companies |
| Research question 4: implications for developing countries |

Exhibit 121: Overview of research questions and their place in the dissertation II

The chapter is structured in a way that it presents a number of relevant topics that have been identified throughout the study. The implications of these findings per topic are discussed and then summarised in the section ‘Potential implications for policy makers’. The following topics are covered:

- role of national innovation support policies on company innovativeness
- education and innovation
- role of international trade
- role of foreign direct investment
- role of technology/sector.

7.1 Discussion of Findings

Role of national innovation support policies on company innovativeness

During the past decade, the innovativeness of Turkish companies and the amount of innovation support funds available from the government have increased in parallel. Annual allocated amounts increased from US $20 million in 2000 to US $128 million

130 Author’s illustration
in 2006; the number of companies supported increased from 178 to 481 during the same period. Moreover, the percentage of innovative companies getting financial support from the government has increased significantly over the past decade.

However, the study also shows that the way innovation support finance has been conducted in Turkey has not been effective in creating innovative enterprises. Insights from the case studies show that the innovation financing provided by the government has not been the reason for R&D investments. Funds provided by the government have been regarded as a welcome but not critical contribution to the companies’ R&D budgets. Furthermore, most project applications were made by large and established companies, with small and new companies accounting for a relatively low share of applications.

Back in the mid-1990s, when the innovation finance scheme was launched, the supply of funds exceeded the demand for them. According to a pre-2000 survey, innovation finance did not have a positive impact since most companies had financing problems for their daily business. In addition, macroeconomic instability made longer-term R&D investments impossible. Only after 2000, when the overall economic conditions got better, access to general finance improved and export markets gained in importance, did demand for innovation finance increase accordingly. As long as companies lack opportunities to commercialise their innovations and turn them into profit, government initiatives to support innovation will remain fruitless.

However, this does not mean that innovation project financing has been useless. Both case study companies have actively applied for support, showing that the returns are significant enough. The overall number of applicants for funds has also increased steadily. According to one company, the project finance scheme helps it fund longer-term riskier projects. In addition, the innovation support scheme has been useful in establishing an R&D project management culture. Another positive impact of these schemes was that they initiated cooperation between academia and industry. In order to get access to the funds, companies need to work with an academic referee, and this creates relationships between these experts and companies that usually go beyond particular projects. In general, we can conclude that the way
innovation project finance is implemented in Turkey is useful for guiding and rewarding R&D efforts, and it helps establish interaction between academia and companies. However, it is less successful in creating new innovative companies.

From 2006, the Turkish authorities reacted by creating a number of programmes aimed at smaller companies and start-ups. The aim is to provide consultancy and funds at an earlier stage and to grant easier access to funds with less bureaucracy. The experience of Turkey shows that there is a need for separate programmes for supporting innovation and for creating innovative companies. Moreover, the Turkish experience shows that companies need to recognise the link between innovation and profits themselves; innovation finance support cannot compensate for their lack of interest.

One innovation support scheme that has been extremely ineffective is the use of tax incentives. In Turkey, the possibility to defer tax payments has been used by a very small number of large companies and has not been regarded as significant. The experience of Turkey shows that the use of tax incentives in the early development stages of an innovation system is useless. There has to be a certain level of existing R&D activity to make such schemes appealing. In the early stages, access to funding for the first innovative activity is more important; only after innovative activities increase can tax incentives become a stronger reward for innovation and motivate further investment. Even in this case, the impact will be limited to larger companies with separate R&D departments which can clearly differentiate between R&D activities and normal operations.

In its efforts to foster cooperation between universities and industry, the Turkish government has had a degree of success. The number of companies located in the technoparks has increased continuously, and the results in terms of exports and patents have been significant. One of the case study companies has R&D units in three different technoparks. The other case study company reports having increased cooperation with universities since the government provides more funds if it does so. The same company also cooperates with government R&D institutes. However, there is still a culture and objectives mismatch between universities and companies. The incentives for academics to cooperate with industry seem insufficient. Here the
Turkish experience suggests that technoparks can be useful tools for developing countries, and that providing monetary incentives for university-industry cooperation can work to a certain extent. However, the Turkish experience also underlines the fact that aligning the interests of academia and business remains challenging.

Another important accomplishment of the Scientific and Technological Research Council of Turkey (TUBITAK) has been the promotion of an innovation culture. The case study companies give TUBITAK credit for its efforts in this. TUBITAK has created platforms where competitors or companies from related industries can come together. Such platforms are valued by companies since they often provide the only opportunity for company officials to come together.

Overall, the Turkish experience suggests that having one central organisation in charge of R&D development has benefits. TUBITAK in Turkey has been the champion of R&D and innovation over the past decades and was a driving force behind the recent developments. It is important that one organisation has a full overview and can receive credit for all progress. However, owing to the strong focus on R&D, non-technological innovation seems to be neglected. Therefore, it might be necessary to give another organisation the lead in non-technological innovation.

**Innovation and education**

The analysis of the Turkish education system has shown that the Turkish population is less educated than that of many comparable countries. Both the percentage of the population with more than five years’ schooling and the percentage of university-educated people are low. The quality of secondary education is also low, as seen from the PISA results. However, these results are comparable with other developing countries, with only Poland scoring significantly higher. Another characteristic of the Turkish system is that it is elitist, with much higher spending on good students than on the rest. Furthermore, spending on university education is higher than the development level suggests, whereas spending on primary and secondary levels is lower. Turkey has only recently started focusing on increasing secondary schooling levels. Increasing university enrolment levels has been a priority since 1980, and increased in pace after 1990. Moreover, from the 1980s onwards, Turkey has increased its focus on graduate education. It has also adopted an Anglo-Saxon-style
graduate education system and made international scientific publications the main criterion for promotion.

It is widely accepted that the education level of a society and its innovativeness go hand in hand. However, a comparison of Poland and Turkey shows that the relationship is more complex than that. In Poland, both the reach of education and the quality of education is much better than in Turkey. Yet in terms of the innovativeness of its companies, as measured by the surveys, R&D spending as a percentage of GDP, and patent applications, show that Turkey has the edge over Poland.

The Turkish experience also shows that it is possible to increase the number of international scientific publications significantly by focusing on graduate education and making publishing the main criterion for promotion. After the 1980s, Turkey began its steady rise in publications rankings, although its enrolment levels continued to lag behind.

Role of international trade in innovativeness of companies
R&D expenditure and patenting activity in Turkey started to rise in the mid-1990s. Between 1995 and 2000 industry R&D expenditures tripled, and between 2000 and 2006 they doubled. There was a significant increase in patenting activity after 2000. The overall innovativeness of Turkish firms has grown consistently since 1995. The most innovative industries (as seen from innovation surveys), which also made the highest R&D investments, were the white goods, brown goods and automotive sectors. These sectors have also been the driving forces behind the Turkish export boom that started after the mid-1990s and exploded after 2000. Indeed, research (Ozcelik and Taymaz, 2004) has shown that innovation and R&D activity are crucial for the international competitiveness of Turkish manufacturing firms. Analysis of innovation survey data for the 1995-1997 period shows a correlation between innovation and export performance.

The mid-1990s are also the time when Turkey’s trade liberalisation increased pace. In 1995, Turkey joined the WTO and at the end of the same year it entered into a
customs union with the European Union. In the following years, Turkey pursued a very active policy in opening more markets to Turkish exporters.

As mentioned, Turkey’s openness to trade and the innovativeness of its companies have shown parallel development. Moreover, research suggests that innovativeness has helped export performance (Ozcelik and Taymaz, 2004).

The case study analysis provides more insights into how openness to trade has an impact on the innovativeness of companies. One of the case study companies, Arcelik, was the dominant domestic producer with over 50% market share. Production had been carried out using foreign licensed technology. The company was able to enjoy steady profits and a stable market condition. We have seen that Turkey’s trade liberalisation threatened this stability. Foreign companies that had supplied the company with technology became less willing to do so. They did not want to supply a potential competitor. Therefore, Arcelik was suddenly unable to procure the latest technology. Simultaneously, Turkey started opening the country to imports, which threatened Arcelik’s strong position in the domestic market. Arcelik was left with the choice of either selling the company or starting to develop its own technology. The possibility of status quo had become impossible. As a result, the company chose to try to develop its own technology and begin international expansion.

The other case study company, Vestel, took a slightly different path. First, its domestic position was not as strong. The threat of imports was therefore not a real motivation for the company to innovate. After the ownership change in 1994, the company selected an international growth strategy based on product variety. Increasing production efficiency was necessary to decrease costs since Eastern European and East Asian competition had much lower cost structures. Also, the company had to become more flexible about satisfying the demands of its customers, which required process innovation. To conclude, Vestel’s innovativeness was related to the opportunities of the export market and the requirements of international competition.
In summary, Turkey’s openness to trade impacted both case study firms in different ways, but as a whole the impact was definitely positive. The threat of imports, the lack of domestic growth opportunities and difficulties in accessing the latest technology pushed Arcelik to become the most innovative company in Turkey. Arcelik had been established for 40 years before the technology development really took off. The fact that it started developing its own technology and began exporting only after Turkey’s trade liberalisation shows that this process provided strong incentives for innovation.

Vestel’s case shows how the international market can provide opportunities for dynamic companies. It also shows how innovative efforts are required to succeed in international competition. Turkey’s relatively high labour costs might even have increased the innovativeness of Vestel, as they significantly increased the incentives for the company to become more efficient.

Another advantage of exporting is the stability that it provides through market diversification. Many developing countries are crisis-prone, and therefore domestic companies face considerable difficulties in long-term planning. Access to export markets can act as insurance against domestic crises as it is possible to shift production to serve unaffected foreign markets. This positive impact of exporting has been visible in Turkey’s case. When the domestic market went into serious crisis at the end of the 1990s, both case study companies were not affected too badly as they were able to increase their export sales. Therefore, openness to trade can have a positive impact on innovation by providing the longer-term market stability that R&D investments require.

In conclusion, the Turkish experience suggests that trade liberalisation has a very positive impact on the innovativeness of companies. Indeed, it seems to be one of the major factors driving innovativeness. We might add that most of Turkish exports have been to the European Union, where users are very advanced. The positive impact of exporting might have been lower if exports had gone mainly to less-developed countries.
Role of foreign direct investment

If the role of trade and exporting is so important, one would expect innovativeness and exports to go hand in hand. This is especially the case for countries with a high share of technology exports, which should be much more innovative than other countries. The spill-over impact of these industries should have a positive impact on other sectors. A closer look at selected countries such as Malaysia, Thailand and Mexico seems to contradict this proposition. These three countries have considerable high-technology exports. In addition, their overall manufacturing exports are very high. However, if we disregard high-technology exports as an innovation output indicator, these countries show weak performance. All three have made fewer domestic patent applications to the World Intellectual Property Organisation (WIPO) than Turkey. All three have lower R&D spending as a percentage of GDP than Turkey. And all three have significantly fewer scientific publications than Turkey. How is this discrepancy to be explained?

One difference between Turkey and these three countries is the role of foreign direct investment (FDI). In Turkey, until recently FDI had a very low impact on exports. Even when FDI finally arrived after 2000, most of it was in non-export-generating industries such as banking or telecommunications. For instance, FDI is absent in brown goods exports and has less than a 20% share in white goods. Foreign companies’ share of the automotive sector is higher; however, the majority of exports still come from joint ventures where strong domestic players are involved. In comparison, the export-oriented electronics industries of Malaysia, Thailand and Mexico are firmly in foreign hands. Overall, most of the high-technology exports come from foreign affiliates. However, these companies have very little local R&D effort. The end-product might be high technology, but the local value-added might be low technology. Basically, we can conclude that high-technology exports are not a suitable measure of local innovation output.

As noted, foreign operations in technology-intensive industries might contribute little to the technology development of the country. It is even possible that these foreign companies have an adverse impact on local development. In Turkey, most technology development has been done by locally-owned companies. If foreign
affiliates serve export markets that could have been served by domestic-owned companies, the overall technology development potential of the country might be severely limited.

The success of consumer electronics companies in Turkey seems to imply this. When compared to Mexican or Malaysian companies, Turkish companies have already started developing their own technology and even have their own international patents. In order to survive in the international arena, Turkish companies had to upgrade their technology base, and this has been a driving force behind innovation. On the other hand, compared to locally-owned companies, foreign affiliates have easier access to markets and technology. It is this easy access to technology that explains the relatively low indigenous innovative efforts. There is hardly any incentive for a subsidiary to develop its own technology if it can transfer the knowledge from its parent company. As for local companies, they often have no choice but to develop indigenous capabilities. As the case study implies, companies only engage in activities if they are forced to and if they can gain economic benefits. That is not always the case for foreign affiliates.

This does not mean that foreign subsidiaries never innovate. There is enough evidence, increasingly so from Turkey, that once the innovation system of a country develops, foreign companies also start doing research, basically for economic reasons. If locally-developed technology can provide added value, then foreign companies will also carry out research. For instance, Turkey has relatively advanced R&D capabilities in white goods, and the local subsidiary of BSH (Bosch-Siemens) has also started to develop technology locally and to apply for patents from Turkey.

The automotive sector offers another interesting insight with regard to ownership structures. Joint ventures with equal ownership seem to be much more innovative. Moreover, the strength of the local partner seems to play a significant role. This can be explained by the fact that the local partner has a strong incentive to make the domestic location attractive and competitive, whereas the foreign multinational can relocate to another country. Advanced capabilities such as R&D increase the attractiveness of the domestic location, so domestic partners have the incentive to drive efforts to become more innovative. This can only be the case if the domestic
partner is sufficiently strong. As already seen, innovativeness depends almost exclusively on the incentive structure in which companies operate.

In general, the Turkish experience suggests that if export-oriented, medium-high technology-intensive sectors are dominated by foreign subsidiaries, domestic technological development is likely to be low. The learning effect is much higher if locally-owned companies become integrated into the global value chains. Only once the local innovation system is more developed do foreign affiliates’ contributions to local technological development increase.

Impact of technology on the innovativeness of companies

The case study shows that the technological development of the white goods arm of Arcelik has been the most advanced. Arcelik has rapidly increased its international patents, and, in terms of capabilities, it has been able to compete with international competition. On the other hand, its brown goods arm (Beko) has been less successful in terms of patents. Analysis of Chinese companies reflects the same picture. Whereas the white goods company Haier had a growing stock of patents and has almost caught up with international competition, the leading brown goods company TCL is much less advanced in technology development. The fact that the white goods arm of Arcelik has been more successful than its brown goods arm suggests that sectoral differences rather than company-specific factors have been the cause.

The white goods sector is characterised by a slower pace of technological development and less R&D intensity. It seems that, as a consequence, catching up with advanced companies is more feasible than in brown goods. The higher possibility of catching up in turn increases the incentive to invest in R&D and innovation.

However, innovativeness in technology-intensive sectors is not completely out of reach for developing-country firms. The rapid transition from one technology to another can also create possibilities. For instance, Vestel’s R&D efforts gained pace after the transition to digital technology. This transition forced Vestel to learn more intensively owing to loss of market share. Moreover, digitalisation decreased the
importance of hardware in favour of software. It seems that catching up is easier in software development, and Vestel has recently been making progress on this front.

Generally, there is a widely accepted belief that, in order to increase overall innovativeness, focus has to be placed on high-technology sectors. However, the Turkish experience shows that a white goods company can play a pioneering role in technology development. Arcelik showed that it is possible for a Turkish company to develop internationally-patented technology and to compete with global giants. This has been an inspiration for many companies as it has proved that R&D, patents and own-technology development are viable options for a developing country like Turkey. It might even be a more effective way to promote innovativeness in less technology-intensive sectors. Innovativeness provides a competitive advantage, and international success can signal the importance of innovativeness to other sectors.

7.2 Potential Implications for Developing-Country Policy Makers

The analysis of the Turkish innovation system and consumer electronics case study highlighted trade liberalisation as one of the main drivers of the innovativeness of companies. In order to take advantage of the opportunities in the export markets, companies have had to innovate. In addition, international competition, especially the extremely low cost of products from Chinese rivals, forced the case study companies to innovate since they could not compete on labour cost. On the other hand, decreasing import barriers eliminated the possibility of a defensive domestic strategy. Basically, trade liberalisation forced companies to innovate or risk extinction in the long run. During the closed economy days, Turkish companies made little or no efforts to innovate since they could dominate the local economy using foreign technology. Essentially, the Turkish case shows that it is extremely difficult to create innovative enterprises without forcing them to participate in international competition.

However, international comparison in the consumer electronics sector indicates that trade liberalisation might not be sufficient to create innovative companies. Countries such as Malaysia, Thailand and Mexico have large electronics industries that generate considerable export revenue. However, the innovativeness of these companies does not go beyond some process optimisation. One characteristic that
these companies have in common is that they are owned by foreign multinationals and therefore lack incentives to invest in developing their technology. They can get much easier access to advanced technology from their parent company.

Consequently, it seems that the positive effect of exporting is most likely to materialise if local companies, instead of foreign companies, do the exporting. This seems especially to be the case when the national innovation system is underdeveloped. This means that developing countries should try to support local companies’ efforts to become integrated into global value chains, instead of attracting foreign direct investment for exporting sectors. Furthermore, the Turkish experience shows that it is important to open the local economy to import competition, otherwise the largest domestic players might remain content to dominate the domestic market without needing to innovate. Thus, the practice of combining export promotion with import substitution for the domestic market would be counterproductive.

In relation to education policy, the Turkish experience suggests that promoting an Anglo-Saxon-style graduate education system and linking academic career progression to scientific publishing increases publications. As publications and patents tend to correlate, such a policy could be useful for increasing the innovation output in developing countries. However, there is also criticism of this approach. Most of the journals are Anglo-Saxon, so, as a consequence, local topics decrease in importance and language barriers favour English-speaking countries. Nevertheless, in today’s globalised world, countries that aim to be successful in international trade might be willing to accept these downsides.

In terms of innovation policy making, the Turkish case indicates that it is useful to have good connections with international organisations. The OECD and the European Union have provided useful guidance for Turkish policy makers. As reported, after adopting the innovation system approach from the OECD, Turkey made significant progress in innovation policy making. Comparison with the OECD and EU countries provides benchmarks and insights that are useful for developing countries. Therefore, close relationships with international organisations that are active in innovation policy can be useful for developing countries.
In terms of innovation support schemes, the Turkish way of providing finance for R&D projects is useful, especially for supporting the R&D efforts of established companies. The strict conditions were useful in fostering an R&D project management culture and were successful in increasing cooperation between university and industry. The practice of using academic personnel as referees for obtaining funds creates a relationship between academia and companies, which usually continues after the projects come to an end. However, the Turkish experience shows that it is important to make the process as lean as possible since bureaucratic barriers decrease the interest from companies.

Overall, though the Turkish experience does suggest that innovation support for smaller and less established companies needs separate programmes, it does not make sense to try to cater for the needs of all companies with one innovation finance scheme. In order to support smaller companies, start-ups and companies without their own R&D departments, other mechanisms need to be used. Access to finance and consultancy needs to be much faster and involve minimal bureaucracy. Moreover, support for commercialisation needs to be provided. Turkish policy makers have learned this from their own experiences, and have launched a number of programmes since 2006.

The use of tax incentives to promote innovation in Turkey has not been effective so far. It is clear that tax incentives are only useful if a certain level of innovation activity is already in place. This is not the case in most developing countries. For more advanced economies, the situation is different and tax incentives have more potential. This example shows that copying developed country innovation support initiatives without analysing the applicability for developing countries does not make sense.

Turkey’s experience also suggests that the centralisation of all technical innovation related topics is useful, at least in the early stages of development. TUBITAK in Turkey has operated a number of successful innovation support programmes. Additionally, it has been able to increase awareness of innovation among companies and the public. It has also established platforms that bring companies together, resulting in a positive impact on knowledge sharing and future cooperation. Through
its institutes, TUBITAK has fostered partnerships between industry and public organisations. On the other hand, the Turkish experience also suggests that, in order to drive non-technological innovation such as human resources and marketing innovation, a separate organisation should have the lead. It is difficult for the same organisation to embrace both aspects of innovation.

7.3 Limitations and Further Research Topics

This study has focused on the Turkish innovation system as a whole and on the consumer electronics sector in particular. The use of both system- and company-level analysis has produced valuable insights that would not have been possible with a system-level assessment alone. Owing to time and resource limitations, this dissertation focused on only one sector; however, other sectoral studies would have been useful. This is supported by the fact that the differences between the white and brown goods segments provided additional insights.

The use of international comparison also provided valuable insights. Findings would have been even more reliable if more countries and sectors had been included. Combining in-depth company case study analysis with system-level assessment and replicating this for a number of developing countries is a promising approach in attempting to arrive at more robust conclusions.

One topic that has not been covered in this study is the role of national culture in the innovativeness of companies. Previous research looking at Japanese and Korean companies had suggested that national culture plays an important role. In this study, it was not possible to cover this topic as the data was not available. However, this topic deserves more attention and could be covered in future research.

Another topic that has not been covered extensively is corporate human resources development. Employee training has been regarded as one of the critical success factors of Japanese and Korean companies. Except for the data collected for the case studies, little information is provided on Turkish employee training practices. This is surely another interesting future research area.
Moreover, this study has focused very strongly on technological innovation. The selection of consumer electronics companies has strengthened this focus. However, non-technological innovation, such as in marketing and organisation, is also very relevant for developing countries and possibly offers better chances to catch up with developed countries. More research is needed to understand the dynamics of non-technological innovation in developing countries.
References


OECD. (2004). *Economic Survey of Turkey 2004.* Retrieved May 24, 2008, from [http://www.oecd.org/document/44/0,3343,en_2649_34569_33804140_1_1_1_1,00.html](http://www.oecd.org/document/44/0,3343,en_2649_34569_33804140_1_1_1_1,00.html)


APPENDICES

Appendix A: Findings from the Assessment of Korea’s Innovation System

Recently, South Korea (hereafter referred to as Korea) has been the most successful country in catching up with more advanced nations. Its success in high-tech sectors in particular has made it especially interesting to innovation policy scholars. The section below summarises Kim’s (1993) highly influential essay on South Korea’s rapid acquisition of technological capability.

Kim identified the following factors as playing a significant role in Korea’s development:

**Human resources**

According to Kim, Korea’s biggest resource is its human resources. The importance of education in Korea’s modernisation strategy is reflected in its education spending. In 1951 Korea spent 2.5% of its total government budget on education, whereas in the 1980s it spent over 22%.

Moreover, government expenditure accounted for only one-third of total education spending in Korea; the remainder was paid for by the private sector and parents. According to Porter (1990), this commitment was greater than the spending of industrial countries such as US, Germany, UK, Japan or even Switzerland. Between 1945 and 1983, enrolment in elementary school increased by five times, in secondary by 28 times and in university by 150 times. By the early 1980s, Korea had 100% elementary enrolment, over 70% high school enrolment, and over 25% university enrolment. Korea also invested in overseas training and development, especially through its special relationship with the US.

Later, at the end of the 1990s, Korea introduced research-oriented science schools and more graduate programmes in science and engineering to make up for a lack of highly-trained engineers and scientists. To increase industry cooperation, Korea also
set up government-initiated research facilities such as a joint semiconductor research institute for both universities and companies.

Culture
According to Kim, cramped living conditions and cold winters made Koreans work hard. The average working hours per week in manufacturing in 1985 was 53 in Korea compared to 33-42 in OECD countries, 44-48 in other Asian NICs, and 46 in Mexico. Kim also mentions the motivation of the older generation to overtake Japan. The occupation of Korea by Japan during World War Two had left behind bad memories within Korean society. According to Kim, the so-called ‘geug-il’ or ‘beat-Japan’ feeling motivated Koreans through national economic competition. Moreover, there was also a desire to overtake North Korea economically, as proof of the superiority of the capitalist system.

Foreign technology and FDI
Lacking its own technological capability, Korea had to rely on technology imports. In the early years, Korea restricted FDI and instead promoted technology transfer through the procurement of turnkey plants. Later, imports of capital goods began, and these became a major source of learning through reverse engineering. The proportion of capital goods imports to total technology transfer was highest in Korea among the NICs. Capital for these investments was in the form of foreign loans. This strategy enabled Korea to maintain independence from foreign multinationals, and the well-trained workforce was able to learn quickly from foreign capital goods.

In the 1980s when Korea needed more sophisticated foreign technologies, it gradually opened the economy to FDI and foreign licensing. The advantage of this late opening was that companies came to invest in Korea not for the cheap labour, but to collaborate with Korean companies in technology-intensive areas.

Role of the defence sector
Korea’s relations with the USA enabled Korean firms to win contracts from the US military, first in Korea and then in the wider region. With this experience, Korean contractors were able to expand to the Middle East. Owing to its poor relations with North Korea, Korea had to maintain a large army. When the Carter administration in
the US expressed the possibility of pulling out US troops from Korea, the government started pushing the development of its heavy machinery industries. Moreover, the procurement demand of the military helped local electronics companies to diversify into industrial electronics.

**Export promotion and import substitution**

To overcome the disadvantage of a small home market and to take advantage of the stable nature of mature technologies, Korea identified strategic industries for import substitution and export promotion. Plywood, textiles, consumer electronics, and automobiles in the 1960s, and steel, shipbuilding, construction services and machinery in the 1970s are examples of these strategic industries.

These industries were created in violation of static comparative advantages and had to suffer from high costs. The government used tools such as market protection from foreign competition, export promotion, tax incentives and preferential financing. In some industries, protection soon became unnecessary, whereas in other industries the protection periods lasted longer.

Firms were granted unrestricted and tariff-free access to imported intermediate inputs, and automatic access to tariff-free loans for working capital. They also had unrestricted access to foreign capital goods. Although these incentives were for all companies, large firms profited more from them as a result of their established structures and resources. These export incentives allowed companies to increase in size and quickly reach economies of scale. Export markets and international competition forced companies to learn quickly - both through experience and through reverse engineering. Informal technical assistance offered by OEM buyers also helped Korean companies to upgrade their capabilities.

The Korean government gradually reduced import restrictions. The average tariff rate went down from 26% in 1984 to 16% in 1988.
Industry structure and government

In contrast to the Taiwanese government’s policy of restricting the emergence of large companies, the Korean government intentionally created them, referring to them as ‘chaebols’. The government helped with capital formation as well as the diversification of these companies. Later, the companies gained access to preferential financing and import protection. According to Kim, Korea differs from other developing countries since it not only promoted companies but also punished poor performance. Good performers were rewarded with new licences for new business. Bad performers in otherwise healthy industries were allowed to be taken over by better-managed firms. Poorly-managed companies were also cut off from preferential financing. Of the ten largest chaebols in 1965, only three remained in the same list ten years later. Of those listed in 1975, seven remained in the list in 1985.

This strategy led to a great concentration in the Korean market. In 1980 the ten chaebols accounted for an incredible 48% of GDP, making Korea even more concentrated than Taiwan or Japan. However, Kim adds that total factor productivity as well as output still grew faster than in most other countries.

Later, the Korean government tried to limit the power of the chaebols by introducing anti-trust legislation, prohibiting unfair cartel practices, investing in affiliate companies, and regulating their vertical and horizontal integration. However, according to Kim, these regulations did not decrease concentration in the Korean market. Moreover, when national banks were privatised, most of them were taken over by the chaebols.

On the other hand, the 1980s saw Korea start to promote small and medium-sized companies, particularly technology-based small firms. The government designed ‘sanctuaries’ for SMEs, designating 205 business territories where large corporations could not intrude. Moreover, a new national law dictated that 35% of all total loans by national banks should be reserved for SMEs. The Korean government also promoted venture capital. In addition, in the same period Korea shifted its focus from promoting strategic industries to innovation in general. It introduced incentives for promoting R&D and human resources development.
Science and technology policies
In the early stages, Korea had few R&D capabilities in universities. Therefore, in 1966 the government established the Institute of Science and Technology (KIST) as an integrated technical centre that, together with its spin-offs, would meet industry’s technical needs. Overseas-trained Korean researchers came to work in this institute and its spin-offs.

Korea also started spending considerable amounts of money on R&D. Its investments increased from US $28.6 million in 1971 to US $2.37 billion in 1987. The ratio of R&D expenditure to GDP increased from 0.32 to 1.93% during the same period. At the same time, government spending share decreased from 68% to 20%.

According to Kim, the Korean government made R&D efforts when the private sector had neither the capabilities nor the market incentives to do so. Later, when the labour advantage decreased, private companies increased their R&D efforts to sustain their international competitiveness.

Financing industrial R&D
Kim reports that although Korea introduced direct R&D subsidies to support company R&D projects in the 1980s, the total amount paid was small, reaching only US $22 million in 1987.

The most important mechanism for funding R&D was preferential financing offered by state-controlled banks and public funds. In 1987, this reached almost 900 million USD. Korea also had a number of tax incentives for R&D. There were reduced tariffs on the import of R&D equipment and supplies, the deduction of annual non-capital R&D expenditures and human resource development costs from taxable income, accelerated depreciation on industrial R&D facilities and exemption of real estate tax on R&D-related properties. Moreover, companies could set aside up to 30% of profits before tax to be used for R&D work for the next four years. According to Kim, these incentives were less effective in the early years as companies did not have technological activities.
Cooperation
In the 1980s, the Korean government used various means to establish effective linkages between the public R&D institutes and industry. According to Kim, the confidentiality considerations of large enterprises meant that these government programmes were used mostly by medium and small companies. However, Kim also notes some important successes, such as the jointly developed 4 MB D-ram project. Regarding university-private sector cooperation, Kim reports that at the end of the 1980s the linkages remained weak as the universities were oriented towards teaching only and lacked resources. Kim also reports government efforts to promote intercorporate cooperation by giving various tax incentives. However, such cooperation produced no significant results.
Appendix B: Overview of Turkish Innovation System Organisations

This part of the dissertation provides a brief overview of the organisations within the Turkish innovation system. The following organisations are covered:

- innovation policy making organisations
- innovation financing, coordination and consulting organisations
- innovation assessment and measurement organisations
- innovation creation and diffusion institutions
- intermediaries between companies and research creating organisations
- non-governmental organisations supporting innovation

Innovation policy making organisations
The Supreme Council on Science and Technology (BTYK) is the main decision-making body and is chaired by the prime minister. In addition to relevant public ministries and organisations, non-profit foundations, chambers and major technical universities are invited to the meetings.

The Scientific and Technical Research Council (TUBITAK) is responsible for Turkey’s science and technology policy. It acts as the implementing agency for the Supreme Council on Science and Technology (BTYK).

The State Planning Organisation (SPO) is responsible for the preparation, coordination and follow-up of the Five-Yearly Development Plans, which also contain the actions for innovation-related issues for the period in question. The High Planning Council is the decision-making body and assistant to the Board of Ministers on implementation of the development plans. The High Planning Council is chaired by the prime minister and includes ministers as well as the under-secretary of SPO. The SPO acts as the secretariat to the Council.

The Under-Secretariat of Treasury and the Under-Secretariat of Foreign Trade are both involved in innovation policy making as well as financing. For instance, TUBITAK-TEYDEP grants innovation project finance from funds from the Under-Secretariat of Foreign Trade.
The Turkish Academy of Science (TUBA) is responsible for determining and proposing scientific priority areas and proposing legislation to the government on issues relating to scientists and researchers.

**Innovation financing, coordination and consulting organisations**

TUBITAK provides R&D project finance for companies through its department TEYDEP (former TIDEP), which was established in 1995. TEYDEP also implements the EUREKA programme, the university-industry joint research centres programme, and activities to increase awareness on innovation, and it assists the government on implementation of the R&D tax postponement scheme and R&D investment incentives.

TTGV is a non-profit organisation established in 1991 to distribute World Bank funds for industry innovation projects. TTGV supports the innovation activity of industry by lending funds and taking credit risk. It works on facilitating university-industry cooperation on innovation, initiates the establishment of technoparks, technology service centres and venture capital funds, provides technology support services to SMEs, and increases awareness of innovation. It also provides information on best practice on innovation matters.

KOSGEP was established by the Ministry of Industry in 1990 and has the objective of increasing the competitiveness of SMEs. It supports SMEs by providing training, consultancy and infrastructure services. It also establishes incubators in technical universities for high-tech start-ups.

**Innovation assessment and measurement organisations**

Turkey established a standards-setting body in 1960: the Turkish Standard Institution (TSE). An organisation for testing compliance with standards was created much later: the Turkish Accreditation Institute (TURKAK) in 1999. Increasing international trade has been the main driver behind the establishment of TURKAK.

Another related department of TUBITAK is the national metrology institute, UME, which was established in 1991. This mainly provides measurement training and
consultancy and infrastructure support for the industry. It provides internationally-accepted testing and measurement services.

The Turkish Patent Institute (TPE) was established in 1994 to deal with issues of intellectual, industrial and commercial rights.

Finally, the Turkish State Statistics Institute (DIE) collects all R&D and innovation-related data according to OECD standards. DIE was founded in 1926 in the Turkish Republic as the successor to the Ottoman Central Statistics Institute.

Innovation creation and diffusion institutions

Universities play a very important role in knowledge creation and diffusion in Turkey. According to the 2005 R&D survey, 54.6% of the country’s R&D spending is performed by universities, and 51.6% of researchers are employed by universities.

Public research institutes employ approximately 2,000 researchers and account for some 8% of total R&D spending. There are nearly 100 public research institutes and the majority of these institutes work in traditional sectors, such as agriculture (there are 64 R&D centres operating under the Ministry of Agriculture and Rural Affairs) and forestry.

TUBITAK R&D centres

The research institutes of TUBITAK are among the most active research organisations, working in a variety of technology areas such as information and communication technologies, genetic engineering and biotechnology. The Marmara Research Centre of TUBITAK (TUBITAK-MAM) is the largest research organisation; it operates five institutes and hosts a technology park (Karatayli, 2008).
Intermediaries between companies and research creating organisations
Technology Development Centres (incubators) are established jointly by the universities and KOSGEB and are important for bridging the gap between universities and the business sector. As of 2008, there were 20 incubators in technical universities throughout the country. There are also private incubators such as Ericsson Mobility World and the Siemens Business Accelerator.

University-industry joint research centres have been established from 1996 with the support of TUBITAK. As of 2008, there were five active centres: the Microelectronic Research Centre at Middle East Technical University (METU), the Biotechnology-Biomedical Research Centre at Hacettepe University, METU and Ankara-OSTIM Industrial Zone, the Ceramics Research Centre at Eskisehir Anadolu University, and Adana University-Industry Joint Research Centre.

Since 2002, technoparks have been established in different regions of Turkey. Currently, there are more than 30 active technoparks in Turkey.

Non-governmental organisations supporting innovation
The Union of Chambers of Commerce and Industry (TOBB) and various local chambers such as the Istanbul Chamber of Industry (ISO) organise various activities related to innovation. The aim is to increase the competitiveness of member companies.

The Turkish Industrialists’ and Businessmen’s Association (TUSIAD) which represents the interests of the largest industrial companies is engaged in innovation promotion activities as well. For instance, TUSIAD organises the Technology Award and Congress with TTGV and TUBITAK, and the National Quality Award and Congress with the Quality Association of Turkey (KalDer).

The Association for Electronics Industrialists of Turkey (TESID), which represents consumer electronics companies, also organises its own innovation awards, and contributes to the state development planning process in electronics-related topics.
There are also a number of other organisations such as the National Productivity Centre (MPM), the Turkish Institute for Industrial Management (TUSSIDE), the Association of Automotive Parts and Components Manufacturers (TAYSAD), the Technology Management Association, KalDer, and the Informatics Association of Turkey (TBD) that carry out activities to raise awareness and disseminate information on technology- and innovation-related matters. (Elci, 2003)

**Private companies**

Private companies have a very central role in the innovation system as they provide the commercialisation of the research efforts, converting R&D into ‘innovation’. The dynamic export sector has especially become very active in innovation.
## Appendix C: List of Interviews

<table>
<thead>
<tr>
<th>Name</th>
<th>Interview type</th>
<th>Position</th>
<th>Time of interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unal Alkan</td>
<td>Personal interview</td>
<td>Secretary General, Turkish Electronics Industry Association</td>
<td>03.11.2005</td>
</tr>
<tr>
<td>Uran Tiryakioglu</td>
<td>Personal interview</td>
<td>Board member, Turkish Electronics Industry Association</td>
<td>07.11.2005</td>
</tr>
<tr>
<td>Refik Ureyen</td>
<td>Personal interview</td>
<td>Consultant, Turkish Technology Development Association</td>
<td>16.11.2005</td>
</tr>
<tr>
<td>Bahadir Akin</td>
<td>Personal interview</td>
<td>Quality manager, Arcelik</td>
<td>23.11.2005</td>
</tr>
<tr>
<td>Dilek Temel</td>
<td>Personal interview</td>
<td>Director, Turkish White Goods Industry Association and Arcelik corporate relations</td>
<td>15.11.2005</td>
</tr>
<tr>
<td>Kemal Berkkan</td>
<td>Personal interview</td>
<td>6 sigma manager, Arcelik</td>
<td>14.11.2005</td>
</tr>
<tr>
<td>Taner Kaya</td>
<td>Personal interview</td>
<td>Product manager (ex), Arcelik (Beko)</td>
<td>07.04.2008</td>
</tr>
<tr>
<td>Dr. Cemil Inan</td>
<td>Written interview</td>
<td>R&amp;D director, Arcelik</td>
<td>24.06.2008</td>
</tr>
<tr>
<td>Cengiz Ultav</td>
<td>Personal interview</td>
<td>CTO, Vestel group of companies</td>
<td>21.12.2005</td>
</tr>
<tr>
<td>Arif Sankul</td>
<td>Personal interview</td>
<td>Marketing vice president, Vestel Turkey</td>
<td>19.12.2005</td>
</tr>
<tr>
<td>Ceyda Ertek</td>
<td>Personal interview</td>
<td>Product manager, Vestel Turkey</td>
<td>17.02.2006</td>
</tr>
<tr>
<td>Funda Inal</td>
<td>Personal interview</td>
<td>Human resources manager, Vestel Turkey</td>
<td>17.02.2006</td>
</tr>
<tr>
<td>Metin Nil</td>
<td>Personal interview</td>
<td>R&amp;D manager, Vestel</td>
<td>23.06.2008</td>
</tr>
<tr>
<td>Tarkan Tekcan</td>
<td>Personal interview</td>
<td>Vice President R&amp;D, Vestel</td>
<td>23.06.2008</td>
</tr>
</tbody>
</table>
## Appendix D: Learning Capability Questionnaire

<table>
<thead>
<tr>
<th>Questionnaire:</th>
<th>Learning capability scale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Management commitment</strong></td>
<td></td>
</tr>
<tr>
<td>The managers frequently involve their staff in important decision making processes</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td>Employee learning is considered more of an expense than an investment</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td>The firm’s management looks favourably on carrying out changes in any area to adapt to and/or keep ahead of new environmental situations.</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td>Employee learning capability is considered a key factor in this firm.</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td>In this firm, innovative ideas that work are rewarded.</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td><strong>Systems perspective</strong></td>
<td></td>
</tr>
<tr>
<td>All employees have generalized knowledge regarding this firm’s objectives.</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td>All parts that make up this firm (departments, sections, work teams, and individuals) are well aware of how they contribute to achieving the overall objectives.</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td>All parts that make up this firm are interconnected, working together in a coordinated fashion.</td>
<td>1. Totally disagree 2. 3. 4. 5. 6. 7. Totally agree</td>
</tr>
<tr>
<td><strong>Openness and experimentation</strong></td>
<td>1. Totally disagree</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>This firm promotes experimentation and innovation as a way of improving the work processes.</td>
<td>1. Totally disagree</td>
</tr>
<tr>
<td>This firm follows up what other firms in the sector are doing; adopting those practices and techniques it believes to be useful and interesting.</td>
<td>1. Totally disagree</td>
</tr>
<tr>
<td>Experiences and ideas provided by external sources (advisors, customers, training firms, etc.) are considered a useful instrument for this firm’s learning.</td>
<td>1. Totally disagree</td>
</tr>
<tr>
<td>Part of this firm’s culture is that employees can express their opinions and make suggestions regarding the procedures and methods in place for carrying out tasks</td>
<td>1. Totally disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Knowledge transfer and integration</strong></th>
<th>1. Totally disagree</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7. Totally agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Errors and failures are always discussed and analyzed in this firm, on all levels.</td>
<td>1. Totally disagree</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
<td>6.</td>
<td>7. Totally agree</td>
</tr>
<tr>
<td>Employees have the chance to talk among themselves about new ideas, programs, and activities that might be of use to the firm.</td>
<td>1. Totally disagree</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
<td>6.</td>
<td>7. Totally agree</td>
</tr>
<tr>
<td>In this firm, teamwork is not the usual way to work</td>
<td>1. Totally disagree</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
<td>6.</td>
<td>7. Totally agree</td>
</tr>
<tr>
<td>The firm has instruments (manuals, databases, files, organizational routines, etc.) that allow what has been learnt in past situations to remain valid, although the employees are no longer the same</td>
<td>1. Totally disagree</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
<td>6.</td>
<td>7. Totally agree</td>
</tr>
</tbody>
</table>
Curriculum Vitae
Yasar Attila Ilman

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University of St. Gallen (HSG), Switzerland, 2003-current
Doctoral Studies in Economics

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Masters Program in International Management (MIM)

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Head of Customer Base Sales 2009-current
Senior CRM Manager, Postpaid 2007-2009
CRM Manager, Prepaid 2006-2007

Hewlett-Packard International, Zurich, Switzerland 2003-2005
Marketing Project Manager, EMEA