

FINANCE OF THE SOFTWARE INDUSTRY IN TURKEY

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MUSTAFA ERDEM SAKINÇ

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Name, Last Name : Mustafa Erdem Sakiç

Signature :

ABSTRACT

FINANCE OF THE SOFTWARE INDUSTRY IN TURKEY

SAKINÇ, Mustafa Erdem

M.Sc., Department of Science and Technology Policy Studies

Supervisor : Assoc. Prof. Dr. Funda BAŞARAN ÖZDEMİR

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This thesis aims to explore the challenges of ICT industries to have access to financial sources in Turkey. The specific subject of analysis is the Turkish software industry. First, it is identified that the global course of the science and technology policies and economic developments are intertwined and they are the major determinants of the current situation of high-tech sectors and their finance all over the world. The importance of finance is based on its association with the innovativeness of high-tech firms. The financial commitment is crucial for firms to sustain innovative activities before revenue generation. Today there is a widely used mainstream model of financial growth cycle defining the sources of finance and the specific needs of high-tech firms along their growth paths. Second, the historical course of finance in Turkey are analyzed and milestones of science and technology policies as well as the development of ICT industries are briefly discussed in order to exhibit the underlying structure of the present issues of high-tech sectors' finance in Turkey. Later, the growth cycle model is implemented for Turkey to analyze the potential of financial sources for Turkish software firms with relevant quantitative data. It is seen that the interest of available financial sources towards high-tech sectors is limited and unconcerned. In addition, an inquiry for the finance of the software industry is also done through the analysis of interviews performed with managers of software firms and several funding organizations. Instabilities and uncertainties of the Turkish economy, underdevelopment of a national strategy on software and the lack of interest of available financial sources towards software industry are the major handicaps for the growth of software firms and the industry as a whole. A selective national industrial strategy on software is crucial for the true allocation of financial resources towards software firms.

Keywords: Finance, ICT, Turkish Software Industry, Financial Growth-Cycle Model

ÖZ

TÜRKİYE'DE YAZILIM ENDÜSTRİSİNİN FİNANSMANI

SAKINÇ, Mustafa Erdem

Yüksek Lisans, Bilim ve Teknoloji Politikası Çalışmaları Bölümü

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Bu tez Türkiye'deki BİT sanayilerinin finans kaynaklarına ulaşmada karşılaştığı zorlukları irdelemeyi amaçlamaktadır. Türk yazılım sanayi analizin özel konusunu oluşturmaktadır. Tezde öncelikle, bilim ve teknoloji politikalarının küresel dönüşümü ile ekonomi alanındaki gelişmelerin iç içe geçmesi ve bunların yüksek teknoloji sektörlerinin ve onların finansmanının bugünkü durumunu belirlemesi ortaya konmaktadır. Finansmanın önemi yüksek teknoloji şirketlerinin yenilikçiliğiyle ilişkilendirilmiştir. Finansal bağlılık, gelir elde edilen sürece kadar yenilikçi faaliyetleri sürdürebilmeleri amacıyla tüm şirketler için çok gereklidir. Bugün yüksek teknoloji şirketlerinin gelişme süreçleri boyunca finansman kaynaklarını ve özel ihtiyaçlarını tanımlayan anaakım bir finansal büyüme çevrimi modeli yaygın olarak kullanılmaktadır. İkinci olarak, Türkiye'de yüksek teknoloji sektörlerinin finansmanı sorununa temel teşkil etmesi amacıyla, finansın tarihsel gelişimi ve bilim ve teknoloji politikalarındaki dönüşümler ile BİT sanayilerinin gelişimi kısaca tartışılmıştır. Daha sonra büyüme çevrimi modeli Türkiye için uygulanmış ve çeşitli finans kaynaklarının yazılım firmaları için taşıdıkları potansiyel, nicel verilerle göz önüne serilmiştir. Mevcut finans kaynaklarının yüksek teknoloji sektörlerine olan ilgisinin sınırlı ve gelişmemiş olduğu görülmüştür. Araştırma, çeşitli yazılım şirketlerinin ve finansör kuruluşların yöneticileri ile yapılmış olan röportajların analizi ile devam etmiştir. Türkiye ekonomisinin istikrarsız ve belirsizliklere açık yapısı, yazılım alanında ulusal bir stratejinin olmayışı ve mevcut finans kaynaklarının yazılım sanayine ilgisizliği yazılım şirketlerinin gelişmesi önündeki en önemli engelleri oluşturmaktadır. Yazılıma dönük seçici bir sanayi politikası finansal kaynakların yazılım şirketlerine tahsis edilebilmesi için gerekli temel koşuldur.

Anahtar Kelimeler: Finansman, BİT, Türkiye Yazılım Sanayi, Finansal Büyüme Çevrimi Modeli

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CHAPTER 1

INTRODUCTION

1.1 Prologue

Today, information and communication technologies (ICT) are generally considered as the keywords for economic growth, innovation, competitiveness, employment or prosperity. The growth statistics of ICT sectors are fascinating and there is a great interest on ICT which is considered as a dominant industry with strong connections to the other sectors of the economy (Schiller, 1999). The interest is based on two important reasons. The productivity and employment contribution of ICT in USA since 1980s and the ICT-related success stories of several developing countries like Korea, Taiwan or 3I's; India, Ireland and Israel.

ICT is always mentioned with globalization. The potential of new technologies fostering the global exchange of goods, services and capital is evident. Moreover a "new economy" emerged and expanded in US within high-tech sectors gradually became the new model for business activity among emerging sectors through the world. The net effect of the recent developments through globalization over employment, income distribution, social issues like migration or social security and environmental issues like pollution or over-utilization of natural resources is questionable. However governments, local administrations, industrial or business organizations accentuate the benefits of new businesses around new technologies over national or local economies. They have been momentarily working for the establishment and sustainability of those industries within national or local boundaries.

A tribute to the new technologies utilized for business transactions, public policy proposals, or social and cultural interrelations makes the world more integrated and homogeneous. However, together with the increasing global economic and social problems, the new world is more complicated, causalities are harder to identify and policies, programs or strategies are more difficult to manage.

Nevertheless, the role of ICT on regional, national and global development is important. The contribution of ICT industries and their subsidiaries to national incomes are gradually increasing and more recently they have been the key sources of growth for some countries and regions. Together with the increasing international trade and production, companies all over the world, regardless of their size, establish multilayered connections with international markets. This in turn blows up the demand for ICT goods and services as the means for those interconnections. Multinational companies in these new sectors have been establishing plants and production facilities as well as main branches all over the world to meet the world demand of ICT goods and services. Thousands of new engineering and science graduates from developing countries migrating to western countries for education opportunities or well-paid jobs related with their education and in return they also establish business relations in ICT sectors and contribute to the growth of those sectors in their home countries (Atkinson & Correa, 2007).

ICT is one of the major priority sectors in science and technology policies of many countries (Türkcan, 2009). The impact of these technologies on economic and social development brought great interest of private and public actors. Harmonious with the new economy model; those new sectors also contribute to the homogenization process with similar expectations through the target of economic growth. Higher investment and economic prosperity expectations; government policies like financial incentives, investments on infrastructure, education or other social programs; linkages which emerge between individuals, firms and nations through partnerships, clusters or international agreements; and overall business opportunities and dynamism of other sectors of the economy within the regional or national area are generally seen as the main capacity determinants of ICT sectors.

Finance is the one of the major determinants of public and private interest on ICT. The innovativeness of ICT firms and the promotion of S&T policies are mainly determined by the flow of financial sources into the ICT sectors which mitigates the risks and uncertainties prevalent in high-tech sectors. Various sources of finance like venture capital or stock markets are now presented as the major intermediaries of financial resources for high-tech firms. Moreover, government programs channeling financial as well as organizational contribution including R&D promotions have been redesigned for start-up firms all around the world (Türkcan, 2009). In turn, ICT helps financial sector to globalize its

activities by facilitating faster and easier transaction channels. Investment opportunities extend with easier access to information.

1.2 Conceptual Framework

This thesis examines the finance of the high-tech sectors, the role of public and private sources of finance for technology firms and their potential for technology development in Turkey. The particular focus of the thesis is a careful study of software industry in Turkey. I discuss the science and technology policies and condition of various sources of finance in Turkey in order to identify the potential contribution of software industry to the economic growth of Turkey. The primary research question of this study is: What are the sources of finance for high-tech sectors in Turkey and what is their potential to contribute to the development of software industry?

Software, as a major global industry today, is the target of a growing number of countries for its potential to generate export revenue and to contribute economic growth and employment. Relatively low entry barriers, low-investment and low physical capital requirements, high demand of local human capital and strong cost advantages favoring developing countries are generally seen as the main advantages of the industry (Commander, 2005). Government vision and policies; level of human capital and national orientation towards software; infrastructure regarding technology, R&D and education; entrepreneurship; level of domestic market and domestic usage of ICT products; and financial infrastructure plus the financial capital available for the industry are the common success factors for the software industry and its export capacity (Carmel, 2003).

Whether the explanations vary and the emphasis on some of these factors is stronger in some analyses than others; attention on the finance of the sector for developing economies is limited. Various studies on software industry (Carmel, 2003; Tessler, Barr & Hanna, 2003; Heeks & Nicholson, 2004) have similar set of solutions about the financial issues of the industry without details and country specifications. However, different capital structures, different levels of information regarding investment opportunities, different cost factors, country-specific business atmosphere or diverse financial intermediation methods across countries are all important in explaining the differences of strategies and success of the industry. In order to identify the underlying reasons behind those differences and to show up the importance of the finance for such a dynamic

industry, a detailed investigation of existing institutional framework of financial structure and national policies concerning high-tech industries is essential.

In this sense, any analysis on technology and innovation should provide an explanation about the financial conditions and their impact. But what is critical with finance and why it is so important and why it deserves for a separate analysis of finance other than the broader perspectives on success factors of high-tech industries?

Lazonick defines strategic control, organizational integration and financial commitment as the 'social conditions of innovative enterprise'. The role of strategy is to confront uncertainty by allocating resources to investments that, by developing human and physical capabilities, it can enable the firm to compete for specific product markets. The role of organization is to transform technologies and access markets to generate products that buyers want at prices that they are willing to pay. The role of finance is to sustain the accumulation of capabilities between the investments in productive resources are made and financial returns are generated through the sale of products (Lazonick, 2007a). A patient capital enables the capabilities that derive from organizational learning to cumulate over time. Strategic control over internal revenues is the foundation of financial commitment. The size and duration of investments in innovation may also demand external sources of finance such as stock issues, bond issues, or bank debt. In different times and places, depending on varying institutional arrangements, different types of external finance may be more or less committed to sustaining the innovation process (Lazonick 2007b).

For high-tech firms the commitment is defined by a complex set of determinants including the national science and technology policy, the orientation of public sources towards infrastructural investments, the country specific conditions regarding the finance of industrial development, the effects of global transformations regarding business relations and financial orientation.

First of all, ICT owes its growth to the intense public R&D expenditures throughout the world. It is widely accepted that the foundations of ICT industries have been the committed government funding and particularly state military expenditures. In this sense, for a broad understanding of the dynamics of ICT sectors today, an analysis of the sources of research and development and the continuous interest of public towards technology sectors is crucial. The motivation behind the continuous support can be identified through an

investigation of the historical development of the sectors. This thesis provides a brief history of financial commitment of governments in the developed world to promote the ICT sectors and the orientation of S&T policies.

Secondly, the turmoil of the capitalism since 1970s brought a new understanding towards the relations between economy and technology. Reorganization in capitalistic relations of economy has coincided with the mass production and consumption of high-tech goods and services across the world. The interrelations between the dynamics of the new sectors and the outcomes of economic and social reorganization brought a complex set of business relations which are discussed under the title of 'New Economy'. This study also identifies the capitalist restructuring, the role of ICT in this process and the concept of 'New Economy' which is introduced as a global business model for high-tech sectors.

Third, in order to provide a description for contemporary financial issues of innovative and high-tech companies and to exhibit the available financial sources targeting high-tech companies with different forms of investment, a 'financial growth-cycle model' has been developed and it is widely used by scholars (Houben & Kakes, 2002; Van Osnabrugge & Robinson, 2000; Saublens, 2005). This model is generally presented as a set of financial sources for high-tech firms with different sizes, growth levels and different levels of assumed risks by investors. A considerable part of this study is to identify the characteristics of the model, the peculiarities of different financial sources and their potential contribution to high-tech firms.

The model may provide a perspective for the analysis of Turkish software industry finance. The components of the model may be evaluated through their potential in Turkey. Such an analysis is crucial in order to reveal the actors of high-tech finance in Turkey and the problematic behind the model regarding its unconditional perspective for different spatial contexts. The thesis follows up the model and investigates the potential of the sources of finance in Turkey for software industry. It asks the role of different financial sources in Turkey for high-tech sectors and tries to identify the demands of software firms regarding finance if they overlaps with the potential in the country or not. Therefore the opinions of different actors in software industry are crucial to find relevant explanations for financial issues of the industry.

Software industry in Turkey reflects some peculiarities based on the level of economic and social development, political economic considerations and other

distinct characteristics of the country. The approach towards science and technology and the development of ICT sectors also echoed these features. What are the effects of internal and external forces on the course of development of ICT, what was and is the approach of governments towards science and technology and how it affected the development of ICT sectors, what are the main characteristics of Turkish financial system and what is its approach towards investment and specifically ICT investment? And finally, why is the software sector in need of financial assistance and how it can be provided? These are some of the instigating questions. The aim of this study is to understand the structure of the finance in Turkey for the software industry within its historical and institutional boundaries. It tries to present some ideas for a broad understanding for the prosperity of the sector.

1.3 Methodology

This thesis is based on a combination of traditional library research and qualitative analysis. Such an approach is highly consistent with the purpose of the study. The potential of different financial sources to promote software industry in Turkey can only be analyzed through a multi-faceted research perspective considering the different aspects of the issues analyzed throughout the study. This is also important due to the deficiencies of available data and lack of current interest to the financial issues of high-tech sectors in Turkey.

I follow a deductive perspective starting with a global analysis of financial issues of high-tech sectors in the world and then discuss the patterns of policies and recent developments in business models and their effect on the software industry in Turkey. This necessitates a traditional library research. Thus, I reviewed the scholarly work on financial sources of high-tech sectors, their transformation throughout the 20th century and recent developments in business models and their impact on global understanding of industrial finance.

An historical perspective regarding Turkey's science and technology practices is crucial to any understanding of technology finance. I review the primary data on Turkish software industry, reports of governmental institutions, policy and project reports and secondary sources including academic and non-academic studies. It is important to identify the underlying factors of the development and future potential of software industry in Turkey through a historical analysis of the developments in financial as well as high-tech sectors of the country. To this

end, the course of financial sector and the science and technology policies are presented through a chronological story.

I also present the most recent picture of the software industry in Turkey providing the sectoral dynamics and its strengths and weaknesses. For this purpose I present a variety of statistics about recent trends in output, trade, employment and industrial dynamics.

I also interviewed several people with first-hand knowledge of the software industry. The perspectives of 6 firm managers and 3 representatives of funding institutions helped me to clarify the issues discussed throughout the study. I properly understood that current difficulties of software companies rooted in some structural issues of Turkey regarding capabilities for industry promotion, access to financial resources and rigidities of business atmosphere. I identified that the underdevelopment of social conditions of innovativeness hinders the potential of the software industry in Turkey and financial rigidities contribute the most considering the prevalent instability and uncertainty of Turkish economy as a whole.

1.4 Outline of the Chapters

The study is organized as follows. The next chapter discusses the source of ICT revolution and the transformation of science and technology policies in the second half of the 20th century. The results of a restructuring in capitalism started in 1970s and the emergence and dispersal of new economy are presented. Chapter 3 introduces the financial-growth cycle model and provides a detailed analysis of the model through its components. Chapter 4 presents the historical development of ICT and particularly software in Turkey. It stresses the course of financial developments and the perspective on science and technology in a historical sequence in order to provide the background information for the potential of financial sources for innovativeness and development of high-tech sectors. Chapter 5 represents the implementation of the growth-cycle model. It explores the current situation of the financial sources represented in the model and suggests the potential power of these sources for the development of the domestic software industry with the help of the quantitative data. Chapter 6 discusses the findings of the interviews conducted with several software firm managers and funders of software firms. The final chapter draws conclusions based on the research.

CHAPTER 2

THE COURSE OF ICT ALONG THE DEVELOPMENTS OF THE 20TH CENTURY

Finance of the high-tech sectors all over the world has deep connections with the past scientific and technical developments. For a long period funding research and development have been the duty of governments as the private sectors were not willing to do because of high uncertainties and lack of enough resources. Science of technology policy was associated with the public orientation of technology development and innovation activities in line with specific targets for the national prosperity (Türkcan, 2009).

Production in the post-war period was articulated with public goods understanding that only through public support scientific and technical knowledge production could be realized and the benefits could spill over to private sectors and consumers (Freeman & Soete, 2003). Subsequently, this understanding was widely accepted by developing countries that the progress of those economies was bounded to the technical change and climbing up the ladder of development became the national objective for developing world. As the spread of information and communication technologies has the potential to bring about massive changes for developing countries today, exploring the role of government in fostering science and technology and providing sources for private sector is essential. It is one of the key arguments of this study that the public science and technology policies are still crucial for the development of high-tech sectors and their survival, especially for developing economies like Turkey.

A reason why governments should intervene into scientific research and R&D investment is explained by the market failure approach that the free mechanisms of market discourage firms to invest in basic research which causes harmful effects for applied research and other innovative activities (Caracostas & Muldur, 1998). Given all these difficulties, it is very hard to imagine that market could provide the pathway for scientific and technological progress which includes the new firm formation and their funding. Socio-economic targets of

countries also play an important factor for huge government intervention which generally intertwines with the market failure reasoning.

A similar reason proposed is about the post-war Keynesian policies which promote the autonomous expenditures of government including R&D through monetary and fiscal instruments where the capitalists are not willing to invest. The equivalent of Keynesian policies in developing economies was the policies organized around development economics aiming linking the unindustrialized world to the capitalist development with higher growth rates (Türkcan, 2009).

2.1 Source of IT revolution – A Brief History

The motivation behind the technological breakthroughs in the second half of the twentieth century is critical to understand the increasing role of information technologies (IT) in social and economic structure of contemporary world. As the state's role in production and organization diffused with the new Keynesian understanding of economy, investment on research and development became a public duty of governments all around the world. So, it is important to assert that the high IT investment and its rapid diffusion did not result from free markets but centralized planning. Products like internet were the outcomes of long-lasting research and development efforts of governments in US and Europe. Specifically the role of military and defense related procurement on the development of some general purpose technologies was crucial and they especially played a decisive role in the development of the US economy in the 20th century (Ruttan, 2006). As it is stated, whether the literature is mainly about the US experience where those technologies were rooted in, the role of state is acknowledged for European countries or India and China as their strong technological bases are related to their military-industrial complexes or electronic and telecommunication industries and even for Japan where large corporations were guided and supported again by government (Castells, 1996). Yet the role of government in stimulating information and communication technologies has been especially important in US as the cutting edge technological breakthroughs were only possible with the government sponsorship and military contracts to private sector and the initiatives of Department of Defense (DOD) during and after the Second World War. This structure formed the basis of IT revolution. Both the existing corporations in electronics and communication industries like Bell Laboratories, AT&T or IBM (Castells, 1996) and the newly flourishing technology companies like EMCC or ERA (Ruttan,

2006) enjoyed the government-enforced monopoly structures and continuous demand from government especially for military purposes.

ENIAC, the first general purpose computer produced in 1946, was the outcome of a research initiative of University of Pennsylvania with US army sponsorship and quickly transformed into a company called Eckert-Mauchly Computer Corporation (EMCC). Continuous government demand stimulated new initiatives of computer production of those new companies or already existing ones like IBM. Another development in computer technology come up with the Semi-Automatic Ground Environment (SAGE) Project which aimed to detect alien aircraft, select appropriate interceptor aircraft and determine anti-aircraft missile trajectories. Specifically the SAGE project was the stimulator of the commercial development of the American computer industry and it led many of the inventions that people come to expect in their personal computers. Following, demand for semiconductors was also dominated by direct procurement for military, nuclear power and space applications as the need for increasingly powerful computers grew well into the 1970s (Ruttan, 2006). In this wave of military/government procurement of technology, software flourished as a distinct industry with quite different path of development than the computer or semiconductor industries. Similar with other industries large military procurement contracts such as the SAGE played a particularly important role in embodied software development. For example one of the greatest contributions of SAGE was the training of a large cadre of skilled systems programmers (Langlois & Mowery, 1996). Even as late as the early 80s the DOD accounted for the largest share of the US software market. Different from the other computer-related industries, military-civilian spillovers in software occurred as a result of defense-related R&D spending rather than direct software procurement and a number of the important software innovations that contributed to the rapid adoption of the personal computer beginning in the early 80s. Moreover, software production has remained exceedingly labor intensive which result in increasing share of software in computer system costs (Ruttan, 2006).

DOD again, through its Advanced Research Projects Agency (ARPA) was interested in the development of a more sophisticated system that could ensure the survival of the communications system after an attack that might disable any single control station. In spite of the resistance of several university-based principal investigators who were committed to the development of their own software but also dependent on ARPA support, the job was contracted to a small

high-tech firm named BBN and ARPANET launched in 1971 as a network of 'host' computers dedicated to the connection (Mowery & Simcoe, 2002). Yet it took considerably long time compare to the relatively rapid liberalization of computer or telecommunications industries (Schiller, 1999) to privatize internet that, as late as 1990, ARPANET was still operated by government agencies with some modifications and splits like NSFNET (network constructed by National Science Foundation to serve for universities) or MILNET (network used for military applications by DARPA). The WWW system invented by European researchers developed by a US researcher and became the platform for multimedia applications as a 'killer application' which accelerated the growth of internet usage. The last development is the application software, now known as a 'browser' which is used to retrieve and display HTML documents. Named as Mosaic, this free browser was written by a graduate student who later founded Netscape in 1994. Whether the launch of Netscape is known as the explosion of internet which was the product of a research team led by a university member involved in the development of NSFNET; between the late 1950s and the early 1990s DOD and National Science Foundation (NFS) supported the development of internet with an amount close to \$1 billion dollars. The military sponsorship resulted in the invention of the *protocols* or instruction sets, which made feasible the network intercommunication and those protocols constituted the requisite suite of software instructions (Schiller, 1999).

The efforts of US government to support technology development and scientific research continued in the 1980s and 1990s through several specific programs. Whether the direct military spending on R&D decreased as a share of GDP, federal government spending remained critical and still highly important for immature industries like biotechnology or space research. Castells (1996) emphasizes the economic role of states in the age of deregulation:

It is precisely because of the interdependence and openness of international economy that states must become engaged in fostering development strategies on behalf of their economic constituencies

2.2 Science and Technology Policies in Transformation

There is an implicit consensus all over the world today that as long as it doesn't distort the competitiveness of firms, not only the academic and basic scientific research but also the industrial R&D activities should be promoted by governments (Caracostas & Muldur, 1998). However there has been a remarkable change in the understanding of science and technology promotion

since 1970s. Massive expenditures of governments in the developed world were under discussion and together with the changing political economic perspective a reorganization in science and technology policy was inevitable (Freeman & Soete, 2003). Two oil shocks, demise of the Soviet Union and the change in the scope of governments' developmentalist aims brought forward markets as decision-makers in resource allocation. Science and technology policies were attached to markets and big R&D projects of governments were replaced with incentives for innovative activities of firms and universities (Türkcan, 2009).

Today government related R&D support is one of the key mechanisms of financing companies through grants and subsidized loans for basic research or direct industrial incentives. And due to its nature, R&D is the riskiest part of doing business. For innovative companies in high-tech sectors with high costs of labor and equipment, those supports are vital.

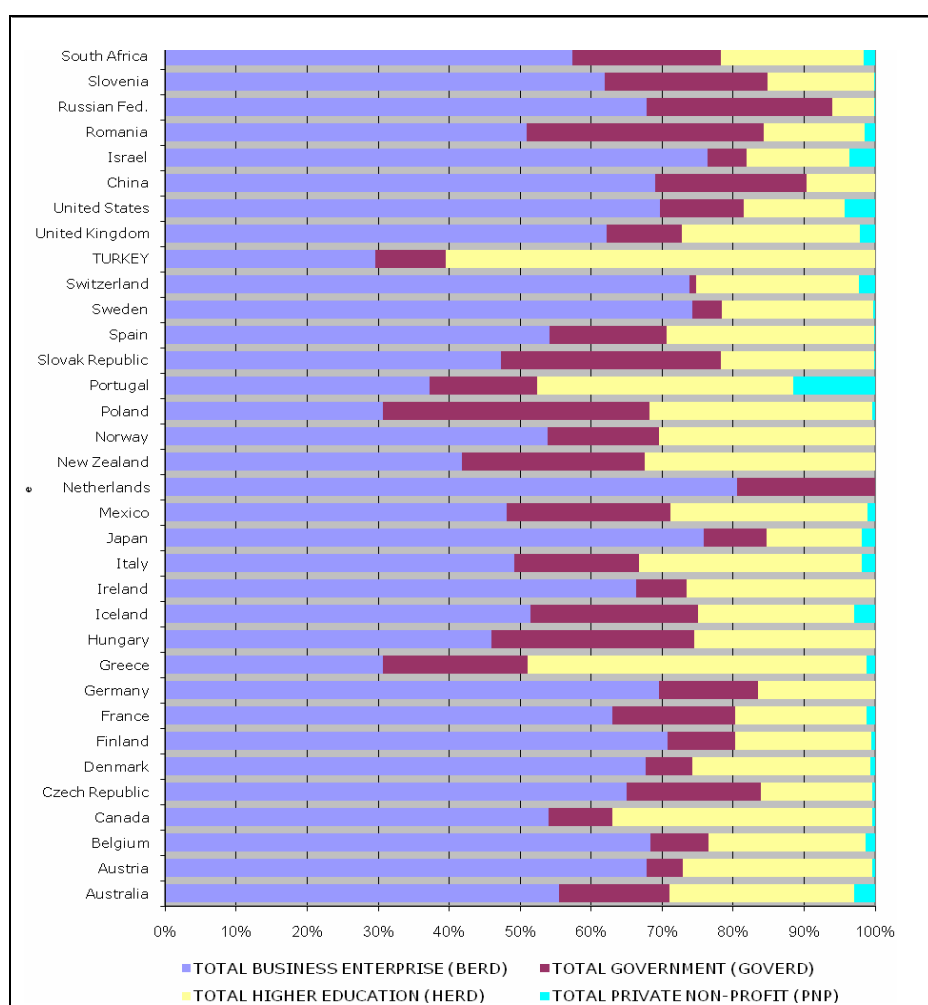


Figure 2.1 – R&D expenditure by performing sector, 2004-2006 averages (Source: OECD Statistics)

In many OECD countries, the government's share of total R&D funding declined during the 1980s and 1990s as the role of the private sector in R&D grew considerably. The relative decline of government R&D funding was the result of budgetary constraints, economic pressures, and changing priorities in government funding. However, since 2000, government funding of R&D has slightly grown in OECD area relative to the business sector expenditure. In 2005, governments funded 30% of research and development among OECD countries on average (OECD, 2007).

Why the scope of government support changed despite its prevalent importance and why public sources are utilized by private markets today? What are the underlying dynamics of this policy shift and how the transformation has been globalized? These questions necessitate a political economic analysis focusing on distribution issues and new economic order.

2.3 Capitalist Restructuring

The existence of a restructuring process for the global economic and political system is likely the most profound social phenomenon in the world since 1970s. In the year 2009, within another economic and financial crisis, it is still blurry to see the overall scale of this process and to figure out the ongoing impact on different social structures. However it already affected billions and redefined all of the economic and social relations and the roles of the established institutions in a broader sense.

The restructuring of contemporary capitalism became a reality mainly through redistributive growth and technological changes. Widely enunciated globalization and the consolidation of world economy as a reorganization through global markets are the main outcomes.

The most crucial aspect of the reorganization is neoliberalism as a new economic thought and practice which goes back to the end of Bretton Woods regime of fixed exchange rates. Thereafter, national regulatory structures, the role of global financial institutions and government functions have been reformulated and the dominant forces in policy making became the most internationalized sectors of transnational corporations and financial institutions. Moreover, new forms of international regulatory bodies were formed and the homogenization of the rules and regulations for production, exchange and distribution accelerated regardless of the distinctive conditions of different parties.

Financial liberalization has been the key underlying force behind the restructuring. United States have been the leader in orienting liberalization in a direction highly profitable for the finance capital and costly for rest of the world. The global institutions like IMF, World Bank or to some extent GATT/WTO have been the intermediaries of implementation of this financial reorder and they directed the economic policies and forced governments to change domestic institutional structure, rules and regulations. Foreign borrowing of governments and private enterprises increased and instabilities created an uncertain environment for investment which has always been crucial for further development of nations throughout the world. Increasing foreign ownership, which became possible especially after the pressures of those global organizations to open domestic economies to the market has again motivated this unequal restructuring (Tabb, 2001a).

The downsizing and deindustrialization in the core has been an important part of the reorganization. To restore profitability of big corporations, massive layoffs and spatial change of production became a norm at the expense of working classes that today the result is lagged real wages to the benefit of capital especially in US and to a lesser extent in other core countries. There is a continuous movement of production around the globe allowing a "spatial fix" for capital to keep the level of production as well as profits (Silver, 2003).

As the young sectors of the global economy grew up, the familiar tendency of capitalism; monopolization again emerged in the core and diffused rapidly as a part of restructuring (Tabb, 2001b). While the existing monopolies keep their markets in control; for newcomers, monopolization; rather than the market share of goods and services related with new technology, is about the awareness and/or utilization of some standard technologies and the concentration of providers within a supply network. For example the biggest software provider Microsoft has only a 16% market share in software industry; however dominates 90% of the operating system supply. Secondary goods and services are also dependent on those products and should be configured in line with existing processes.

This restructuring process whether started as a response of capital to the economic and social crises of late 1960s and 1970s, entered into a new phase in 90's with the help new technologies and rising financialization. Schiller (1999)

when discussing the liberalization of US telecommunications in his study explains this phenomenon:

'Liberalization was embraced first and foremost as a reflex of ... world's information infrastructure.'

As a consequence, technological developments gained a prominent role in restructuring and they are forming the solid base of 21st century capitalism.

In effect, the basic role of new technologies is about the diminishing costs of transportation and information transmission and processing. That's how international capital markets developed rapidly, aided by the power of computers to do the complex calculations and data manipulations (Tabb, 2001a). As a response to the saturated markets of the developed world and the difficulty to compete with price or quality, demand can only be increased through design and model differentiations and marketing and advertising campaigns and the role of ICT is enormous in establishing those channels for businesses (Dawson & Foster, 1998).

Finance as the main actor of the restructuring process became the sectoral leader of overall corporate information technology spending. Financial network applications harbored further developments that they allowed exponential increases in the volumes of trading exchange or other speculative instruments (Schiller, 1999).

The restructuring which is bound to the nature of capitalism is a process of redistributive growth. To examine the ways in which the gains and costs of technological and economic change are distributed is critical. The growth of information technology has been changing the world dramatically and like in the first and second industrial revolutions;

'The repercussions of technology are again embodied in capital and work processes, change the balance among class factions, and reconstitute classes and forms of industrial and social organization' (Tabb, 2001a)

The important point here is the role of new technologies and their transformative power to force companies to grow:

Technology has a central role to play in determining which companies come out on top, but there should be little doubt there will be both consolidations and monopoly profits made or that new technologies

will continue to revolutionize the economic contours of global capitalism (Tabb, 2001a)

The repercussions of this restructuring process through new business forms and industrial organization following new technologies brought forward specific descriptions for the ongoing developments in global economy. New means for business have been widely discussed and different aspects including finance have been analyzed through different perspectives (Baily, 2001; Landefeld and Fraumeni, 2001; Lazonick, 2006). As the importance of high-tech sectors in global economy increased, new business forms and their components including finance also became globalized and started to affect the whole organizational structure of businesses and overall economic relations.

2.4 New Economy

In 1990s, a new terminology was introduced to define the contemporary economy. The 'new economy' which is widely acknowledged as a result of the 'IT revolution' and globalization, has been presented as the transformation of the business structure and accelerating performance of existing economies. The discussion around the concept first appeared in the core of the global economic system; in US and dispersed to the other parts of the world, yet the US business model has been generally presented as the best performer of this new model of production.

The main argument of the new economy is about how investments on IT tools fostered the productivity of companies and improved their economic performance whether they are in IT business or using IT as a tool for their main activities. Within the storm of the rapid developments, new economy debate focused on its effects on the course of economic activity through the improvements in productivity and increasing global interconnections. The main line of the debate has been circled around the benefits of new economy in line with the better performance of US economy during this period. However the critical perspectives have opposed to the gain-gain argumentation of new economy followers and pointed to the inequalities and further questioned the newness of the new economy. There have also been some analytical studies over the concept whether and how it has minor and major effects over different economic actors and different countries through new set of policies and structural changes.

At the end of 1990s, new economy was almost seen as the rise of investment on and consumption of IT-related products which substantially contributed to the economic growth with low levels of inflation and unemployment in US. These improvements were all attributed to the trust of US companies on technology together with the old virtues of deregulation, flexibility and competition. Until the beginning of 2000, the tribute went along with the blurriness of the definitions and measurement problems of the impact of new economy on growth and productivity (Landefeld & Fraumeni, 2001). Nevertheless, a general consensus emerged around business circles in US, that whatever the degree of exact results, new economy was different than the old one that there is a radical restructuring towards prosperity and IT revolution and:

These trends can combine in powerful ways to raise Americans' standard of living, create jobs, spur entrepreneurial effort--and do all this without boosting inflation. To the believers in the New Economy, we have here the magic bullet--a way to return to the high-growth, low-inflation conditions of the 1950s and 1960s. Forget 2% real growth. We're talking 3%, or even 4%. Forget double-digit inflation and the natural rate of unemployment. We're talking stable prices. Forget hopelessness in the developing world. We're talking about raising living standards in India and Brazil (Shepard, 1997).

With a broader perspective than the dot-com understanding of the previous decade, new economy is generally presented today with a set of structures in transformation. In the table below some key issues of new economy are presented with their counterparts in old economy which generally refers to the economic structure before 80s.

Table 2.1: The dichotomy of Old and New Economies

| Issue | Old | New |
|---------------------------------|--------------------|---------------------|
| Markets | Stable | Dynamic |
| Scope of competition | National | Global |
| Organizational form | Hierarchical | Networked |
| Production system | Mass Production | Flexible Production |
| Key factor of production | Capital/labor | Innovation/ideas |
| Key technology driver | Mechanization | Digitization |
| Competitive advantage | Economies of scale | Innovation/quality |
| Relations between firms | Go it alone | Collaborative |
| Skills | Job-specific | Broad and changing |
| Workforce | Organization Man | Intrapreneur |
| Nature of employment | Secure | Risky |

(Source: Atkinson & Correa, 2007)

One of the two main forces behind the new economy is the globalization process (Shepard, 1997; Mandel, 2000; Atkinson & Correa, 2007). Opening up free trade, deregulation of markets and the rise of foreign investment intertwine with the intense global competition of big multinationals including many high-tech companies. In this sense, Farrell (2003) admits that there is a 'new' economy; however rather than a single result of technology or internet revolution, it emerges from intensifying business competition and a surge in managerial innovation. Competition is the key variable which compels firms to make innovation a regular feature of their activities. It is also presented as the success of US firms with respect to competitiveness and productivity over European and Japanese rivals is due to the structural deficiencies of the latter (Tyson, 2003). New economy firms are the global organizations based on financial, informational and communicational breakthroughs with integrated production, distribution and consumption.

The second force; IT revolution supplies the new products and processes which transform the means of doing business. The increases in speed and quality accompany with the decline in prices. With a deflation effect, IT diffuses quickly to different sectors.

Technological innovations not only increased productivity in some sectors; IT itself also directly facilitated the diffusion of many business and technological innovations. Companies used more sophisticated corporate planning tools, improved communications systems, and continuous on-line monitoring to increase the speed with which they replicated the breakthroughs of their competitors. New technological capabilities played a particularly strong role in spreading innovations across distribution centers and stores in the retail sector and across banking and brokerage branches in the financial sector (Farrell, 2003).

Within mainstream circles, it is believed that, the revolution makes all the data available worldwide and the continuing improvements of tools and techniques like e-commerce, e-business or e-finance used by companies all over the world, ensure the benefits for all actors in the global game. Rapid introduction of new technology products and their rapid obsolescence force firms for continuous product, process and organizational innovation.

Flexibility is one of the basic characteristics of the new economy. Capital and product markets have already been under way of flexible structures like through financial liberalization and just-in-time inventory control. Intense competition and rapid innovation go along with high flexibility. However, critically, labor

flexibility has a direct contribution to the high returns of innovation and IT investment that, for US the success supported by new technologies is largely the result of a reduction in labor costs which is especially done by cheap and quick ways of displacing workers in US. For example, insecurity continued with the corporate agenda of keeping labor costs down that unions weakened by years of corporate and government attacks and corporate policies of replacing permanent jobs with temporary, part time and contract jobs (Kotz & Wolfson, 2004).

Deregulation of markets is the other key character and flexibility can only be achieved with deregulated markets. This is not a brand new concept emerged with new economy however; the business structure of new economy firms is highly consistent with the deregulation of financial, capital and labor markets. Easy access to capital markets, easiness of establishing global or local connections and signing contracts, ownership, taxation facilities and easy hiring and firing are critical for new economy firms in order to gain better performance.

A last character of new economy is the 'entrepreneurship'. This old concept reinvented for especially the new performance of US economy thanks to the new economy firms which were generally launched by particular people. Together with the emphasis on historical dynamism and innovativeness of the US economy, new period specifically distinguishes with the rapid diffusion of novel products through continuous innovation owed to those entrepreneurs. The old-new dichotomy appears with the difference between 'organization man' and 'intrapreneur' especially for developed economies and specifically US. Organization man of the old economy, who had a college degree, was secured with a well-paying job with an established company early in his career, and then worked up around the corporate hierarchy during his life-long employment period with defined social benefits (Lazonick, 2006). However, an intrapreneur is someone working for a large organization that is able to be entrepreneurial within that organization (Atkinson & Correa, 2007), yet in a risky environment without defined benefits.

The beginning of new economy is generally attributed to the initial public offering of Netscape in 1995 (Mandel, 2000). The stock value of the company doubled in its first day of IPO. This date was the start of the rapid valuation of high-tech companies later named as 'dot com bubble' which burst at the beginning of 2000, supposedly due to the Microsoft's case of monopolization and the slowdown of the US economy. NASDAQ stock prices rapidly decreased in a single

day and the fall continued in the following days. After a year NASDAQ lost over half of its value equivalent of a third of the houses in the US sliding into ocean with massive layoffs, bankruptcies and investment cuts (Tabb, 2001b).

The impact of new economy on developing countries also analyzed in early 2000's mainly around the discussion on digital divide. After a half-century long discussion on convergence and divergence of economies throughout the world without a consensus and a general policy proposition especially from international organizations (Fagerberg, 1996) a new debate on digital divide shown up with a fear if the new economy is reinforcing the gap between rich and poor countries. However the fear quickly transformed into hope for the whole and especially diffused through mainstream circles that ICT can be the 21st century miracle that is a potent instrument for accelerating broad-based growth, sustainable development and for reducing poverty (Baliamoune, 2002). As there has been a general approval about the role of ICT in US economic success and growth started with 90s, then it could be possible to propose the success of ICT in fostering growth to the rest of the world. UN Ministerial Declaration of the Economic and Social Council of 2000 initiated a task force for member countries to help to bridge the digital divide through developing new and innovative approaches to devise technological solutions for development of backward countries and people (Pohjola, 2002). Sustainability potential of new economy has been especially stressed for developing countries that as a new channel for economic growth, ICT has been presented as uniformly beneficial for all. Insufficient investment in ICT, insufficient complementary infrastructure like education or skills in order to reap the benefits from ICT, and low levels of demand for knowledge products are considered as the obstacles to ICT diffusion and growth (Pohjola, 2002), and income levels, government trade policies, political rights and civil liberties, education (Baliamoune, 2002) or income distribution (Bedi, 1999) are the critical factors for ICT diffusion. It is argued that the purchase of imported capital and inputs, transfer of know-how through foreign direct investment or reverse learning can help ICT diffusion and the result is further growth (Shane & Roe, 2000).

The critics of new economy are also relevant with this aspect that they interrogate whether there is a new economy or it is a part of an already ongoing process. They assert that the deregulation, erosion of governments' role for stability, cost-cutting strategies of firms and new employment strategies are all

parts of an anti-labor agenda and only accelerated within the period of new economy (Kotz & Wolfson, 2004; Baxandall, 2002).

Lazonick (2006) defines the 'new economy business model' as a new mode of organizational structure which reshapes the working conditions and processes which is more than a catalyzer of ICT or a new surge of productivity increase. This model emerged among high-tech companies in Silicon Valley and then diffused all others throughout US and to some extent among European and Asian high-tech sectors. The basic determinant of this new model is probably the contribution to an insecure and instable economic atmosphere.

Increasing mobility of labor between firms, unequal wages among employees, outsourcing, passing on the benefits of employees to their own responsibility, elimination of union organization are the main peculiarities of new economy sectors. Especially in US economy, compensations like stock options offered to managers widened the gap between wages among employees. Together with increasing mobility of labor and decreasing security, pensions and health insurances laid on the employees to manage.

The reflection of this new model on production process is defined with vertical specialization. Production process is divided into pieces among companies and specialization increases within different segments. It also brings about differentiated markets and in terms of both products and processes; therefore, companies in the new model entail a higher degree of strategic focus. Contract manufacturing becomes a norm for production as the new economy companies that don't do manufacturing rely on contract manufacturers and an international network of production activities and services including testing, design, documentation or shipping emerges (Lazonick, 2006).

Lastly, new financial sources like angel investing or venture capital became common and stock market as a whole is now considered as a way of payment for compensations or even for acquisition of other companies. In sum, the sustainability of new business model considering its outcomes about employment and financial stability is questioned. Based on big research and development expenditures of the previous period, new economy firms may fully exploit existing knowledge but now focus on only development but not on research and new labor market is now wide open to inequalities and increasing fragility (Lazonick, 2006).

2.5 Perspective

The association of capitalist restructuring, rise of the information and communication technologies and new economy model is more than a coincidence. Whether the perspective of an ahistorical mainstream analysis presents the current picture as a global opportunity to be profited by everyone (Shepard, 1997), the restructuring has been based on the transformation of the main institutions of capitalism with profound effects on billions sometimes disproportionately. Moreover the effect of the restructuring and the utilization of the opportunities for different countries are not the same. The strategic planning and decision-making abilities of developing economies may differ in expanding but fluctuating global economy. It is hard to accept the existence of a template useful for every developing economy.

However the restructuring as well as the process of globalization also affect the understanding of the role of various tools including finance for the growth of domestic economies. Several success stories across the world contribute to the efforts of proposing templates. In effect, the new economy concept is the underlying theme of the discussion that the components of the new economy are proposed as the tools to apply to the domestic economies in order to reap the benefits of scientific and technological breakthroughs of the 21st century.

Finance is one of the major components of the discussion. Today as a general understanding, it is an important component of technology development and it should also be restructured in line with the needs of the market. Therefore, the transformation in science and technology policies and the developments in the public and private allocation of financial resources to high-tech sectors brought about the modeling of financial tools for innovative firms. In recent years, starting with the investigation of venture capital, different financial sources have been analyzed and various propositions have been developed for the finance of technology development. There are various generalizations about the role of different finance methods for innovative firms thus, the analysis of the current approaches regarding finance mechanisms for high-tech sectors is critical.

CHAPTER 3

FINANCIAL GROWTH-CYCLE MODEL FOR HIGH-TECH FIRMS

It is evident that governments are still highly important in supplying funds to high-tech sectors for their innovative activities which otherwise might never exist. Yet, there is another reason as much critical as the market imperfections averting R&D investment. Badly working financial systems also affect high-tech investment and growth of technology sectors. Today the role of government as a direct financial mediator of the economy has gradually abolished and markets became the arbiters in financial systems to provide financial sources for companies. Meanwhile, the deregulation of financial institutions through the restructuring process overlapped with the rise of new technology sectors. For developing economies which are already weak in providing necessary source for these industries; new channels of interaction for investment decisions became important. Having a successful example like the United States venture capital especially important for start-up and developing high-tech companies; financial channels and their regulatory and administrative infrastructure are started to be discussed not only among corporate circles and related government institutions and multilateral organizations but also among scholars of innovation.

Bartzokas and Mani (2004), properly describe the trade-off between technology and finance;

If financial markets are underdeveloped, people will choose poorly productive, but flexible, technologies. Given these technologies, producers do not experience much risk, and hence there is little incentive to develop financial markets. Conversely, if financial markets are developed, technology will be more specialized and risky, thereby creating the need for financial (and assets) markets. A particular resource (capital) can be specialized into a narrow range of tasks without being harmed through the increase of risk because financial institutions are used in order to deal with it. Thus financial markets contribute to growth by facilitating a great division of labour. In the absence of financial markets, diversification is taking place at the firm level through technology 'options'. Firms will choose technologies that are less risky, with many applications but less productive. Firms are reluctant to engage in sophisticated technologies as long as they cannot share the risk they incur with financial markets. Indeed there is a strategic complementarity between financial markets and

technology, because both are instruments that can be used for diversification and technological upgrading.

In this sense, what are the financial channels currently available, what are the financial preconditions for the successful development of a high-technology sector especially in developing economies, and the challenges and opportunities different finance forms provide for the ICT industries in developing economies, need to be analyzed.

3.1 Representation of the Model

The primary function of financial institutions is to maintain the allocation of funds within an economy. Yet how would this allocation occur in an environment composed of different actors with different expectations? How the financiers and entrepreneurs can meet together for a finance agreement? This depends on various factors including firm size, firm age, information availability as well as the level of investment risk assumed by investor and the severity of finance for the firm to grow. This picture is much more complex considering the information asymmetries. For example, while ICT firms are young and small, hence lack a track record and their market prospects are relatively uncertain, outside investors will have little to agree on participation (Houben & Kakes, 2002). Equally important, other than the characteristics of the firms, there is a relation between legal systems, regulation, the structure of financial institutions and the investment decisions (Mayer, 2004).

Conventionally, high-tech firms have a general financial structure primarily depending on their size. The following graph is prepared in line with the overall framework:

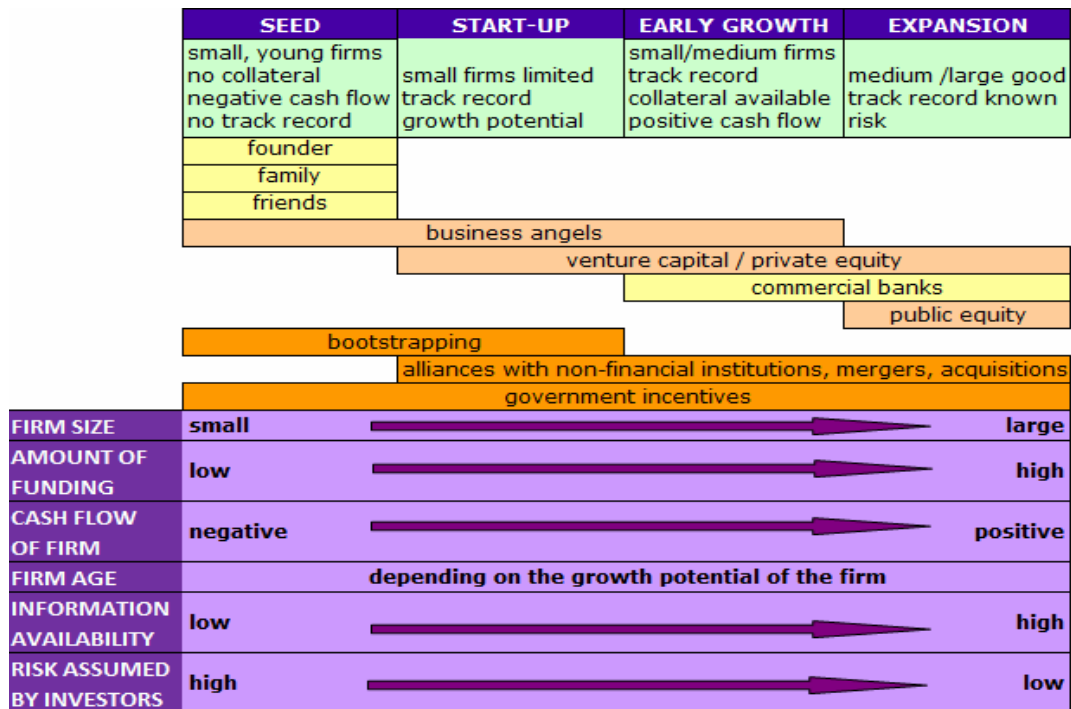


Figure 3.1: Financial growth cycle of high-tech firms

(Derived through: Houben & Kakes, 2002; Van Osnabrugge & Robinson, 2000; Saublens, 2005)

The first phase in the development of high-tech firms is the seed stage. By implication internal financing play a heavy role during this phase (Houben & Kakes, 2002). The firm has a concept still to be proven and developed (Mayer, 2004) or the firm starts doing business in related fields to provide some cash inflow but the awaiting concept is the only source for growth. The seed capital is necessary for the finance of R&D activities, prototype production and their development or simply to finance the workforce in case of human capital intensive activities. The sources of funds other than the 3F (founders, family, friends) may be the unguaranteed and interest-free debts, micro-credits, governmental institutions' small scale funds or early stage equity financing from business angels.

The second is the start-up phase when products are developed and initial marketing is launched. This is maybe the most critical phase for innovative companies because they now have more things to lose as they already accumulated some and the need for finance is higher as marketing is an expensive business for start-up firms. The main characteristics of start-up companies which are mainly relevant for seed phase are as follows;

- Short performance histories

- Small-scale operations
- Involvement of an innovation that further increases already high risk
- Weak access to supply and distribution markets
- Illiquidity
- Uncertain growth rates
- No collateral
- Low survival rates (Van Osnabrugge & Robinson, 2000).

To continue, early-growth stage is the third phase of firm development that the firms are expanding and producing but may well remain unprofitable. They are often less than five years old at this stage (Mayer, 2004). When a certain track record has been established and monitoring arrangements developed, venture capitalists may provide complementary equity financing. In practice, venture capitalists tend to contribute not only to firms' start-up financing, but also to their management know-how (Houben & Kakes, 2002).

The fourth stage is the expansion stage. At this level the firm is mature and profitable and often still expanding (Van Osnabrugge & Robinson, 2000). Once cash flow has turned positive and assets have been accumulated, security banks may be expected to step in. Prior to this stage their debt financing role is generally low given the borrower's lack of collateral and inability to cover debt service obligations with current proceeds (Houben & Kakes, 2002). With a continued high-growth rate, it may go public in a time period depending on the available financial atmosphere.

For a better understanding of the financial channels for innovative firms with different stages of development, it is necessary to look through in detail to the funding source and to identify their opportunities, investor expectations, and advantages and disadvantages. The amount of financing usually increases with each progressive stage of financing as the firm grows. However the time interval between different stages varies because of the financial structure in which firms operate. Information asymmetry also decreases with the visibility of the firm and the risk assumed by investors as well.

3.2 The Three F's – Founder, Family and Friends

At the seed stage, most entrepreneurial ventures are financed by the entrepreneur's personal savings. If more capital is needed, it comes from family and friends. It is the most popular source of funding not because it is the best

one but the other sources are not available at the moment due to the perceived riskiness of the firm and higher costs of outside funding. In a UK study about the financial constraints of small high-tech firms, founder's savings are the biggest considered and actual source of finance and families or friends are the third in actually secured sources.

Table 3.1: Sources of finance for small high-tech firms in UK

| Source of Finance | % of Firms Considering Source | % of Firms Actually Securing Source |
|--------------------------------|--------------------------------------|--|
| Founder's Savings | 69 | 49 |
| Bank loans | 69 | 7 |
| Money from families or friends | 12 | 9 |
| Money from government agencies | 48 | 9 |
| Business angel and VC | 45 | 10 |
| University endowments | 5 | 6 |
| Strategic partners | 29 | 6 |

(Source: Van Osnabrugge & Robinson, 2000)

Within the early phases of development, equity gap for firms is enormous. Equity gap is the absence of small amounts of risk capital from institutional sources at the early stages. The fixed costs of investment appraisal and monitoring make it uneconomic for venture capital funds to make small investments and banks are reluctant unsecured lending. For example the gap is for U.S. firms seeking less than \$500,000 (Van Osnabrugge & Robinson, 2000). The basic criterion of the investors at this stage is not more than the trust relationship they have.

3.3 Business Angels

Business Angels maybe the most important actor filling the equity gap in developed economies with a long history of entrepreneurship. Angels are real people using their financial wealth and entrepreneurial experience to help young firms grow, often by working side by side with the firms. In fact they are the oldest source of outside funds for young high-growth firms. Bell Telephone, Ford, Apple Computer, Amazon (see Appendix A) or DreamWorks founded with business angel funds (Van Osnabrugge & Robinson, 2000). More recently, Facebook, the social networking website had its first external funding from an angel; Peter Thiel with an amount of \$500,000 in exchange of 7% of the ownership in 2004. The company is worth \$15 billion and Thiel's share is above \$1 billion (Hodgkinson, 2008). In fact this is a basic 'next generation of

innovation' (Van Osnabrugge & Robinson, 2000) example that the entrepreneurs of the past like Thiel who co-founded the PayPal and sold it to eBay for \$1.5 billion become angels or venture capitalists. By nature angels tend to focus their efforts in the industry they know.

The main benefit of angels is removing the equity gap as stated. Second, they tend to have less risk aversion and lower expectations of return than other types of investors. This is especially critical for high-tech companies which inherently come with high risks. Third their cost of finance is often cheaper for the entrepreneur, and their funding is received more quickly than other finance sources. Fourth, most business angels are value-added investors in that they contribute their personal business skills to furthering young business. Lastly angel financing market is more geographically dispersed. They can be found everywhere, not just in financial centres (Van Osnabrugge & Robinson, 2000).

To give an example, in United States more than half of the business angel investing goes to the high-tech sectors among which software is the leader sector for the average of last five years. In 2007, total angel investment is \$26 billion with an increase of 1.8% over 2006. A total of 57,120 entrepreneurial ventures received angel funding in 2007, and the number of active investors in 2007 was 258,200 individuals (CVR, 2008).

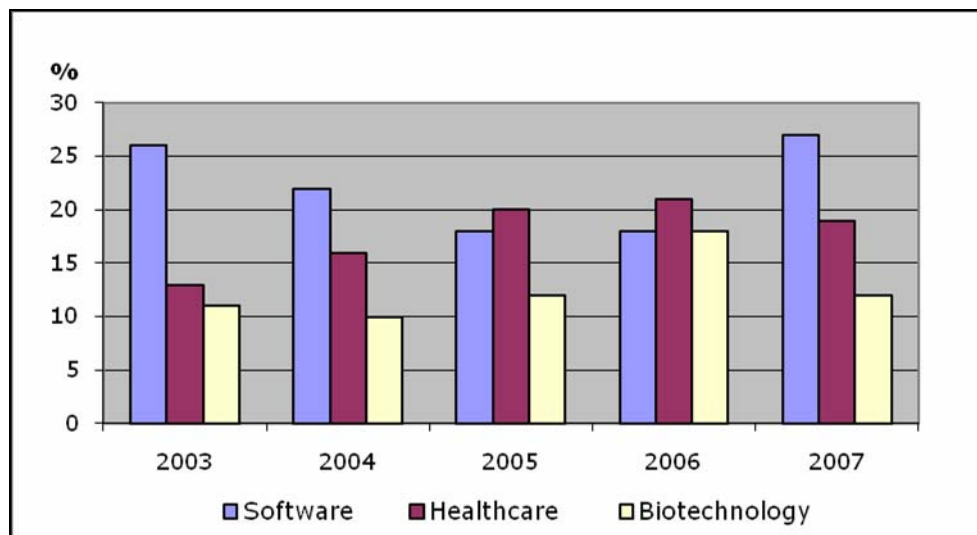


Figure 3.2: Top 3 technology areas receiving angel capital investment in USA (Source: The Angel Investor Market in 2007, University of New Hampshire, Center for Venture Research, 2008)

To compare, European angel investing is not that much developed. According to European Business Angels Network estimates, in 2007 about 50,000-75,000 investors invested €2-3 billion. An important difference between U.S. and European angel investing is that angel investing in Europe is at its development stage with smaller amounts per investment; yet there are some fiscal incentives or government support for business angels in some countries (Munck, 2008).

Unfortunately, business angels are almost invisible and often overlooked by entrepreneurs. In order to increase their visibility and to become more efficient in serving for start-ups, two different organization structures developed. The first one is the Angel Syndicates; the consortiums of a number of angels which allows them to collectively make larger and more frequent investments. They also can provide more expertise for entrepreneurs than a single angel (Saublens, 2005). Considering the amount they can provide, they located between single angel investors and venture capital (Van Osnabrugge & Robinson, 2000). The second form of organization is the Business Angel Networks or Matching Services. These organizations afford a means of cost-effective communication between entrepreneurs seeking finance and business angels seeking investment opportunities. The networks are not only helpful for resource-seekers but also for less-experienced angels (Saublens, 2005).

Business angels have some priorities in doing their investment decisions. They generally look for current and comprehensive business plan, a committed management team, high growth and strong business forecasts, sometimes already developed product and realistic pre-money value of the investment. Yet, entrepreneurs' qualities are the most important criteria for angels (Munck, 2008).

The return of the angel investments is definitely critical. Especially as ventures grow and investors wish to realize some (or all) of the financial gains on their investments, it becomes a serious concern to consider different exit opportunities. A study with information on 539 angels' 1,137 exits in United States during the last two decades shows that 52% of all of the exits returned less than the capital the angel had invested in the venture. 7% of the exits achieved returns of more than ten times the money invested (Wiltbank & Boeker, 2007). In another study about the returns of angel investing in Britain, most common exit routes for angel investments which are not write-offs are presented in the table below.

Table 3.2: Exit routes for angel investors

| Exit route | Frequency used (%) |
|--------------------------------------|--------------------|
| Trade Sale or Acquisition | 43.1 |
| Sale of Shares to Other Shareholders | 26.4 |
| Sale to Third Parties | 16.7 |
| Going Public (IPO) | 12.6 |
| Liquidation of Assets | 1.3 |

(Source: Van Osnabrugge & Robinson, 2000)

Certainly angels are not perfect investors for small-scale start-ups. Other than the inefficiencies of the investment mainly caused by the fragmented nature of the market, imperfect channels of communication, and the visibility of business angels, they also have some disadvantages as listed below.

- Angels are less likely to make follow-on investments in the same firm which is sometimes critical as venture capitalists mostly do
- Angels prefer to have a say in the running of the firm, which may force the entrepreneur to give up some degree of control
- A small minority of business angels may turn out to be 'devils' who have self-serving motives for investment, rather than promoting the good of the firm
- They usually don't have the reputation and prestige, which can be crucial if the firm is successful enough to seek assistance from an investment bank for a private placement of initial public offering (Van Osnabrugge & Robinson, 2000).

3.4 Venture Capital

Venture capital is the most likely source of external equity funding for early-phase entrepreneurial and specifically high-tech firms in the developed world. Venture capitalists tend to fund high-growth ventures with little track record. These ventures do not yet have access to the quoted securities markets and are still risky for bank lending but they are in need of funding beyond the means of individual business angel investors (Van Osnabrugge & Robinson, 2000).

The history of venture capitalist or in other words 'institutionalized business angels' goes back to post World War II period of 'Corporate America'. Venture capital evolved into a market solution to the problem of how to fund innovations that fell outside existing corporate boundaries. Today the ideal-typical venture capital firm is based around Silicon Valley with international connections and

invests largely in high-tech sectors. However, the diversity of different nations in terms of their national systems of innovation, level of entrepreneurship, political economic development, varying labor practices, corporate ownership regulations, educational achievement and business cultures posits out that venture capital in each country has a different evolutionary trajectory (Kenney, Han, & Tanaka, 2004). In fact, venture capital firms require strong public policy support in terms of organizational infrastructure, regulation and incentives. The role of governments in establishing and mediating the venture capital industry is evident through the examples in Israel, Taiwan, Singapore or India (Bartzokas & Main, 2004).

The essence of venture capital and private equity is to gain an equity stake in the firm to be funded and to realize value out of the equity as the firm grows. However, these investors are not passive outsiders that, they demand seats on the board of directors through which they monitor the firm. They also assist firms in terms of technical and financial knowledge and intervene actively in decision-making. In doing those their primary motive is definitely to make more money in return of their investment. Yet, social goals such as reducing unemployment, increasing R&D or building community's tax base are not their concerns (Kenney, Han, & Tanaka, 2004). Nevertheless, venture capitalists have helped to create well-known corporations in United States which are in the sectors the most contributive to the overall employment of the country. Apple Computer, Cisco Systems, FedEx, Genentech, Intel and Oracle are several new economy companies have had venture capital contribution in their development periods (Van Osnabrugge & Robinson, 2000).

The trend towards globalization of venture capital through the incorporation of venture capital funds in global portfolio management structures dates back. Here it is important to mention that this incorporation has not been that much innocent that sometimes it came with financial liberalization which has been generally hazardous for many countries especially in 1980's and 90's. The World Bank Group affiliate International Finance Corporation played an important role in encouraging the formation of many of the early venture capital funds. Whether the convincing of India to establish its venture capital industry as part of a process of its financial liberalization is presented as a benefit for India, many other nations such as Brazil, Nigeria, Argentina and Indonesia the encouragement of venture investing failed but the liberalization was completed in those countries with hazardous effects (Kenney, Han, & Tanaka, 2004). Today

the globalization of the industry is based on the networks backed by giant banks or other finance corporations. Many venture capital firms have established around the world with branches in main financial centers in the last decades.

As the venture capital is an intermediary between the investors and investee, venture capitalist raises financing from outside providers on a competitive basis. Since most venture capital funds are organized as partnerships, these fund providers are referred as limited partners (LPs). The usual categorization of LPs is as follows;

Private Independent Firms: independent private and public firms including both institutionally and non-institutionally funded firms and family groups

Financial Institutions: firms that are affiliates and/or subsidiaries of investment banks and non-investment bank financial entities including commercial banks and insurance companies

Corporations: venture capital subsidiaries and affiliates of industrial corporations

Institutional Investors: professional entities that invest capital on behalf of pension plans and university endowments.

Government

(NVCA, 2008)

Sources of venture capital funds differ significantly across countries. For example banks in Germany, corporations in Israel, insurance companies in Japan and pension funds in Britain are major financiers (Mayer, Schoors, & Yafeh, 2001). Therefore the financial structure and the particular forms of finance in different countries bring different difficulties as well as opportunities.

It is generally admitted that venture capital is a middle stage funding source for firms. However, structural changes in the overall economy or the peculiar characteristics of different countries also affect the trends of investment. As the venture capitalists are focused on exit and better returns, their preference lays between middle to expansion stages for firms. The reasons include liquidity problems, impossibility of exact pricing, rates of return differences or simply scale issues for the deal sizes and deal numbers (Van Osnabrugge & Robinson, 2000).

For United States today, 79% of the venture capital investments goes later and expansion stage companies (NVCA, 2008). For Europe, 82% of venture capital is invested in either expansion stage companies or invested for replacement capital (EVCA, 2008).

The reasons above also explain the venture capitalists' willingness of exit. They are rule-based, and use careful screening of applicants and due diligence (Mayer, 2004). The main two exit routes for venture capitalists are IPOs and mergers&acquisitions. It is also possible to recapitalize the company or to sell the equity to the founders. However, a liquid financial market and a developed IPO market including stock exchange is considered as essential (Mayer, Schoors, & Yafeh, 2001).

Venture capital is regarded as a high-tech funding source. Software, telecommunications, biotechnology and electronics/computer sectors comprise more than half of the venture capital investment globally. For United States this amount is much higher with software as the leading sector for years (NVCA, 2008) but in Europe, venture capital is mainly focused on manufacturing, business and industrial services (EVCA, 2008). Asian venture capital is also focused on high-tech sectors without a specific industrial concentration (Mani and Bartzokas, 2004).

One of the main deficiencies of venture capital is the relationship with fund providers and investee firms. Venture capitalist has to wear two hats and contend with both the supplier and the user of finance in the volatile environment of entrepreneurial investing (Van Osnabrugge & Robinson, 2000). Therefore the preconditions including the stage of the firm to invest, the sector of the firm, previous investments on the firm or conditions to exit are all effective in the decision-making of venture capitalists and their financiers. The trend now is later stage financing with smaller number of investments involving larger amounts. For example, in the United States, the share of start-up venture finance has decreased from 29% in 1980 to 4% in 2007, while the later stage finance increased from 9% to 41% during the same time period (NVCA, 2008). In Europe, the definition of venture capital is already different than the U.S. case that venture capital is limited to the growth stages of a company, i.e. seed, start-up and expansion capital. However, private equity investment comprises all stages of financing: seed, start-up, expansion, replacement capital and buyouts. The ratio of buyouts (later stage investment) to venture capital was 1.37 in 1997 which became 4.94 in 2007 (EVCA, 2008). Obviously the numbers are also decreasing for early-stage investments that fund providers focus on risk-aversion strategies with increasing monitoring and working with more mature firms to decrease uncertainty.

Another problem with the venture capital is the lack of expertise within the sector. Investment in technology based firms is risky not only because of the fact that huge technological uncertainties exist but the expertise is rare and expensive for technical monitoring of firms. Agents with knowledge in technical and financial issues together are hard to find and venture capitalists tend to favour investments outside the technology-based sectors. This increases the difficulties of high-tech new and small firms in raising capital (Bartzokas & Mani, 2004).

The last issue about venture capital is about its main aim –exit as soon as and as best as possible. Stock markets are generally a prerequisite for the development of the venture capital industry however the nature of those markets can be threatening for the entrepreneurship and future course of companies. Venture capitalists try to exit in upward trends of the market and the valuation of the firm in those times may become arbitrary. Through downward trends they hesitate to invest in firms even their innovativeness are strong and prosperous.

3.5 Banks

Commercial banks rarely take risky investments. Because early stage firms lack a track record, collateral offerings and liquidity, and have volatile profit and cash flow measures, banks often restrict lending to those firms since it is difficult and costly to evaluate the risks (Van Osnabrugge & Robinson, 2000). Banks are the debt-financing options for firms which highly in need of credits in their early stages. However, debt financing by banks remains subsequently limited, when firms grow up and have direct access to capital markets (Houben & Kakes, 2002). Nevertheless, banks are indirectly financing high-tech ventures through their shares in venture funds and they are still important in providing short-term, emergency borrowings.

Similar to the exit strategy of venture capitalists, banks also reshape their lending practices within changing financial conditions. When they squeeze their credit supply, it becomes impossible for the high-tech small firms to obtain funds as they are the riskiest units in banks' portfolios. Therefore the bank managers have a strong lending preference for bigger firms than smaller ones. "A bank usually only lends money to small firms once it can prove that they do not need it" (Van Osnabrugge & Robinson, 2000). Case studies identify that small and innovative high-tech firms are more likely to be financed by venture capitalists rather than banks (Zara, 1995; Hogan, 2004; Audretsch & Lehmann, 2004). One

important thing, firms which already provided sources through equity financing are likely to persuade banks for borrowing as they are already monitored with investors.

The overall macroeconomic policies of countries and their regulatory framework are important for the general behavior of banks towards venture borrowing. OECD reports about the rigidities of banking systems especially for small and innovative small businesses. State-ownership, business group-ownership, reluctance of banks to change their customer base, and especially the fluctuations in the economy are all important indicators for banks' credit supply (OECD, 2006).

3.6 Public Equity

Although only a small minority of firms reaches public equity through an initial public offering (IPO), public equity is considered as the targeted source of finance for many firms in their expansion stages. There are several advantages to do public equity financing:

- A stock market listing attracts further external capital that can be used to fund the firm's growth
- A market listing permits investors who funded the firm in the early stages to realize their locked-in investments for a financial gain, which can then be reinvested elsewhere.
- Naturally, entrepreneurs are also rewarded for their adventurous endeavours.
- Rendering to entrepreneurs the opportunity to possibly repurchase shares of stocks at a later date, and so regain control of their ventures, may make them more willing to seek external equity capital in the early stages of their ventures (Van Osnabrugge & Robinson, 2000).

Few firms are lucky to have an IPO. Even in the United States where the stock market is the most developed, fewer than one in a thousand new ventures have an IPO that the number of IPOs in 2007 was only 155 (NVCA, 2008). Nevertheless the profitability of the source attracts many companies including young high-techs. The utilization of the stock market also depends on the different financial structures of different countries. United States is foremost leader in stock market utilization and the average age of a firm coming to the market is much smaller than European or Japanese firms (Mayer, 2004).

The peculiarities of firms preparing themselves for an IPO also vary according to the previous source of funding or specifically the existence of venture capital. As venture capitalists target an IPO as best as possible their funding and monitoring scheme also reflects this aim and they prepare their investees like race horses. 86 of 155 IPOs in 2007 in U.S. were venture backed IPOs (NVCA, 2008). The overall return of the venture industry has been 15-20% since its inception, yet investors generally expect for 50% after the due diligence and investment periods and they prepare their investees for such an internal rate of return (Van Osnabrugge & Robinson, 2000). Again for U.S. case, VC funded companies doing their IPO are younger, more profitable in the long-run and have better timings for their IPO. The control of venture capitalists continues after the IPO for prolonged periods (Gompers & Lerner, 2001).

The issues about stock market are far great and deep considering high-tech finance. Whether it is considered as a heaven for many start-ups, the structure of the market is much more profound than any other kind of finance mechanism and its functions go beyond fund-raising. Lazonick (2007a) explains the contemporary functions of stock market especially for high-tech firms from a critical perspective of mainstream approach:

Stock market can support innovation by inducing investors to commit financial resources to highly uncertain new ventures with no immediate prospect of a financial return. In the late 1990s the booming US stock market enabled young companies to go public much more quickly and at much higher prices than had previously been the case, and thus encouraged venture capital to invest in start-ups... However, on the supply side ... speculation caused problems for the accumulation of innovative capabilities. At technology start-ups more effort was often devoted to getting to an IPO than to developing a commercializable product. Speculation could also disrupt the innovation process at established high-tech companies when key technical and administrative personnel "jumped ship" to start-ups as well as when top executives of established companies acquired technology start-ups in an attempt to convince the investing public that their companies had become "new economy", and hence were worthy of higher stock prices.

In this sense, the current mainstream understanding of stock market as maximizing the shareholder value rather than the prosperity of the firm through innovation is questionable.

3.7 Nonfinancial Corporations, Mergers, Acquisitions – Trade Sales

Another important source of finance for later stage firms is the alliances with other firms whether the shape of it ranges between equity sharing to complete takeover. The main argument behind the reasoning of alliances, buyouts or in general; trade sales is the difficulty for a firm to make an IPO or the volatility in the IPO market. These options allow buyers to acquire small firms to complement their product or service offerings, and small firms to use this new influx of strategic funding to further expand operations (Van Osnabrugge & Robinson, 2000). Both for United States and Europe the amount which is raised through trade sales and the number of transactions done is much higher than the IPOs (Lazonick, 2007a; EVCA, 2008). This particular kind of financing is especially critical where stock markets are under-developed or fluctuating and the benefits of scaling are much higher.

3.8 Bootstrapping

A last but not least method of finance for small entrepreneurial firms is bootstrapping. This method is a means of financing for firms through creative use of acquisition and use of resources without equity or debt financing. There are different options of bootstrapping for either product and business development or minimizing the need for capital;

- Forgone, reduced or delayed compensation (business)
- Personal savings (business)
- Working from home or space at very low rent (business)
- Deals with professional service providers at below-competitive rates (business)
- Personal credit cards and home equity loans (business)
- Prepaid licences, royalties, or advances from customers (product)
- Special deals on access to product hardware (product)
- Development of product at night and on weekends while working elsewhere (product)
- Customer-funded research and development (product)
- Free or subsidized access to general hardware (product)
- Turning a consultant project into a commercial product (product)
- Buy used equipment instead of new (minimizing the need for capital)
- Borrow equipment from other businesses for short-term projects

(minimizing the need for capital)

- Use interest on overdue payments from customers (minimizing the need for capital)
- Hire personnel for shorter periods instead of employing permanently (minimizing the need for capital)
- Lease equipment instead of buying (minimizing the need for capital)
- Obtain capital via the entrepreneur's assignments in other businesses (minimizing the need for capital)
- Buy on consignment from suppliers (minimizing the need for capital)
- Employ relatives or friends at nonmarket salaries (minimizing the need for capital) (Van Osnabrugge & Robinson, 2000)

These instruments are all widely used by early stage firms. Bootstrapping is especially critical for firms operating in high-tech sectors due to their early dependencies on their customers in marketing and considerably longer product development periods. They try to utilize all the methods as long as they can.

3.9 Perspective

It is identified that finance is a necessary precondition for high-tech firm formation and growth. Firm level analyses should consider the role of finance and the impact of the mode of finance on firm performance. Various sources of finance for high-tech firms should be examined in detail and their potential disclosed. Financial growth-cycle model may provide a template to identify this potential within a country and for domestic software industries. The related quantitative data and the strengths and weaknesses of each financial source can be analyzed. For innovative firms the relative importance of each source can be identified in order to establish the connections between existing finance schemes within a country, their potential strengths to provide funds for innovative firms and the needs of these firms.

Several studies revealed that there is a strong relationship between financial structure of the country and the contribution of the ICT sector to economic performance (Houben & Kakes, 2002; McQuaid, 2002). Again the US case and other examples like Israel and Taiwan are generally considered the best for others to follow with respect to their success in matching financial sources and innovation through different channels of finance for different needs. However, each country has its own characteristics that a role model is difficult to propose. Countries may not establish all the finance channels in the same manner, firm

may not utilize the financial sources or there are different structural reasons for the finance gap of firms.

Therefore, from a developing country perspective, there is a threat that the countries with poor performance in those variables determining ICT diffusion may sink further in the digital divide. Given old problems of development adjacent to the factors like business model, market access, competitive environment, human capital and government policies (Pohjola, 2002) ICT is not a standard solution for countries in the surge of development. The national policies regarding new technologies, and the capacity of innovativeness would widely differ among countries. Regional disparities within countries, inter-class relations, infrastructural capacity, social development levels or financial stability of the country are determinant factors in directing these policies.

In this sense the integration of new economy into national economic structures does not necessarily mean that the benefits of economic growth and globalization would be equally distributed. Mainstream approaches rarely consider the role of governments in regulating the resource allocation and spatial differences which may cause tensions with the sets of solutions offered like flexibility, deregulation and financial liberalization. Capitalist restructuring worked also for developing economies throughout the period of neoliberalism and caused structural issues like underinvestment, unemployment or financial instability. It couldn't find solutions for the problems of low level of national savings, underdevelopment of financial markets in serve of industrial sectors or allocation of resources into productive sectors and physical and intellectual infrastructure. Therefore it is critical to identify the country specific conditions while working on model-based research areas. The utilization of any tool to identify the potential of a domestic mechanism should have historical as well as institutional perspectives. The course of domestic science and technology policies and their interaction with the broader economic and social development should also be considered in order to identify the national orientation of technology development.

What is common for all, whether private or governmental and in the form of debt or equity, every kind of financial support is highly critical for high-tech firms. The priorities for different modes of finance and different policy solutions depend on historical conditions of national resource allocation and the political orientation regarding technology development.

CHAPTER 4

HISTORY OF ICT AND FINANCE IN TURKEY

4.1 Quest for Development - Before 1960s

4.1.1 Statism and State Support

State was the key economic actor of Turkey in its early years. Its primary purpose was to promote the industrial development and to orientate the national capital accumulation through a wide array of policies. Direct involvement into the production was also a policy option. *Statism* as a distinctive method of economic activity became the main policy for economic development in the early 1930's, especially motivated with the Great Depression which caused large trade and budget deficits, and the lack of ability of the private sector to foster production (Tezel, 1994). In fact the method of 'state capitalism' (Tezel, 1994) was not a new concept for the industrialization efforts of the country. Since the late Ottoman period, state intervention into economic activities was common. For example, around fifteen years after the introduction of telegraphy in 1854, first telegraphy workshop was opened to produce telegraphy machines and spare parts which was also in serve for the needs of state's Telegraphy Administration in Turkey. In addition, existing privately owned telephone companies in the main cities of the young republic were nationalized in the 1930's and The General Directorate of Posts, Telephone and Telegraph Cooperation (PTT) was redefined as a public service organization and finally restructured as a state economic enterprise in 1954 (Başaran, 2000).

For the young republic, the meaning of *statism* didn't mean only the contribution of state enterprises to the domestic production or employment. These enterprises also affected the size and productivity of other private firms that the former provided raw materials and intermediate goods for the latter to produce final goods. So the state as an intermediary economic institution oriented the whole national industry. At the same time as a regulatory body; through a diverse set of tools like trade regime, price controls or credit supply, it dominated the economic activity as a whole (Tezel, 1994).

4.1.2 Five-Year Industry Programs

Within a global context, the meaning of an intervention could be best understood with the import substitution model of industrialization. Whether it is generally attributed to the post-war period of world capitalism, the efforts of national economic development through domestic industries had already been initiated before the WWII. In spite of the efforts of government to promote private industry through regulations like *Law of Industry Incitement* (1927), to launch those industries eventually became the duty of state. Industrialization efforts in this model were generally held by state enterprises especially for new and sometimes high-tech industries which necessitate large amount of financial, physical and human capital. In concordance with these efforts, first and second five-year industry programs were put into practice. These programs assessed the needs of the domestic economy and projected the investments necessary to meet the demand of final and intermediate goods. Although the first program (1934) was successful to meet the targets with considerably higher costs than predicted, second program (1939) was failed due to the economic bottleneck of the World War II period (Tezel, 1994). The programs were composed of specific projects to increase the production capacity of the country. These projects were administered by the investment banks of Sumerbank and Etibank. The banks had both financial and organizational roles proving the deep intervention of state into economic activity. Nevertheless, private sector was always provided with financial incentives. Maybe as an early venture capital example; the role of the 'Industry and Mining Bank of Turkey' which was established by government in 1925, was to promote private industries with medium or long term credits, and to provide technical or financial information. The bank was acquiring the stocks of private companies, as a contribution to the capital accumulation of private sector. This bank and other financial institutions of state were the main actors of the national financial activity which had a fundamental role in development efforts. In understanding the role of state in economic development of Turkey, the approach of Tezel (1994) about *statism* is worth considering. He claims that the role of state as an investor and an administrator agent for the industry wasn't based on the ex ante strategic and ideological doctrines but the practical decisions consistent with the global and national conjuncture.

4.1.3 Communications and Young Republic

Communications quickly became a priority area of development for the country. For a successful national integration, necessary communications and transportation infrastructure had to be maintained. However, early modernist theories which consider economic development and social development are identical, largely affected the formation of the information and communication technologies infrastructure in developing economies including Turkey. Without a long-term perspective about the role of communications in development and without a national commitment towards science and technology; Turkey became a direct recipient of final goods and services of communications until the beginning of 1970s. The infrastructure regarding those technologies was almost dependent on foreign support and maintenance. Moreover, the procurement of these goods and services was sometimes in difficulty because of the balance of payment deficits, lack of enough foreign exchange, reflections of political corruption in auctions and interventions of foreigners to influence the administrative body for their own sakes (Yücel, 2006). Nevertheless, government launched first initiatives to establish the communication infrastructure and investments to develop the national telecommunication systems.

A third development program was initiated in 1946 in order to complete the targets of the previously failed program and to go further with the involvement of the state into economy activity as an executive and regulatory body. However the global political economic agenda was widely different than the previous period. As Turkey had an alliance with the West, the financial sources for the development initiatives came through US and European development and military funds. During the period, economic development was tied to those funds, other loans and foreign technical expertise. In 1950, Turkish Industrial Development Bank (TSKB) was founded as the first private investment and development bank and administered the foreign funds like Marshall Aid or International Bank for Reconstruction and Development (IBRD). TSKB became the driving financial source for the private sector investments especially for textile, food and glass industries which then played a main role in technology investments of the private sector in the following years (Özkan, 2005).

During the period between 1946 and 1960, other than the initiatives of the development program towards the investments on communications

infrastructure and increasing public access to the services, the main activity in developing the necessary physical infrastructure was the NATO communication infrastructure projects. These projects were coordinated and financed by NATO in collaboration with Turkish PTT. However the projects maintained the dependency and were not resulted in spin-offs or technical competence which was the case in the US military-industry technical development example. For example, the NATO investments were focused on transmission systems and the technical competence regarding *operators/switchboards* remained underdeveloped and other than the physical capital imported, the services of assemblage were also outsourced to foreign firms without any learning by doing possibility. Yücel (2006) discusses the lack of standardization in the communication infrastructure, deficiencies of early institutional commitment for in-house production efforts, disregard of some technological competences and bureaucratic issues as the main problems of PTT of Turkey precluding domestic supply of communication technologies and further technology development. He considers the foundation of PTT Research Laboratory (PTT-ARLA) was a progressive attempt to be a cure for these problems mentioned.

4.2 Planned Years – 1961-1980

4.2.1 Need for a Planned Perspective

It is possible to argue that the interest of the state towards science and technology policies and communication technologies flourished with the planned period of the 1960s and 1970s. Before 60s, utilization of technological tools and techniques like calculators or punch card readers were already started to disperse among state enterprises like State Statistics Institute or General Directorate of Highways. Some private initiatives like IBM Turk, Koc-Burroughs or Turkish partner of Remington Rand went into production and distribution of appliances and devices for computation and data processing (Özkan, 2005). However, planned period fostered the utilization of technology especially in state enterprises and universities in line with the 'development' perspective spread over the nation. In 1960, State Planning Organization which would prepare the '5-Year Development Plans' was established and first computer arrived into the country.

The idea behind the preparation of a development plan was to define a complete development strategy according to the 1961 constitution. To be more precise, the aims of the First Five-Year Development Plan (DPT, 1963) were 'to increase

the domestic savings, to direct the investments toward public welfare and to realize the economic, social and cultural development in a democratic manner'. First plan specifically stated the growing problems of the economy like rising trade deficit, high inflation, deteriorating income distribution and high military expenditures. The targets of the plan were to initiate the utilization of the resources and to set the necessary regulations and measures in order to increase the growth rate of the economy and realize the 'social justice' and 'public welfare' (DPT, 1963). It was plausible to understand the necessity for such a planned perspective for the country with a 16.5% birth mortality ratio, 2.5% tuberculosis rate and a 60% illiteracy rate in 1963.

4.2.2 Research

In the first five-year plan, 'research' and specifically 'applied research' was precisely stated as the driving force behind industrial, economic and technological development. Table 4.1 presents the state of the research expenditures at the beginning of the planned period.

Table 4.1: Public sector research expenditures in 1961

| Category | Expenditures |
|------------------------------------|---------------------|
| Social sciences research | 27.1 |
| Agricultural research | 33.3 |
| Research on public works | 11.8 |
| Research on health | 0.8 |
| Research on mining and electricity | 46.0 |
| Other research | 1.0 |
| Subtotal | 120.0 |
| Research at Universities* | 59.0 |
| Private sector research** | n/a |
| Grand total | 179.0 |
| | |
| GDP*** | 49,213 |
| Research Expenditures/GDP | 0.36 |

(Source: First Five-Year Development Plan – 1963, in millions of TRY)

*Institute expenditures, research and analysis portion of the university budgets and a defined percentage of wages of university personnel **Unstated in the Plan ***in 1961 factor prices

Disorganization of the research initiatives, coordination problems of related institutions and the lack of collaboration and support mechanisms would be recompensed with necessary policy measures and a Scientific and Technical Research Council would be established to organize the basic and applied research initiatives and support research as a whole (DPT, 1963).

The decisions taken through the First Five-Year plan was not the sole source of interest on science and technology. In 1962, OECD Scientific Research Committee launched a project named "The Pilot Teams' Project on Science and Economic Development" aiming to perform a research activity on how scientific research and technology could be related with production and social welfare problems of developing countries. The project pointed out the necessity for a national policy promoting the scientific research as an important factor for economic growth (Göker, 2002). One year later Turkey joined to the project and in 1967 a specific country report was published. It might be the first report on a science and technology policy perspective for Turkey. The report posited a systematic interrelation between science, technology and development, and assessed research activity as a variable affecting the productive power of the country which could be planned as well. This approach wasn't available in the first plan and would slightly appear in the second and third (Göker, 2002). Second plan was the first document defining a target for the ratio of R&D expenditures to GDP and it precisely stressed the relation between innovation and productivity. To meet the target, first education of researchers then the research activities of public sector would be promoted, and the private sector would be encouraged by Scientific and Technical Research Council of Turkey (TBTA) to invest on research activities and to establish research units within their bodies (DPT, 1968). The emphasis of the third plan tended to technology and technology related issues. Technology transfer was strongly admired as a development initiative but the importance of domestic technology advancement was also stressed. Universities and other academic institutions would also be in coordination with industrial sector to promote technology. The plan was also first in discussing the conditions of 'electronic information processors' (computers) (DPT, 1973).

The promise about a research council to organize country's science and technology contexture and to support research was indeed kept and in July 1963, Scientific and Technical Research Council of Turkey (TBTA) was established. Other than supporting research as a whole, the activities of the council was formulated in line with the development efforts of the nation and close relationships with other state institutions and universities were expected (DPT, 1968). In 1968, Electronics Research Unit and in 1972, Gebze Scientific and Industrial Research Institute established tied to the main body of TBTA.

4.2.3 Finance but How?

First five-year development plan (1963-1967) was distinguishing in its emphasis on 'mixed economy'. Public and private sectors were considered as complements and state was definitely the crucial element for economic development through investment programs, incentives and necessary regulations promoting domestic industries. However, the financial source of all those investments was in question and a finance policy for the plan was defined. The finance should be inflation-free and keep all the resources in balance. Public finance would be ensured with necessary reforms and flexible structures fostering public revenue. Investments would be financed through real savings and especially private savings should have been increased through several support measures. Technological advancement through investing activities was also stressed in the plans and sectoral differentiations of those activities were taken into consideration.

In the second plan (1968-1972), other than the ones related with public trust and trade restrictions, one of the critical measures regarding the incentives would be the formation of capital markets and the attraction of private savings of small earnings to those markets. In addition, for the financial needs of state enterprises a 'State Investment Bank' would be established which would gather the funds of those enterprises together and provide them credits for longer terms. However, private savings remained low and the rate of increase in fixed capital investments of both public and private sectors wasn't sufficient for all the three periods. Essentially the overall realization of the targets of the first three plans was 48%. For each five-year period these ratios were 45%, 58% and 39% respectively (DPT, 1979).

Finance of investments including R&D was the primary target for all these development plans. If private sector was unable to invest, state with a strategic long term perspective should have held those investments with considering the technological possibilities and advancements and subsidizing the existing initiatives (DPT, 1963; DPT, 1968; DPT, 1973).

4.2.4 Domestic Electronics Industry

The choice of import substitution as a model for industrialization and the emphasis on scientific and technical research activities to provide necessary knowledge for domestic production brought into the decisions about setting up domestic communications industries. The demand was already available through

state enterprises like Turkish PTT. For the first plan, communications or electronics industries were only mentioned through a 'communications report' previously prepared in which the issues of communications infrastructure and skilled labor supply was discussed (Başaran, 2003). In the following three plans electronics industry was discussed as a main industrial branch and the connections between communications infrastructure, economic development and national security were strongly maintained.

In line with the plans, first step was to form a research laboratory within PTT to perform design and prototype production activities and to assess the needs for communication infrastructure of the country. As an example of state support through publicly owned enterprises, the assistance of PTTs to form up research laboratories within their own organization and to develop national industries by subsidizing private companies through high-priced orders were common especially in Europe (Yücel 2006). Likewise, PTT-ARLA was established in 1965 within the body of PTT organization, quickly started the production of components necessary for PTT and helped the establishment of electronics industry by providing the necessary knowledge generation. Laboratory also involved in research activities like publications about process development activities, research collaborations with TBTAk or reports on domestic electronics industry for state authorities. It joined to the Special Committee for Electronics Industry which was commissioned for the preparations of Second Five-Year Development Plan.

Yücel in his memories (2006) tells about the difficulties the laboratory had from its early beginning to its transformation into an incorporated company and its further sale. He mentions insufficient supply of skilled labor, short-lived license agreements based on old technology, inability to develop authentic products, insufficient knowledge on IPR and international law necessary for successful agreements with foreign partners and finally rapid sale of the company to foreigners who were not willing to continue research and development activities in their Turkish branches. As stated above, PTT-ARLA was transformed into an incorporated company (TELETAŞ A.S.) as a partnership with ITT group in 1983 and later privatized by selling its shares to foreign partners. It was profitable and financing itself through its own resources and paying dividends to its shareholders while it was public (Yücel, 2006). The wave of privatization after 1980's was also in charge for Teletaş. The procurement of electronics turned towards imported goods, Teletaş became a subsidiary of Alcatel. Today Alcatel

Teletaş is a publicly open company and directing 0.04% of its revenues to R&D activities (Alcatel Teletaş, 2009).

NETAŞ, the second initiative in electronics was also the outcome of the National Security Council (NSC) decision in 1964. In effect, both PTT-ARLA and NETAŞ were related with national economic independence and national security. The company was established in 1967 as a joint venture company by Turkish PTT and Northern Electric Company Limited (Nortel Networks Corporation) of Canada with the aim of supplying locally manufactured telecommunications equipment for domestic needs (NETAŞ, 2008). Company launched its R&D activities in 1973. The reason behind R&D activities was to support domestic production of electronics. This was the main advice of the previous NSC decision. However, the problems with Northern Telecom in production capacity of the company (Başaran, 2003) delayed the R&D initiatives. The company especially served for Turkish PTT and Turkish armed forces. It also specialized on projects subcontracted by Nortel. As an established company it has been mainly financed through credits and its own resources. Its R&D activities today carry out for the development of products that meet the requirements of customers in Turkey and it provides Nortel global software and technical service support in major projects. Company is the biggest exporter of software in Turkey with a value of \$42 million in 2007 (NETAŞ, 2008). However, to give an insight about the scope of R&D expenditures of NETAŞ, in 2008, the ratio of R&D expenditures to net sales was only 0.52%, while it was 15.1% for the multinational Nortel (NETAŞ, 2009; Nortel, 2009). Nortel the major shareholder today (53%) is reorganizing NETAŞ as a regional centre of technical support for customers' services and other operations.

The last initiative in electronics was the establishment of Aselsan as a provider of electronics and telecommunications requirements for Turkish armed forces. Its mission is to eliminate the dependency of armed forces to imported products. In fact, the establishment of Aselsan can be regarded as a Turkish 'sputnik' case that, the company was initiated quickly after the US embargo due to the second Cyprus crisis in 1974 likewise the NSC report followed the first Cyprus crisis in 1963 (Başaran, 2000). This event made authorities take notice of the strategic nature of telecommunications and electronics industries which also helped to attract foreign capital as a proof of the availability of necessary telecommunications infrastructure within the country in the following decade (Geray, 2003). Company today is a publicly listed firm and Turkish Armed Forces

Foundation is the major shareholder (84.6%). Its main sources of finance are the company's own resources, stock market and the credits from banks. R&D expenditures as a percentage of net sales are 4.4% which will be resulted in better quality products with higher technology solutions (Aselsan, 2009). The R&D support which the company receives from the government is slightly more than a half of company's own R&D expenditures or 2.34% of net sales which shows the importance of state support of science and technology even for the biggest high-tech companies of the country.

4.2.5 Computerization

Computers were first mentioned in the third development plan. Their total number, the total money spent on, the ratios of capacity utilization and the problems like the lack of educated technicians were discussed (DPT, 1973). In addition the importance of this equipment in economic development was especially stressed and efficient organizational formation of enterprises was preconditioned. Whether it was first mentioned in the late 1960's, the usage of computers goes back to early 1960s and except the first plan, all plans were prepared with the help of computers and computerized systems. Only the first plan was the outcome of a mechanic *Facit* calculator (Özkan, 2005). First four computers were installed by General Directorate of Highways (1960), Istanbul Technical University (1963), Middle East Technical University (1964) and State Institute of Statistics (1964). At the end of 1970, the total number of computers in the country was 76. The table below presents the early distribution of computers.

Table 4.2: The number of computers in different sectors in 1970

| Sector/Institution | # |
|------------------------------|----|
| State Economic Enterprises | 20 |
| Private Industrial Sectors | 19 |
| Banking and Insurance Sector | 15 |
| Public administrations | 15 |
| Universities | 7 |
| Total | 76 |

(Source: Özkan, 2005)

Computers quickly diffused to the biggest institutions and enterprises and the spending on computers was rapidly increasing. However the capacity utilization of computers was still weak and the skilled labor shortage was tremendous. Computers were being sold by distributors of big corporations like IBM, Univac or

Burroughs but their services were limited and only comprising the utilization of computers for limited purposes. Therefore the overall efficiency was insufficient.

Only after 1970s, the initiatives to regulate the purchase and utilization brought an order to the computer market. First the government charged State Planning Organization to audit and control the import of computers through a set of criteria. This was also due to the foreign exchange shortage of the country during the period that import restrictions were common. Second, the private sector reorganized its computer utilization. It first outsourced their activities to 'servis büro' computer service providers and later in the period established its own IT departments. Early computer education programs in universities were also launched during these years (Özkan, 2005).

4.3 Lost Years in Transformation – 1980-1990

4.3.1 Turkey's restructuring

1980s were the years of a transformation from a regulated regime to another for Turkey. However the scope of the regulation in 80s was largely different. Regulated prices, interest and exchange rates which were mainly determined by the development plans were gradually abolished and a Turkish model of neoliberalism put into practice. Previously, the aim of the state was to invest on industrial development through state enterprises and to regulate the market through strict controls on financial instruments. Whereas, this distribution system got into trouble with the internal and external crises of 70s and the restructuring of global capitalism also made the staggering system obsolete. The result was the 'Economic Stability Decisions' dated January 24, 1980 which was more than a stabilization program but were transformed the whole society toward free market liberalism with a polarized distribution of income and a degrading social state (Kazgan, 1995).

The main and urgent duty of the program was to solve the current debt crisis. IMF and World Bank loans were highly critical in postponing the short-term debts however only after the *coup d'état* it was possible to launch the program since the country was in great political and social crisis. Restructuring loans of these supranational organizations and other loans from different sources like Islamic Development Bank or European Resettlement Fund came into the country to stabilize the economy and to provide a temporary solution for the existing

vicious circle of debt. However, it was just the beginning of the program that the main restructuring and liberalism period followed.

One of the main restructuring policies was the liberalization of trade that the import substitution policy was abolished and export incentives were put into practice in order to be *credible* in international finance markets and to provide further growth for import. Second, the controls on prices and exchange rates were abolished, the prices of state enterprises started to increase and capital inflows accelerated. The aim was to attract foreign investment but foreigners only invested on highly profitable still protected manufacturing industries or unproductive fields like banking or tourism. Third, after stabilizing the debt, internal debt financing started as a major finance method. It was especially necessary to foster the infrastructural investments of the government during the period. However, the internal financing was still not enough and external borrowing also increased rapidly especially in mid 80's. As a result, external debt was doubled between 1984 and 1987. Fourth, privatization of state enterprises started with a strong belief on free market that the private sector would take the initiative with an entrepreneurial and competitive perspective that the country would take a better position in the globalizing world. Tax incentives were also in serve for big capitalists that only with stronger capital groups formed through mergers and acquisitions it was possible to compete globally. Fifth, real wages were especially kept low as a promise to IMF and WB that the competitiveness and profitability of the companies would then become possible. Lastly interest rates were liberalized with a hope that the domestic saving would increase and then would be directed to investments as the economic growth would be accelerated (Kazgan, 1995).

The aim of the government was to reformulate the economy through monetary policies. With liberalized interest and exchange rates the economy could be balanced with capital inflows. Since the tax system was already deteriorated and the public savings decreased, government could only perform domestic borrowing to finance its expenditures. Public sector was not alone in need for financial sources. Private sector, which was traditionally working with limited shareholders equity due to the increasing inflation and continuous fluctuations in currency, was also in search for borrowing (Sönmez, 1992). However, at the beginning of the decade the financial sector was highly underdeveloped. System was composed of Central Bank, deposit banks, state investment banks and social security funds (Akyüz, 1987). It was due to lack of capital markets, capitalization

of firms wasn't possible, saving for investment wasn't a preferable way and people were stocking either gold or foreign exchange but not for productive purposes. Throughout the 1980s, both the public sector debt financing and private borrowings created an atmosphere where banks became so important for the finance of the economic activities. They gained a prominent role for the economy as a whole but also made it fragile. To some extent, the reason why capital markets remained underdeveloped was due to the interest policy and its outcome; predominance of the banking sector. Firms became dependent on banks other than share markets to finance themselves and result was the pressure over wages, employment, investment, and increasing prices (Akyüz, 1987).

Only after the second half of 1980s, a national stock market was put into work. Capital Markets Board was already established in 1981 but remained ineffective until the establishment of the stock exchange in 1986. First publicized companies were the state enterprises and this was followed by enterprises of big family groups or big incorporates. It became possible for foreigners to enter into market after the further liberalization of capital markets in 1989 (Kazgan, 1995). Whether the interest on stock exchange was considerable at the end of 1980s, the market was wide open to external shocks, corruption due to insider trading and big fluctuations (Sönmez, 1992). Lack of market makers and rating institutions also helped this worsening situation that the stock market has always been considered as a dangerous but also a seductive option to invest in.

The outcome of this turnover years was complex but determinant for the future course of the economic development of the country. At the end of the decade, the economy was again staggering with accelerated inflation, increased internal and external debts as well as high budget deficits, re-increased trade deficit and financial fluctuations. Short-term capital inflows became increasingly decisive for the overall economy and following measure was further liberalization. Kazgan (1995) reflects the understanding of the period with the question; 'when there was excess capital globally, why the people should suffer inside the country?' However this understanding resulted in further decrease in national savings and derogation of public spending and social subsidies which were going to accompany economic crises in the following decades.

4.3.2 Science Policy Revisited

In 1983, a new initiative towards a national science and technology policy launched. The preparatory bodies of the policy were SPO and TÜBİTAK. However the government was also in coordination with those organizations and 'Turkish Science Policy: 1983-2003' was submitted to the prime minister with a foreword:

'With this study;

- 1. The overall potential, human source capacity and R&D expenditures are re-evaluated as compatible with international norms*
- 2. Long-term targets are identified for science as a whole*
- 3. The priorities in science and research areas are introduced in line with the economic and social development objectives*
- 4. Supreme Council for Science and Technology (SCST) is organized with a decree law and necessary mechanisms are formed to reach the targets in scientific fields and to activate the existing framework of science and technology,*
for the first time in our country (quoted from Göker, 2002).

The policy was profound and detailed in understanding the science and technology issues of the country, well structured in assessing the science and technology targets and the industries which should be promoted (Göker, 2002). Policy set up a target of 1% for R&D/GDP ratio for 1993 which was only 0.24% in 1983 (Taymaz, 2001). However, the policy was never put into practice by the government. According to Nimet Özdaş; minister of state and coordinator of the preparatory body in 1983, minimum ten years were wasted because the policy was remained untouched (Göker, 2002).

The outcome of the study; Supreme Council for Science and Technology which is today the highest S&T decision making body in Turkey also remained non-functional until 1993 that it could meet only once in 1989 aiming a 2% R&D/GDP ratio following in ten years (BTYK, 1989). Only after 1993, the Council partially started its activities within the secretariat of TÜBİTAK. The aim of the Council is to coordinate the science and technology policies and research and development activities promoting economic and social development and national security as generally stated in development plans of the country.

As the first science policy of the country was totally ignored, in the fifth and sixth five year development plans, authorities requested a new Master Plan regarding science and technology and only in 1988; and, when the sixth plan was being prepared, a 'Science-Research-Technology Master Plan' was written down. However this was only a 'commission report' which was suggesting a science and technology planning to be done in the future (Göker, 2002).

4.3.3 Outlook of ICT

As the capitalist restructuring accelerated globally in 1980s, there were two important developments critical for the worldwide diffusion of this restructuring. Personal computers and their main component software appeared not only in offices but also in homes and a computerized life began. First Apple (1976) then IBM (1981) introduced their personal computers which quickly became an alternative to microcomputers. IBM worked with the DOS system of Microsoft which later made software an important component of computers and became a world giant.

The entry of personal computers in Turkey is important. To understand the development of software industry within the country, it is crucial to identify the course of personal computers and the role of domestic companies. As the first PC was developed by Apple, its distribution in Turkey also started earlier through an initiative of Komili Group in 1982. However at that time, the cost of an Apple PC was almost equivalent to a Murat 124 (Özkan, 2005). Whether the prices decreased in the following years with upgraded models, the market share of Apple always remained smaller. IBM was already in Turkey with its established marketing and distribution channels. However, at the beginning this was an unfortunate event rather than an opportunity because the main aim of the distributors was profitability. And software industry remained underdeveloped at the beginning because the programs about human resources or accounting written by IBM Turk were distributed as the promotions of the PCs disregarding the importance of their production. A distributor had a 40% profit from a single PC and the investments into the software sector were totally ignored (Özkan, 2005). After the introduction of other brands into the PC market, distributors started to sale Microsoft operating system separately. Mikroyazilim was the first distributor of Microsoft products in Turkey and the cost of a Microsoft office was almost equivalent to the half of the price of a PC at the beginning of 1990s.

The inflow of foreign technology products and their widespread diffusion was only possible through the change of economic policy in line with the restructuring process. Import substitution was discarded as a development strategy and the limits over foreign exchange, borrowing and importation were gradually abolished and the ICT sector was affected by these momentous changes. The digitalization of the communication infrastructure with technology transfers via Teletaş was unsustainable and the R&D capacity of the domestic industry

deteriorated through privatizations. After 1980, the policy of increasing saving-investment ratios and strengthening competitiveness through technology-related productivity increases has been ignored and fixed capital investments were only financed with rising technology importation resulting indebtedness which limited the growth dynamism of many sectors including agriculture and manufacturing (Kazgan, 1995). This was also valid for the ICT sectors. The previous “*servis-büro*” computer service providers for companies became the importers and distributors of PCs. By 1989, 87% of firms in computer sector had been established after 1980 and the annual sales of computers reached \$504 million (Özkan, 2005). The result was quite consistent with the global developments.

4.3.4 Software Walks In

Software industry in Turkey had to wait for the necessary skilled labor force to develop software products in serve for domestic firms. This was only possible with the engineering graduates of several Ankara and Istanbul universities which already helped to the composition of the necessary computerized infrastructure in 70s. First independent software company was SITA established in 1980 by young Bosphorus University graduates. Angel of the company was one of the founders’ father and the company developed and marketed an invoicing program. Many young entrepreneurs first gained experience within SITA and organized their own software companies however SITA didn’t work well later and closed down (Özkan, 2005).

Second company Link was established in 1984 by some engineers from SITA without any capital as they transferred some customers from SITA. The company started its operations in an apartment with two computers donated by customers. Early years were really hard for the company as they had to first tell their customers what is software before selling their products. At the end of 80s, they started to make profits but they were still inexperienced about financial issues which the founder of the company asserts that they learned how to make business after their agreement with Microsoft in 1992 (Özkan, 2005). They gained know-how from Microsoft not about technological innovation but business administration. With this agreement they also started to sale Microsoft products that their net sales quickly exceeded Link’s own product sales. In 2000 the company did its IPO and still operates in the market.

Third company; Logo was established by young university graduates in 1985. Their first product is a project planning software but they could only sell three

copies. Consequently they also turned to accounting programs but with considerable technical experience they gained with their previous technologically successful but non-marketed product. They followed the same path with Link as they also signed an agreement with Microsoft to distribute their products with increasing sales figures. However, they also continued to develop their own products as 'Alinteri'; their cheap-priced accounting program became the top-seller software product of Turkey in 1993. Their business was also staggered with the 1994 crisis and they lost some critical opportunities to grow more and become an international company not because of the discredited and instable Turkish economy (Özkan, 2005). They did their IPO in 2000 with an initial stock price higher than expected. Today the company has the highest R&D to net sales ratio among the top R&D spending companies (Logo web site).

The last company rooted back to 1984 is Likom which previously marketed hardware products but later developed its own software products. The company is based on Ankara and its main customers are government institutions. The company is only developing and selling its own products and largely investing in R&D activities.

4.4 In Search for Stability within Crises – 1991 Onwards

4.4.1 Sources of Finance and Instability

The preparation of necessary infrastructure for the new global economic and political order which would also be effective in Turkey completed in 1980s. It is possible to argue that after 1990s Turkish economy became totally open and liberalized, and redistributive forces of national wealth gained a strong legal and ideological framework. The role of state has been under discussion for the second time in the 20th century and persisting economic crises especially related with the new political economic structure of the country labeled the developments in these years.

The main aspect of the economic liberalization has been the introduction of new financial mechanisms. Whether the liberalization of capital movements and the establishment of capital markets were maintained in order to create an effective finance structure for the private sector, government's debt financing remained the major finance mechanism and the major determinant of economic activity. Decreasing savings of government in 1980s turned to negative values at the beginning of 1990s. This deficit could only be financed with private savings and

the means of the finance has been the domestic borrowing which later caused to another vicious circle negatively affecting both private and public investments. The ratio of domestic borrowing interest payments to public investments exceeded 100% in 1992 and reached 638% in 1999 (Yeldan, 2001). So the meaning of government activity became the debt financing as the ratio of interest payments reached 35% of total budget expenditures in 1999 which has been 24% in 2007. Yeldan (2001) emphasizes the new role of government budget as:

...It became an intermediary of reorganizing the income distribution in finance markets other than social infrastructure and economic growth so it left its productive and investor role in 1990s.

The expectations about deepening financial markets and so further growth of savings and investments were not realized and the investment capacity of the national economy quickly deteriorated. The overall economic activity was bound to government domestic debt securities (Yeldan, 2001).

What's more, the domestic borrowing required high interest rates in order to continue debt financing so the public debt started to be financed by external savings which further pressurized the production capacity of the economy as the trade regime and consumption preferences were also in transformation. Short-termed capital flows made the already weak financial system more fragile and fluctuations in economy widened the base for economic crises.

Another expectation within the wave of liberalization was increasing investments through varying financial instruments of banking sector intermediaries. However the credit base of the banking sector remained almost unchanged during 1980s and 1990s as a percentage of GDP. The function of the banking sector has been then the intermediation for public sector to finance its debt. After a while, banks became almost the only purchasers of government securities however this situation made the system more fragile as the source of these purchases has been foreign borrowings. More serious, other private sectors also started to enter into speculative accumulation efforts and gave priority to short-term financial investments rather than investing in fixed capital (Yeldan, 2001).

The only other source of investments; government has not been squeezed only with debt payments but the degrading role of public spending and the opening up the public spaces to the serve of capital (Oyan, 1998). Government expenditures gradually decreased during those years and the primary expenditures was remained almost always below 20% of total government

expenditures between 1980 and 2007 which is today more than 50% for European Union countries. This also explains the weakening investment capacity of the economy and the persisting low levels of the ratio of total investments to the overall GDP.

The process started with 1980 and continued along 1990s and 2000s not only brought forward a weak and instable economic and social atmosphere also caused deep economic and social crises like 1994 or 2001 economic crises or a recession in 1999. In the first decade of the new century, the instability and the fragility of the economy still persists as the speculative fluctuations harshly affect the weak financial base of the economy and the role of the state in the new century still under discussion.

4.4.2 Internet in Turkey

Today, the internet in Turkey is more than 15 years old and the commercialization has been quick but surging due to the persisting infrastructural and bureaucratic problems.

A discussion about internet in Turkey should first consider the developments in telecommunications infrastructure and the related legal and administrative framework of the country. The infrastructure was digitalized with massive government investment in 1980s. Late in 1985, first connection with EARN (European Academic and Research Network) was established and in 1986 the counterpart of EARN in Turkey; TUVAKA was founded by a consortium of 12 universities and TÜBİTAK (Özkan, 2005). However, as the number of connections increased and the volume of transactions as well, the system became insufficient at the beginning of 1990s. The approach of PTT to the network transactions wasn't different than a regular telephone network and although it was high in volume, the infrastructural investment couldn't catch up on the technological developments and also slowed down in the late 1980s (Başaran, 2003).

The problems occurred within TUVAKA and the pressures for generalization of internet forced the top two users of internet METU and TÜBİTAK to launch a project. In 1993, first internet connection with Washington established in Ankara with a new line procured by PTT. Whether the early interest about internet was promising and inciting for further developments, the economic crisis in 1994 called a halt to the spread of internet as the purchase of a single modem or a

connection channel were even impossible for many institutions and the efforts of METU to enlarge the internet infrastructure were in great difficulty due to the financial problems. Only after the establishment of Turkish Telekom, the late completion of the TURNET project in late 1996 and the growing interest of the private sector through internet service providers maintained the basis for the spread of internet. A considerable number of internet service providers rapidly entered into the market but the expectations were so great especially related with the reflections of the dot-com bubble. The severe competition among these providers together with the introduction of Turkish Telekom's internet service caused an instable and uncertain economic environment for the sector. Eventually, the impact of NASDAQ burst and more important the 2001 economic crisis again stopped the investments of private sector on internet; the mergers of service providers accelerated and the decision about the privatization of Turkish Telekom were taken as a promise to IMF in order to receive the necessary loans (Özkan, 2005). Thereafter, the price cuts of Turkish Telekom with improved services like ADSL prepared this public enterprise for privatization as a monopoly in telecommunications sector. The privatization was completed in 2005.

4.4.3 Milestones for new ICT policy

Within this period, the regenerated science policy accompanied with an overall ICT perspective. The new ICT policy was initiated in collaboration with the World Bank. The report issued by the World Bank in 1993 called 'Turkey: Informatics and Economic Modernization' was presented as the plan for an information-based economy (IBE). The suggestions were to foster an internationally competitive supply of informatics technology goods and services (especially in communications), to align human resource strategy and education delivery mechanisms with the needs of an IBE, to increase productivity and innovation in public sector services through better use of informatics and to safeguard civil liberties and consumer rights against risks created by informatics (WorldBank, 1993). The report was rich in detail. Different subsectors of ICT and the role of government were analyzed extensively. It mainly discussed about the role of government and further actions towards restructuring. Other than market liberalization, privatization and legal framework for intellectual property, the decentralized institutional framework for implementing informatics policy was encouraged. A broad informatics policy is considered as a long run task and the government was advised to focus on short-term tasks like privatization,

providing legal framework or computerization procurement. Throughout the report, there were usually country comparisons about policy actions. However, the details how these countries succeeded in implementing their national policies were not available. The report defined the incoming national informatics and telecommunications policies to a large extent (Başaran, 2003) however the interactions between different actors of information economy like government, private sectors, academics and regulatory bodies left untouched and structural economic and social problems which hinder the development of an information society, were ignored.

In 1993, government published a new science and technology policy document. The new policy aimed to foster R&D expenditures, S&T education, international collaboration and development of technological infrastructure including technoparks, institutes and R&D centers (TÜBİTAK, 1993). ICT was defined as a priority area for necessary infrastructural investment and financial and other incentives. KOSGEB, TIGV and TÜBİTAK sources were channeled to the priority areas for R&D support and various other incentives for firms. Through these intermediary organizations the flexibility of resource allocation was maintained.

Beginning with 2000s, the public interest on ICT increased. In 2002, a vision statement for ICT was published:

An ICT sector which contributes to the sustainable growth of the GDP directly with its brands and indirectly with its technological support to the other sectors of the economy in a gradually increasing manner in Turkey as a preferred country at least in three fields of ICT (TÜBİTAK, 2004)

Whether target areas within ICT were determined in line with the vision and mission statements policy recommendations including finance were not defined in this study. Only in 2006, a national strategy of information society was adopted. The strategy embraces an integrated approach. Information society should cover every aspect of economic and social life and should maintain the sustainability of economic and social development and international competitiveness of domestic industries. To this end, a social transformation allowing every individual to have access to ICT-based goods and services; increasing utilization of ICT tools like e-commerce, web-based communication or specialized software products by businesses including SMEs to increase productivity and to maintain competitiveness; providing public services through ICT-based channels; reforming public administration with the help of ICT tools;

foster global competitive power of domestic IT sectors to transform Turkey into a regional software and services hub; providing high quality and cheap broadband access for everyone; promoting R&D and innovation to allow ICT industries produce globally competitive products and services are defined as the major priority areas (DPT, 2006).

Among these areas, maintaining global competitiveness is critical. The strategy aims to increase government demand of IT and business collaborations of public and private sectors. The motivation is to provide the necessary business atmosphere for the private sector to gain business experience and financial strength. Domestic IT demand is projected to reach \$10 billion in 2010. Moreover, it is assumed that with an export-oriented strategy similar to the 3I's success in 1990s, IT export is projected to be \$400 million in 2010 (DPT, 2006).

4.5 Perspective

The long history of ICT in Turkey is consistent with the world developments. Strong government commitment with a direct involvement into economic activity was replaced with a policy maker and supporter role after 1980s. The duty of government to invest on infrastructure and human capital formation as well as research and development perpetuated.

However, the structural issues of Turkish economy also affected the development of ICT industries. The problem of low level of savings never resolved and the disinterest of private capital into high-tech sectors persisted. Therefore the growth of high-tech firms has been limited. The importance of ICT tools to foster productivity has been recognized but its utilization also restricted to big enterprises.

There is a growing interest among public authorities on the importance of ICT to foster economic and social development. Especially in 2000s, the policy perspectives have an integrated approach that they recognize the importance of different factors like infrastructure, education, utilization of clustering, domestic and international collaboration opportunities, finance and related business environment. Moreover, the Supreme Council for Science and Technology council has very important roles for science and technology policy of the country including the coordinator role for the preparation of national policies and plans about science and technology and innovative strategies, supervisory for the state supports for technology development and innovativeness of the private firms.

However, finance of high-tech industries squeezed in a couple of sentences in policy documents and R&D incentives remain the sole source of public support for technology sectors.

The history of ICT in Turkey shows that the financial commitment is one of the primary issues still unaccomplished. The interest of public and private sources to invest in ICT sectors fluctuated with the broader economy. The existing potential of financial resources and their strengths and weaknesses are necessary to be identified. The model proposed can be a start to investigate the role of existing finance mechanisms on high-tech industries specifically ICT and software.

CHAPTER 5

THE FINANCIAL GROWTH CYCLE MODEL FOR TURKISH SOFTWARE INDUSTRY

5.1 Turkish Software Industry – At a Glance

First software company in Turkey was established in 1983 (Özkan, 2005) and the industry is still in its development phase. There are two major sources of statistical data available for Turkish information and communication technology industries. One of them is based on a questionnaire conducted with IT firms annually (İnterpromedya, 2008). This study which is prepared by a domestic private organization presents the biggest 500 IT firms in Turkey with their sales figures and product/service specialization within different IT categories. The second study is prepared by OECD. The study which is called Information Technology Outlook has a broader perspective on the IT as well as communications industries and provides detailed statistics about ICT spending, ICT trade, employment and R&D figures, household consumption of ICT goods and services and number of ICT-related patents (OECD, 2008). The representation below is based on the software industry specific data derived through these studies.

Table 5.1 shows that the software sector has the highest growth rate among different ICT sectors and it is comprised 5.2% of the total ICT expenditures, which is about 5.7% globally (İnterpromedya, 2008).

Table 5.1: Turkish ICT industry growth

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008* | % share in 2007 | CAGR (%)** |
|------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------------|---------------|
| Hardware | 1054 | 1400 | 1540 | 1768 | 2227 | 2700 | 3457 | 4100 | 13.22 | 21.89 |
| Software | 293 | 336 | 393 | 452 | 618 | 780 | 1260 | 1620 | 5.22 | 27.52 |
| Services | 823 | 775 | 847 | 1122 | 1412 | 1690 | 1768 | 1950 | 6.29 | 13.59 |
| ITRCM*** | 74 | 122 | 90 | 113 | 141 | 165 | 211 | 245 | 0.79 | 19.08 |
| IT Total | 2244 | 2633 | 2870 | 3455 | 4398 | 5335 | 6696 | 7915 | 25.52 | 19.99 |
| Communications | 6847 | 7517 | 8592 | 11815 | 14380 | 17390 | 19096 | 23100 | 74.48 | 18.64 |
| ICT Total | 9091 | 10150 | 11462 | 15270 | 18778 | 22725 | 25792 | 31015 | 100 | 18.98 |

(Source: İnterpromedya, 2008, in millions of USD) *Forecasted

Compounded Annual Growth Rate *IT-Related Consumption Materials

ICT spending in Turkey is increasing, but the country is still behind the countries with similar population figures. The chart below represents ICT spending among OECD countries. The software expenditure in Turkey is slightly above 5% of the total ICT spending. However, compared to 2003, Turkey is the number one in OECD in terms of ICT market growth (OECD, 2008).

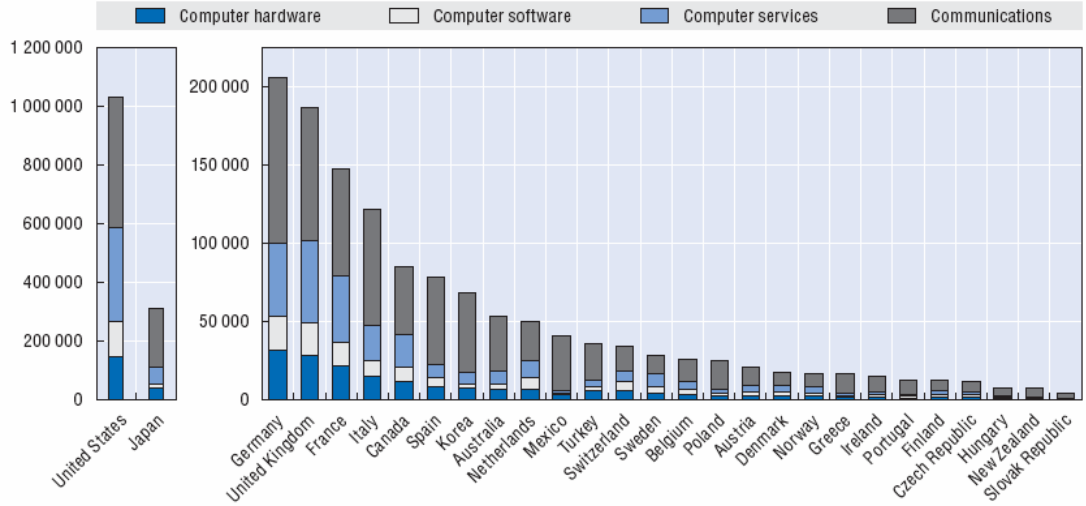


Figure 5.1: ICT spending by market segment in 2007
(Source: OECD, 2008, in millions of USD, current prices)

Software firms in Turkey continue to gather revenues from non-software activities like service providing, sale of other companies' products or application development. Their product sale services through their web sites show that this is true for every size of company operating in the industry. Table 5.2 shows the top 10 software-producer IT companies in Turkey in total sales. The sector is mainly dominated by Turkish subsidiaries of multinationals.

Table 5.2: Top 10 IT companies in sales

| Rank | Firm |
|------|---------------------------|
| 1 | Meteksan |
| 2 | Microsoft |
| 3 | Havelsan |
| 4 | Koçsistem |
| 5 | Oracle |
| 6 | Çözüm Yazılım |
| 7 | Logosoft |
| 8 | SAP Türkiye |
| 9 | Birim Bilgi Teknolojileri |
| 10 | Milsoft |

(Source: İnterpromedya, 2008)

In 2006, Turkey had only one firm among the top 250 ICT firms in the world. Software comprises only 2.5% of the total revenue generated by these 250 firms and there is only one software firm among top 50 ICT firms in the world (OECD, 2008). Software still represents a small part of ICT sectors as a separate industry.

Table 5.3 shows the leaders and their market share in detailed subcategories of software industry in Turkey. Domestic firms dominate these segments. However, this is not because they are the leaders in these segments or they are only marketing their own products. The probable reason is the reluctance of multinationals to publicize their sales figures. There isn't any product specification in sectoral surveys to understand the real size of the domestic market. Nevertheless it is possible to argue that since the first WB report on IT in Turkey, in spite of the difficulties like Turkish business management attitudes towards software and the cross-subsidization of hardware vendors (WorldBank, 1993); Turkish software companies have been capable of developing products and provided specific solutions for their customers in the market.

Table 5.3: Sales and leader firms of different software categories

| Categories | Category Leader | Total Sales | Sales of Leader | Market Share of Leader |
|---|-------------------|-------------|-----------------|------------------------|
| Operating System | İndeks Bilgisayar | 134,329 | 29,757 | 22.2 |
| Office Programs | İndeks Bilgisayar | 155,433 | 23,240 | 15.0 |
| Security Software | İfonet | 76,818 | 10,911 | 14.2 |
| Application Development Tools | Bildem Bilgisayar | 15,506 | 6,450 | 41.6 |
| Sector Specific Softwares | Havelsan | 611,437 | 213,085 | 34.8 |
| CRM | Bizitek | 25,393 | 5,149 | 20.3 |
| ERP | SAP Türkiye | 129,459 | 48,752 | 37.7 |
| Database Software | Link Plus | 45,241 | 8,707 | 19.2 |
| Mobile Applications | Telenity | 45,653 | 14,561 | 31.9 |
| Data Warehouse and Business Intelligence Software | NCR | 8,830 | 2,254 | 25.5 |
| Archive Management Applications | Docuart | 10,161 | 2,520 | 24.8 |
| Image Processors | Medyasoft | 31,489 | 16,415 | 52.1 |
| Various Business Applications | Innova | | 12,481 | 12.7 |

(Source: İnterpromedya, 2008, in thousands of TRY)

The number of software companies in Turkey is almost unknown. An estimate states that there are nearly 3500 firms in the industry (Türkoğlu, 2008). However how many of them actually produce and market software and how many only provide service are uncertain. Many domestic software companies

also sell the products of multinationals. The ratio of domestic software sales to imported products is unknown. Therefore, the trade of software gives the best relevant insights about the development potential of the sector. Table 5.4 shows that Turkey has a huge deficit in software trade in recent years. It is estimated that around 100 software companies export their products (Türkoğlu, 2008). This is a very small number considering the integration of global markets.

Table 5.4: Foreign trade of software in Turkey

| | 2005 | 2006 | 2007 |
|------------|------------|-------------|-------------|
| Exports | 15,066,922 | 20,608,199 | 14,318,153 |
| Imports | 89,751,390 | 114,108,212 | 108,339,258 |
| Ex/Im Rate | 16.79 | 18.06 | 13.22 |

(Source: İGEME, 2008, in millions of US dollars)

Software sector has low-entry costs in terms of capital requirements. Rapid increase in the number of Turkish software companies may be a proof. However, for the companies which produce software products, survival within the industry is more critical than establishing a business. They have to survive for a considerable period of time in order to maintain their product development, to market their products and to provide support and maintenance for their customers. To do this, other than the sufficient financial structure, first a stable economy and second; a growing awareness towards IT products and services are crucial.

The utilization of IT products throughout the economy is important for the development of the software firms. To give an example, one of the major groups of customers for software products, SMEs still use computerized systems and internet with lower levels. Less than half of the businesses in Turkey own a web site while the internet access of them is around 80% (DPT, 2007a).

Each year more than 10,000 new graduates with software industry-related diplomas enter into workforce (DPT, 2007a). The labor demand of software sector as well as other IT sectors is also enormous that the Informatics Association of Turkey forecasts a shortage of 213,000 jobs for the whole ICT industry in 2013 (Türkoğlu, 2006). However in 2007, the share of ICT specialists in the total labor force is less than 2% (OECD, 2008). A general computer education through the national education system has been lately introduced by the government and the outcomes of this initiative and other efforts towards an

information society will only be available in the future. Brain drain is another issue regarding the development of the software sector. Its effects on high-tech sectors have not been evaluated yet. However, between 1981 and 2000, it is estimated that more than a million higher-educated people emigrated from Turkey especially to the OECD countries (Kaya, 2007).

ICT companies in Turkey need experts in specialized fields, system engineers and technicians (DPT, 2007a). According to a survey on Turkish software firms; support, maintenance and product services departments have the biggest number of people employed and half of the companies surveyed do not have R&D departments (İyidoğan et.al, 2006).

Turkish software firms operate in a variety of fields (İnterpromedy, 2008). However, the scope of the domestic firms is on commerce, finance and accounting related products (DPT, 2007a). The main reason is the character of demand. Large companies in Turkey invest in imported software products or develop their own applications in their IT departments. Small and medium size firms buy domestic products for their specific requirements (Alican, 2006).

Strategic planning is another issue of Turkish software industry. Strategic planning is an organization's process of defining its direction and making decisions on resource allocation including labor and capital. Software firms do have some sort of planning even it is not properly defined and formally written up. Institutionalization is the basic requirement the software industry should have. Software firms are still young and need organizational support to be able to perform their activities in a globally competitive and rapidly changing business atmosphere. Average age of the top 20 software companies is 13 and only five of them have 100 or more employees (DPT, 2007). In that respect, as an important sector with future potential for Turkey, software should have an industrial organization authorized by government. The proposition of YASAD to establish an organization is worth to consider (Alican, 2008).

5.2 Implementation of the Model for Software Industry in Turkey

Most of the software firms in Turkey can be categorized as small or medium size enterprises. They share the similar problems with SMEs in financing their activities and their financial issues do not have any special treatment either through government or private actors of the economy.

The only study on Turkish software companies which contains a specific section on finance is a research promoted by Istanbul Chamber of Commerce in 2006 (İyidoğan et.al, 2006). The study contains several parts of analysis based on a survey performed with 52 software firms and it has a question about the financial sources of firms. The graph below summarizes the financial sources of software firms in their start-up period and current status. The results show that the founders' own resources are the biggest source of finance for software firms either in their early periods or in their current situation. However, the study does not provide any detail about the results that the understanding of venture capital or leasing among companies or the specific sources or their own capital is unexplained.

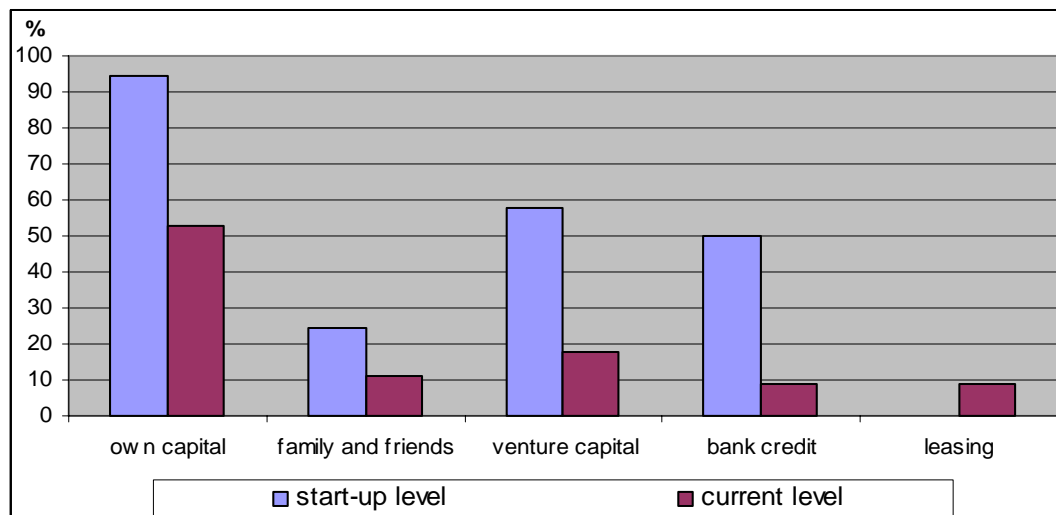


Figure 5.2: Financial sources of software firms in Turkey (Source: İyidoğan et.al, 2006)

5.2.1 The Three F's – Founder, Family and Friends

There is no specific study in the literature identifying the role of the founder, family and friends as financiers of software industry (or other industries). However it can be said that this group is the most important source of finance for companies in their early levels. The survey of İyidoğan et.al (2006), the oral histories of CEOs of the biggest domestic software firms (Özkan, 2005) and the qualitative findings of this study confirms that the software sector in Turkey was and is dependent on the great motivation of the founders and the people who voluntarily offer their financial sources.

One way to identify the amount of potential resources to be directed to high-tech companies is to check the total deposits of the residents in Turkey. Table 5.5 below shows that the number of depositors having more than TRY 50,000 is about 27,000 and the total amount of money they have in their accounts is about TRY 345 billion. For the first two categories (which can be considered as private depositors) this amount is equal to TRY 241 billion.

Table 5.5: Banking sector deposit classification as of December 2008

| | < 10,000 | 10,000- 50,000 | 50,000- 250,000 | > 250,000 | Total |
|---|-------------|-------------------|--------------------|--------------|---------|
| Savings Deposit | 17,910 | 41,084 | 55,888 | 65,434 | 180,316 |
| FX Deposit Accounts | 6,311 | 17,526 | 28,725 | 89,296 | 141,858 |
| Precious Metal Deposit Acc. | 19 | 29 | 34 | 262 | 344 |
| Official Institutions' Deposit | 379 | 388 | 647 | 15,944 | 17,358 |
| Commercial & Other Institutions' Deposit | 1,933 | 3,853 | 6,188 | 70,449 | 82,423 |
| Special Current Accounts | 447 | 630 | 862 | 1,413 | 3,352 |
| Participation Accounts | 1,294 | 3,712 | 3,969 | 6,311 | 15,286 |
| Total | 28,293 | 67,222 | 96,313 | 249,109 | 440,937 |
| Number of Depositors | 351,000 | 42,000 | 22,000 | 5,000 | 391,000 |

(Source: BDDK, 2009, in millions of TRY)

5.2.2 Business Angels

The business angel network activity in Turkey is less than 5 years old. Any person who can contribute to the company with a professional perspective (more than a trust relationship) can be considered as a business angel. Therefore, the actual number of angels in Turkey cannot be estimated and it's hard to say that entrepreneurs are fully aware of the potential angels. Moreover, because the formal angel activity is so new, there isn't any study on the scope of the angels and their targets, evaluation criteria, sectoral preferences or return rates.

Through a web search, it is identified that the existing formal activity of business angels in Turkey is composed of angel networks. How much they actually invested into companies in exchange of what percentage of equity is unknown. The only network which discloses its investment activity is LabX that invested into three projects and targeting 8 others in 2008. These projects or incubations were transformed into firms after providing the necessary capital (Moral, 2008).

These networks accept online applications of entrepreneurs with detailed explanations of their projects. They try to match these applications with their

own member investors or other outsider investors who also apply to the networks to invest in those projects. The networks are generally formed as associations and some of them have international connections. For example, Metutech BAN and LabX are members of European Business Angel Network (EBAN) or the Endeavor Association in Turkey is organized as an affiliation of Endeavor Group. The networks all over the world have budgets composed of membership fees from investors and entrepreneurs, sponsorships, some governmental funds and their parent organizations (EBAN, 2008).

In Turkey, the awareness of angel investing is today limited to business people in high-tech companies and banks or members of richest family groups. Early intentions of business angel activity in Turkey are about developing the R&D base of the country, establishing specific networks of high-tech investors, attracting foreign capital into the country, providing new employment opportunities and increasing the entrepreneurship capacity (MetutechBAN, 2009; Lab-X, 2009).

One of the main arguments about the potential of angel investing in Turkey is the cultural appropriateness. Relationships based on contacts and references are common characters for businesses (Tavli, 2007). This provides a social framework for the additionality of this investment. Another major argument is about the need of experience transfer for high-tech start-ups (Sürer, 2008). As the high-tech sectors including software have generally less than 30 years of history; the accumulated knowledge is not satisfying and materialized. Therefore, the transfer of technical or business knowledge through angels is as much critical as the financial support. Utilization of already available knowledge in the software sector could support for the development of new products and increasing entrepreneurship capacity.

Primary obstacle for angel investing which is highly relevant for the Turkish investors is the tendency to see the returns as soon as possible. In an unstable economic environment, a short-sighted investment perspective is also in effect for venture investors. Many other proponents of angel investing which are important for the success like the preferences of co-investing or sole investing, preferred stage of investment, proximity of investors and investees, sectoral preferences are out of discussion regarding the actual development of angel activity.

Another obstacle is about the difficulties of networking and matching activities. To be successful, it is necessary to increase the number of angels and entrepreneurs as much as possible. Protecting the intellectual property rights of entrepreneurs and the introduction of specific financial knowledge into the matching and investment processes are crucial for the further development.

Whether it is a private form of investment, government intervention is again crucial for the success of the investment model. Tax incentives are the most proposed government incentives (Tavli, 2007). These incentives can be region or sector specific. For example, Small Business Capital Investment Tax Incentive Program in Arizona, United States offer investors a tax credit up to 35% of the investment amount over three years if they invest in a rural or bioscience company within the state (ADC, 2008). Likewise, UK provides a highly supportive tax cut for angel investors which includes income tax rebate equal to 20% of investment, exemption from capital gains or income tax relief of 40% on failed investments and the main angel network, British Business Angels Association is backed by the British government (EBAN, 2008).

In Turkey, angel investing is maybe the best form of private financial contribution to the high-tech sectors. First of all, the amount of investments is small enough to attract a large number of investors. They can join to the networks and search for a best investment opportunity from a pool of start-ups. Second, the importance of technical and business knowledge transfer through a private equity form of investment is priceless. Existing knowledge should be used by others as it is a form of social capital with increasing returns to scale. An investor from Metutech BAN states; 'I've reached to the annual earnings of \$1 million in 20 years of business. I am here for others who shouldn't wait that much. We want to offer guidance and provide funds' (Çakırözler, 2007).

Third, angel investing is also good for local private investors. Closeness is highly critical for investors to have regular meetings with their investees. Investors can invest in firms around their area and strengthen the cluster organization and local networks for further growth of the regional economy.

5.2.3 Venture Capital

Whether the Turkish venture capital legislative and private equity dates back to the year 1993, VC-funded investment hasn't developed in Turkey. The oldest active domestic venture capital firm is 13 years old and the number of VC-

funded firms, the amount invested and the awareness about venture capital investment among firms are still limited. The legislative obliges venture capital firms to go public after a definite period of time. It broadly defines the scope of investment on venture firms that, other than the partnerships, purchasing the debt securities of these firms is also possible for venture capital firms as a form of venture capital investment (SPK, 2003).

As it is a highly attractive source of finance both for investors and ventures, studies on venture capital are so large in number and detailed all around the world. In contrast, highly related with the underdeveloped situation of the concept, the literature on venture capital activity in Turkey is limited and away from a detailed analysis about the weaknesses, strengths, potential power of VC and a detailed statistical inquiry. Few sources mainly discuss the short history of venture capital activity and remarkable investments of venture capital within the country (Kuğu, 2004; PWC, 2007; Şirvan, 2008; Yardımçioğlu & Demirel, 2008).

Venture capital investment hasn't been regarded as a source of finance for seed and start-up high-tech companies in Turkey. Thus, the current activity of venture capital in Turkey is generally regarded as private equity investment which only targets the investment on firms for expansion or buy-out. This categorization is quite relevant when the scope of recent venture capital activity is analyzed.

Table 5.6 Venture capital activity in Turkey, 1995-2008

| years | # of invested companies | | | | amount of investments (in millions of USD) | | | |
|-------|-------------------------|----------|------------|-------|---|----------|------------|---------|
| | foreign | domestic | consortium | total | foreign | domestic | consortium | total |
| 1995 | 2 | 0 | 0 | 2 | 4.0 | 0.0 | 0.0 | 4.0 |
| 1996 | 2 | 0 | 0 | 2 | 8.0 | 0.0 | 0.0 | 8.0 |
| 1997 | 5 | 1 | 0 | 6 | 16.5 | 1.0 | 0.0 | 17.5 |
| 1998 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1999 | 4 | 1 | 0 | 5 | 28.0 | 2.0 | 0.0 | 30.0 |
| 2000 | 6 | 1 | 0 | 7 | 62.0 | 1.0 | 0.0 | 63.0 |
| 2001 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2002 | 0 | 2 | 0 | 2 | 0.0 | 5.0 | 0.0 | 5.0 |
| 2003 | 2 | 2 | 0 | 4 | 26.0 | 14.5 | 0.0 | 40.5 |
| 2004 | 3 | 1 | 0 | 4 | 6.0 | 3.5 | 0.0 | 9.5 |
| 2005 | 1 | 1 | 3 | 5 | 29.0 | 14.0 | 76.0 | 119.0 |
| 2006 | 8 | 1 | 4 | 13 | 1,912.0 | 4.0 | 81.0 | 1,997.0 |
| 2007 | 7 | 3 | 0 | 10 | 1,596.0 | 13.5 | 0.0 | 1,609.5 |
| 2008* | 3 | 2 | 4 | 9 | n/a | 13.5 | 1,695.5 | 1,709.0 |
| total | 43 | 15 | 11 | 69 | 3,687.5 | 72.0 | 1,852.5 | 5,612.0 |

(Source: VentureXpert, 2009; PCW, 2007) *a large number of deals is disclosed in 2008

The total amount of venture capital/private equity investment in Turkey since 1995 reached to \$5.6 billion. However more than \$5.3 billion of this amount is concentrated in the last 3 years (2006-2008). The amount invested between 1995 and 2005 is only around \$300 million. As the main incentive for venture capital investment is to exit with revenue, due to the financial and political instability and lack of prospect for positive returns, between 1995 and 2005 the amount of investment was limited. Only since 2006, venture capital activity accelerated. The interest of domestic as well as foreign funds increased and these funds formed several consortiums to invest in established companies. However, during this period the character of venture capital type of investment has largely transformed. These were the years of historically highest levels of FDI and especially the interest of foreign funds concentrated on buyouts other than early stage or expansion level investments. In 3 years, total amount of investment was \$5.2 billion and \$3.8 billion went only to three companies. For example, in 2008 51% share of Migros Turk; one of the oldest retail store chain in Turkey was acquired by a consortium of 7 funds (4 undisclosed, 1 domestic and 2 foreign) for \$1.7 billion as a buyout level of investment. Similarly in 2006, 90% share of Mey Icki Sanayi Ltd was acquired by Texas Pacific Group Inc for \$810 million in a leveraged buyout transaction. The company was founded in 2004 as a joint venture unit of several domestic holdings and bought the privatized Tekel for \$292 million in the same year of foundation. Most of the venture capital transactions in these years were acquisitions. This is especially relevant for investments of foreign funds.

Table 5.7 represents the level of investments in these two periods by domestic and foreign funds and consortiums. It shows that foreign funds as well as consortiums mostly focus on expansion level or buyouts/acquisitions. Domestic funds invest in all levels.

Table 5.7 Stages of VC Investment in Turkey, 1995-2008

| Level of investment | Early stage | | | Expansion | | | Acquisition/buyout | | |
|---------------------|-------------|----|----|-----------|---|---|--------------------|---|---|
| | F* | D* | C* | F | D | C | F | D | C |
| Fund origin | | | | | | | | | |
| 1995-2005 | 0 | 3 | 0 | 6 | 5 | 2 | 2 | 1 | 0 |
| 2006-2008 | 0 | 0 | 0 | 1 | 4 | 1 | 17 | 2 | 7 |

(Source: VentureXpert, 2009) *F: Foreign, D: Domestic, C: Consortium

Age of investee firms also gives some insights about the character of venture capital investment in Turkey. Table 5.8 proves that, VC investments don't have a concentration on a specific group of companies in terms of their age. Half of the companies funded are older than 10 years old.

Table 5.8: Ages of VC-funded firms, 1995-2008

| Age | # of firms |
|------------|-------------------|
| 1-5 | 18 |
| 6-10 | 14 |
| 11-20 | 12 |
| 21-30 | 9 |
| >30 | 12 |

(Source: VentureXpert, 2009; PCW, 2007)

VC investment in Turkey is mainly directed to manufacturing and service industries. Table 5.9 shows the sectoral destination of VC investment during the whole period. Investments on high-tech firms are eminently few in number as well as small in volume of investment. In OECD area, 30% of the total venture capital investment goes to ICT sectors on average. For countries like Korea, Ireland or Israel, this ratio is more than 50% (OECD, 2008).

Table 5.9 Sectoral destination of VC investment, 1995-2008

| Sector | # of firms | Amount |
|--------------------------|-------------------|---------------|
| Biotechnology | 2 | 3 |
| Business Services | 7 | 101 |
| Communications | 3 | 275 |
| Computer Software | 1 | 3 |
| Construction | 2 | 47 |
| Consumer Related | 26 | 2890 |
| Financial Services | 2 | 1 |
| Holding | 2 | 170 |
| Industrial/Energy | 7 | 185 |
| Internet Specific | 5 | 10 |
| Medical/Health | 5 | 262 |
| Real Estate | 1 | 110 |
| Transportation | 6 | 1555 |
| Total | 69 | 5612 |

(Source: VentureXpert, 2009; PCW, 2007, in millions of USD)

The ownership amount is also an important indicator for the target of investment. Table 5.10 shows that 22% of VC investments are composed of majority stake ownerships. If a VC fund owns a majority stake of a firm, it appoints the members of administrative board as well as CEO and other managers or administration before the investment follow all the rules and directions of funders. For investments with minority stakes this is not a rule.

Table 5.10 Ownership Ratios of VC investments, 1995-2008

| | |
|-------------|----|
| <50 | 43 |
| >50 | 15 |
| 50-50 | 4 |
| Undisclosed | 7 |

(Source: VentureXpert, 2009; PCW, 2007)

Investment activities of foreign venture capital funds started before the legislation and accelerated after mainly related with the opportunities of investment into domestic firms. There is a high correlation between foreign venture capital investments and foreign direct investment into the country. Especially for recent years, it is possible to argue that venture capital investment of foreign funds can be considered as a form of foreign direct investment.

5.2.4 Banks

Turkish legislation defines SMEs as companies with less than 250 employees and with annual net sales of TRY 25 million. In that sense Turkish software industry is almost composed of small and medium size firms. For example, Logo Yazilim, one of the biggest software firms in Turkey has only 247 employees and has annual revenue of TRY 22 million in 2008. Therefore, they have similar issues with other SMEs about external finance through banking sector.

Commercial banks are generally the main source of external finance for small and medium size enterprises. However, there are several rigidities about macroeconomic, institutional and regulatory nature of an economy that may bias the banking system against lending to SMEs. Furthermore, the financial market may not contain the necessary range of products and services to meet the needs of SMEs. The fact that SMEs in many emerging markets do not have access to credit financing is especially worrisome because SMEs typically employ a large share of the labor force and account for a large part of national income (OECD,

2006). Turkish financial system reflects these imbalances. Although the system can be characterized as 'bank-dominated', bank assets represent a comparatively low share of national income in comparison to the other bank-dominated financial systems in Europe (DPT, 2007b). At the same time, bank costs are high, as are interest margins. Product innovation and credit skills have been weak, especially on the SME lending side.

Table 5.11 Ratios of Assets, Loans and Deposits to GDPs in EU Countries and Turkey in 2004

| | Assets | Loans | Deposits |
|---------------|---------------|--------------|-----------------|
| Germany | 297 | 136 | 113 |
| Austria | 268 | 125 | 98 |
| Belgium | 322 | 115 | 143 |
| Denmark | 313 | 166 | 63 |
| Finland | 141 | 69 | 53 |
| France | 268 | 93 | 77 |
| Holland | 343 | 174 | 122 |
| Britain | 406 | 142 | 118 |
| Ireland | 485 | 176 | 122 |
| Spain | 205 | 121 | 104 |
| Sweden | 209 | 114 | 51 |
| Italy | 168 | 88 | 58 |
| Luxembourg | 2.673 | 462 | 850 |
| Portugal | 245 | 138 | 104 |
| Greece | 138 | 77 | 96 |
| Euro-12 | 265 | 117 | 97 |
| EU-15 | 276 | 117 | 94 |
| Turkey | 71 | 23 | 44 |

(Source: DPT, 2007b)

In the recent past, with excess demand for credit, banks have preferred to lend either to finance government deficits, public entities or affiliated groups. Meanwhile, lending to the private sector has been typically very short-termed (OECD, 2006). Moreover, Turkish banking sector has always been affected deeply by the fluctuations and economic instabilities. Especially after the financial crisis in 2001, they became more prudent and risk-sensitive. Nevertheless favorable economic conditions of the recent period helped banks to increase their credits to SMEs.

Table 5.12: SME loans provided by the banking sector as of December 2008

| | Cash Loans | Non-performing Loans | Non-cash Loans |
|---|-------------------|-----------------------------|-----------------------|
| Loans Extended to Micro Enterprises (1-10 employees) | 32,792 | 2,488 | 6,749 |
| Loans Extended to Small Enterprises (10-50 employees) | 26,691 | 1,366 | 9,663 |
| Loans Extended to Medium Enterprises (50-250 employees) | 27,945 | 0,950 | 15,169 |
| Total SME Loans | 87,428 | 4,805 | 31,581 |
| Banking Sector Total Loans | 374,877 | 13,881 | 190,613 |

(Source: BDDK, 2009, in millions of TRY)

Unfortunately banking sector statistics do not include detailed sectoral loan distribution. Among commercial loans of the total banking system 'Computer and Related Activities' category is the only category close to the ICT sector and comprises only 0.2% of the total loans distributed in 2008.

Table 5.13: Percentage distribution of loans provided by the banking sector as of December 2008

| | Short-term Loans | Medium & Long Term Loans | Total Loans |
|----------------------------------|-------------------------|-------------------------------------|--------------------|
| Individual Loans | 3.63 | 15.37 | 10.34 |
| Housing Loans | 0.08 | 18.10 | 10.38 |
| Car Loans | 0.01 | 2.49 | 1.47 |
| Credit Cards | 20.44 | 0.16 | 9.28 |
| Commercial Loans | 75.84 | 63.88 | 68.53 |
| -Computer and Related Activities | 0.34 | 0.11 | 0.21 |
| Total | 100.00 | 100.00 | 100.00 |

(Source: BDDK, 2009, in millions of TRY)

Even countries with no general SME financing gap may have serious gaps in financing innovative companies (OECD, 2006). For software companies this is much highly relevant due to the nature of their business. Their access to bank credits is very limited. They rarely generate sufficient cash flow to service debt and their risk is too high to be suitable candidates for loans as well as for other forms of debt financing. Their primary source of revenue is their human capital and they don't have collaterals to apply for loans.

As a structural problem the level of national savings is low and so the banking sector is not well developed and well integrated with the rest of the economy in order to promote economic growth. The extent of informal sector also affects the

sector negatively due to the difficulties in risk assessment for loan provision. Another major problem about banks as a source of finance is the crowding out effect of excess government borrowing. For years banks were the main sources of demand for government bonds. The necessary environment for complex products of finance for different actors of the economy couldn't develop (DPT, 2007b).

5.2.5 Public Equity

The primary function of a stock market is to give a company access to cash to be used for operational expenses, further investment or R&D. It brings together the investor and investee firm for a transaction of equity and savings and helps to 'socialize' capital. For the same purpose Istanbul Stock Exchange (ISE) was established as the primary institution for valuation and exchange of public equity as well as other capital market instruments.

Since its inception, the growth of ISE has been limited. The proportion of the market value of publicly listed companies to the GDP remained small mainly due to repeating financial crises and bankruptcies.

Table 5.14: Market value of ISE and its proportion to GDP, 1990-2006

| | 1990 | 1995 | 2000 | 2004 | 2006 |
|-------------------|-------------|-------------|-------------|-------------|-------------|
| Market value | 55 | 1,265 | 46,692 | 132,556 | 141,328 |
| MV/GDP (%) | 14.1 | 16.3 | 37.5 | 30.8 | 30.9 |

(Source: Istanbul Stock Exchange, in millions of TRY)

A comparison between the yearly volume of exchange for shares of private firms and of other instruments shows the trends of private savings. It is seen from the table 5.15 that the transactions in repo market quickly became the major financial activity in comparison to the stock market.

Table 5.15: Private investments on financial markets in Turkey, 1991-2008

| | Government Bonds | Repo and Reverse Repo | Stock Market |
|------|------------------|-----------------------|--------------|
| 1991 | 312 | - | 8,502 |
| 1992 | 2,406 | - | 8,567 |
| 1993 | 10,728 | 4,794 | 21,770 |
| 1994 | 8,832 | 23,704 | 23,203 |
| 1995 | 16,509 | 123,254 | 52,357 |
| 1996 | 32,737 | 221,405 | 37,737 |
| 1997 | 35,472 | 374,384 | 58,104 |
| 1998 | 68,399 | 372,201 | 70,396 |
| 1999 | 83,842 | 589,267 | 84,034 |
| 2000 | 262,941 | 886,732 | 181,934 |
| 2001 | 37,297 | 627,244 | 80,400 |
| 2002 | 67,256 | 480,725 | 70,756 |
| 2003 | 144,422 | 701,545 | 100,165 |
| 2004 | 262,596 | 1,090,476 | 147,755 |
| 2005 | 359,371 | 1,387,221 | 201,763 |
| 2006 | 270,183 | 1,770,337 | 229,642 |
| 2007 | 278,873 | 1,993,283 | 300,842 |
| 2008 | 239,367 | 2,274,077 | 261,274 |

(Source: Istanbul Stock Exchange, in millions of USD)

The main reason of low market capitalization is the small number of publicly listed companies. Despite favorable economic conditions in recent years, the number of IPOs was low and stock market remained unattractive for firms as a source of finance.

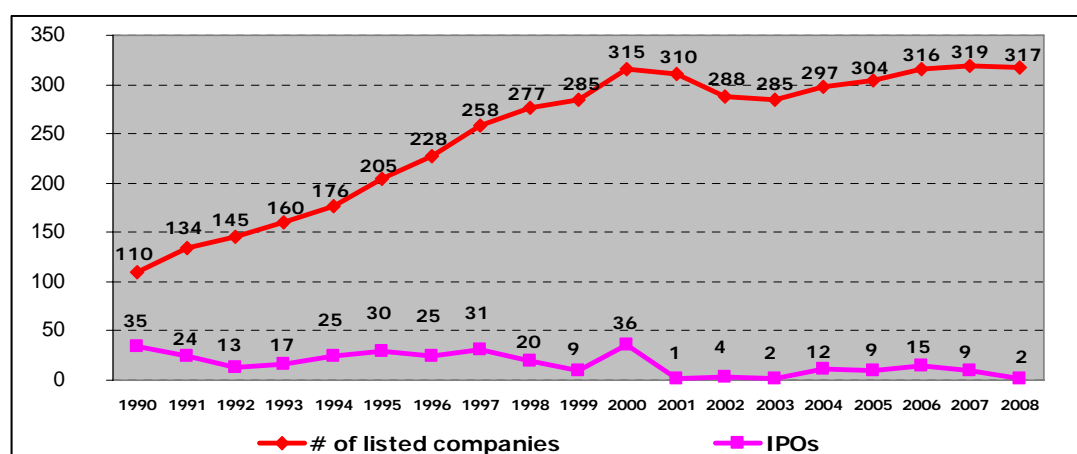


Figure 5.3 Number of Publicly Listed Companies and IPOs, 1990-2008

(Source: Istanbul Stock Exchange)

The other part of the reason of low capitalization is the disinterest of investors to the stock market. The number of investors with deposit accounts in stock exchange is decreasing since 2000 (DPT, 2007b). However the number of foreign investors has increased during this time and their share in the stock market reached to 72% in 2007 and only decreased to 67% at the end of 2008. This is mainly because of the insufficient flow of domestic savings into the stock exchange. The crowding out effect of government financing is also relevant for public equity investments. The proportion of government securities to the total securities in Turkey was about 92% in 2007. Another reason of low capitalization is the difficulties in ensuring the rights of shareholders. Juridical processes are slow and inefficient in providing the trust relationship between investors, intermediaries and investees.

The rapid fluctuations in foreign exchange and interest rates negatively affect the profitability of publicly listed companies. Moreover, insufficient market depth causes problems in pricing as well as demand-supply disequilibrium (DPT, 2007b).

The interest of technology companies to the stock market reflects the similar issues of Turkish financial system. Despite the incentives provided by the stock exchange like the New Economy Market established in 2003 to attract high-tech companies for public offerings, investors were again uninterested to provide finance for high-tech sectors through stock markets.

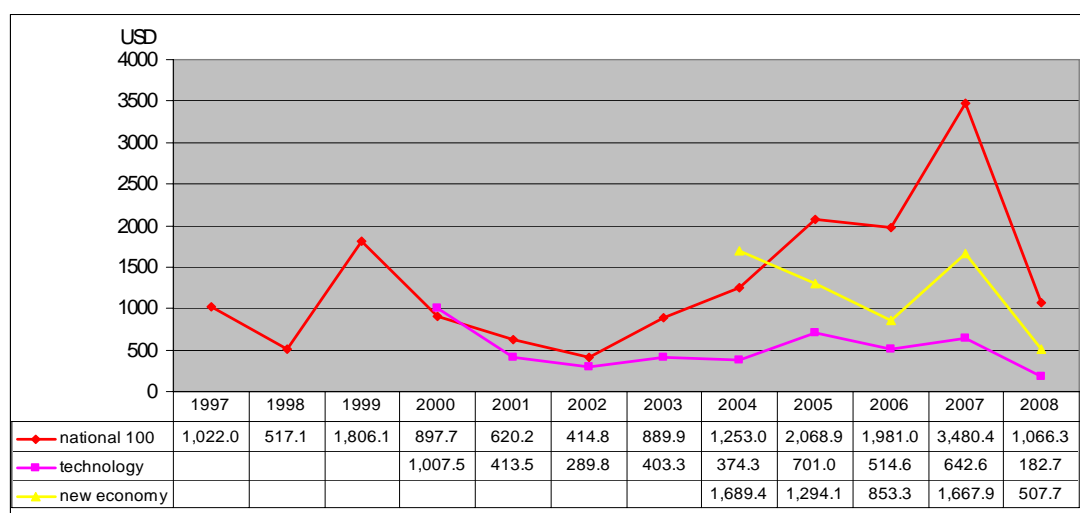


Figure 5.4 Index values of technology related firms in stock market, 1997-2008 (Source: Istanbul Stock Exchange, in USD)

Today there are 10 companies in the national technology group which is not an index for ISE. In the new economy market, there are only 3 companies and since its inception the market has lost more than two thirds of its value. The loss in technology group is even higher. Total market value of the technology group is only comprised of 0.4% of the total value of publicly listed companies. Aselsan, the primary communications defense systems and microelectronics firm of Turkey makes up half of the whole technology group market valuation.

Table 5.16: Market values of selected groups in ISE as of December 2008

| | Market Value | % |
|-------------------|---------------------|----------|
| ISE Index | 180,880 | 100.00 |
| ISE-100 Index | 154,943 | 85.66 |
| -Technology Group | 686 | 0.38 |
| -Aselsan | 348 | 0.19 |
| New Economy Index | 52 | 0.03 |

(Source: Istanbul Stock Exchange, in millions of TRY)

5.3 Perspective

Software firms in Turkey face similar difficulties with their counterparts across the world. Their financial problems are also similar. They need a financial commitment maintained by internal and external sources to accumulate their capabilities of R&D, production as well as marketing. Software industry in Turkey needs continuous flow of financial resources to develop as a major sector. It is quite possible for software to be a main industry in Turkey regarding the size of the domestic as well as international markets, their growth rates and the growing potential of ICT utilization in every sector of the economy and in household consumption.

However, despite the growth potential of the sector, the interest of various financial sources to the high-tech sectors including software is immature. The implementation of the growth-cycle model for the Turkish software industry shows that the attraction of high-tech sectors in for different finance sources is absent. Financial investment or the orientation of private savings is towards government-related borrowing schemes and foreign direct investment and equity investments are concentrated on manufacturing, retailing and service industries.

Discouraging high interest rates and rapidly fluctuating foreign exchange rates for investment; disinterest of domestic and foreigner investors on high-tech

sectors; underdevelopment of intermediary organizations for non-mainstream financial investment like angel investing for high-tech firms and lack of specialized government policies towards the industry are some of the obstacles for software firms to attract funds. Structural issues of Turkish economy like low level of domestic savings and disinterest on equity-finance models also contribute to the broader picture.

Software firms need specialized funds along their growth paths. And the growth of high-tech firms is essential. As an example to meet the demand of SMEs for software products, software firms should also grow along with SMEs. In this sense, profit retention or funds from non-professional investors like 3 F's or informal angels are not enough to match the growing software demand. To develop the product range from single-purpose products to high-end solutions, to expand the export capacity of the industry and to compete with multinationals located in Turkey with diversified and competitive products and services should be the main growth strategy of domestic software firms. There is an important trade-off between the disinterest of conventional sources of finance like bank loans or stock market and the needs of high-tech firms to grow.

The investigation throughout the growth-cycle model is important to reveal the dynamics of financial sources in Turkey. However the question of their potential for the domestic software industry is also necessary to be analyzed through the perspective of industrialists. Their ideas and considerations are important to comprehend the question of finance for innovative firms and to gain a deeper and industry-specific perspective. To possess a broader understanding of an industrial structure which is critical for an industrial policy solution, the voices from the fields of software are required to listen.

CHAPTER 6

OPINIONS FROM THE INDUSTRY AND FUNDING ORGANIZATIONS

There is diversity among software firms in Turkey regarding size, field of business or forms of incorporation. However there are two features common for the industry as a whole. First, software firms in Turkey are small and medium enterprises and second, their primary capital item is the human capital they have. This feature determines their major cost item as wages and salaries of their employees.

The interviewee firms represent the variety of the industry. All the firms I interviewed involve in R&D activities and develop and sell their own products. They are all domestic firms and their size varies between 6 and 100 employees. 4 out of 6 firms have their headquarters in technoparks. The oldest firm was established in 1991 while the youngest was in 2006.

Interviews are based on open-ended in-depth questions primarily investigating the general problems of software firms and specifically their financial issues. The questionnaire is composed of firm-based and industry-based questions and all the interviews were done as face-to-face conversations. There are specific questions about direct financial issues while there are several other questions on non-financial topics. The reason behind asking the latter is to reveal the interrelations between financial and other difficulties the firms come across. In the course of interviews, these interrelations were tried to identify through inducing interviewees to answer these secondary questions. Moreover their broader perspective about the software industry was also questioned. Their point of views about the course of the industry is worth to investigate in order to understand their level of awareness about industrial issues.

The representatives of funding organizations were also questioned with a focus of financial issues of high-tech firms. They were asked about their investment priorities, criteria for the selection of investee firms and their own financial sources. In order to identify the approach towards software industry, their sector specific investment decisions were also questioned.

6.1 Setting up the Firm

The first question directed to the firm managers was about the financial difficulties they had to bear during the establishment of the firm and the source of their seed capital. Five out of six managers declared that their firms were established by personal savings including support from family and friends. Only one firm was established as a subsidiary of a holding company and had resources to develop products until sales and marketing. Three firms launched their activities with already existing customers through previous contacts, two others developed their initial products with government-related support mechanisms and one firm initiated its first project with the help of the mother company.

Today, older firms perform modifications for their primary software products and they are able to offer alternatives of their own products to their customers including foreigners. It is understood that bootstrapping methods and profit retention have been the basic sources of finance in the early years of the firms interviewed.

6.2 Costs

The second question was; what are the primary cost items for software firms? Labor is the major cost item for all the firms interviewed. One manager identified that labor costs comprise 65-70% of their total costs. Rent and costs of communication are the following major cost items. Five out of six companies enjoy the benefits of technoparks despite expensive office rents they have to bear.

Other than the labor costs, the emphasis of firms on other cost items differ according to the size and characteristics of their business. Several firms with foreign connections and one firm specialized in networking emphasize the costs and difficulties of communication and only the firms which are capable of performing sales and marketing activities stress marketing costs. The cost issues differentiate in details.

6.3 Risks and Uncertainties

The diversity among firms is also available in their perception of risks and uncertainties. The list below summarizes the primary risk/uncertainty that managers declared for their firms.

- Loss and/or lack of customers
- Imperfect competition
- Exchange rate fluctuations and loss of competitiveness
- Loss of human capital
- Unfair foreign competition and lobbying activities
- Imitation of products with low quality and loss of R&D efforts

The major reasons of differentiation are about the differences in scale of product sales, customer scope, different features of products (package, project-based, adaptable/modified), R&D intensity of firms and the issues in competition among firms. Therefore the risks attributed by managers also diversify in detail.

6.4 Growth in Question

As the firms stress the prevalence of uncertainties in Turkish software market, managers' answers about the growth potential of their firms are prudent. They base their growth potential to the quality of their products, new domestic or foreign marketing opportunities and redirecting revenues to further product development. Growth through partnerships and new finance opportunities are secondary and mostly hardly possible alternatives. The interviewees are all prudent and rational. They are well informed about the success stories of software industries in US, India or Ireland, yet they also are also aware of the facts of doing business in Turkey and their growth plans are based upon their profit retention activities. Their unsuccessful surge for opportunities like partnerships or external financial sources makes them turn into themselves and surge for new markets with their own resources.

The answers about growth show that an analysis on sources of growth is a complicated issue regarding a firm-based analysis. Financial constraints force firms slow down or postpone their growth plans despite their complaints about the fierce competition, mismatch of their product specifications and market needs and marketing difficulties. Regardless of their size the issues of growth are quite similar.

Another question related with growth is the possibility of control loss after growth. This issue has two dimensions. First there may be problems with monitoring and coordinating business activities after the growth of the firm. This is an organizational issue. Second, the loss of control may happen after an external finance to the firm like a merger, private equity or public equity. Firms

are more concerned with the first dimension. Three managers discuss the organizational difficulties they faced while their firms were involved in new projects. One manager indicates the difficulties he experienced of an acquisition his firm recently did. They are mostly neutral with the second dimension of loss of control. All the managers except one consider the issue of sharing the control of their firm with outsiders to be determined in the course of negotiations. The only manager who disregards the possibility of sharing the control with others does not consider growth as a firm strategy.

6.5 Issues of Marketing

The basic source of finance for the firms interviewed is profit retention. For this reason, the primary source of their profit; their sales and marketing activities is necessary to be questioned. The table below lists the issues of marketing according to the managers interviewed.

- High costs of marketing including advertising
- Lack of affordable sales opportunities and supports of commercialization
- Unequal bargain power of customers due to fierce competition
- Language barriers for export
- Differences in culture of business between countries
- Market uncertainties due to economic fluctuations
- Mismatch of quality and service expectations with product prices
- Prevalence of low quality products in the market

The price – quality tradeoff is the major complaint the managers express. The managers stress the race to the bottom in prices through fierce competition which damages the trust relationship between software provider and customer. The decrease in prices accompanies with the loss in quality and the waste of resources of public and private customers is prevalent. Another major source of dispute is the differences between firms and their customers in service and maintenance expectations. Most of the managers complain about their customers' behavior about the extra services. Customers consider service and maintenance are included in the price they pay but firms want to charge for specific services they offer.

The firms which produce package programs also complain about the high costs of sales and mention about how they are unable of advertising and marketing

their products. They need financial resources to extend their marketing channels and to have access to customers.

6.6 Sources of Finance

One of the major questions asked to the managers was on sources of finance. How do software firms in Turkey consider different finance methods and what are their experiences in their search of financial sources? All of the managers are aware of the fact that there are different sources of finance including debt and equity finance methods. However the utilization of these methods is limited for the firms.

None of the managers consider bank loans as a source of finance for software firms. One manager considers debt financing as a way of suicide regarding the volatility of interest rates. Most of the managers complain about the difficulty of finding guarantees for bank loans when necessary. Software firms do not have fixed assets to get loans from the banks.

All of the managers are positive with equity financing methods like venture capital or angel investing. Three out of six firms have experience of negotiations for private equity financing but none of them have used this method as a source of finance. A manager indicates the changing mentality about equity financing and partnerships in Turkey. She states that until recent years looking for a partner or investor had been considered as a sign of recession for firms. Today search for external finance is seen as a regular activity in every sector.

The managers who previously negotiated for external finance indicate various difficulties of a potential equity finance agreement. The list below identifies some of the difficulties stressed by managers.

- Speculative character of foreign venture capital investment
- The lack of investor interest to the existing products of software firms
- Knowledge deficiencies of angel investors about high-tech firms
- The differences between domestic firms and foreign investors in perception of risks as well as innovativeness of firms
- Disinterest of venture capital due to the small size of the software firms
- The loss of control after equity finance
- The issues of trust between investee and investor regarding intellectual property, future R&D activities and future course of business

- The difficulty of long-term business planning in Turkey due to volatile business environment
- The reluctance of investors to continue negotiations
- Lack of exit options for investors

The issues indicate that the difficulties is mostly about the information asymmetries between parties and the disaccord between firms and investors regarding business orientation, size of investment and forecasting. The managers who previously performed negotiations do not mention any disaccord about the valuation of the company or any disagreement about administrative and organizational restructuring within the firm after the investment.

Nevertheless managers are optimistic about the future potential of equity financing. However they are aware of the facts of business orientation in Turkey and propose some solutions like a regulatory and intermediary body organized by government concerning equity investment or consultancy services of technoparks specialized in legal and financial issues of high-tech firms. In fact a manager summarizes the difficulties of high-tech firms in Turkey regarding finance:

We are in a technopark. Technoparks should offer consultancy services to prepare firms for the future. A patent office, a financial advisor, legal services or a consultancy about EU integration should be provided. These are the components of know-how the firms must learn in order to grow. These offices should prepare companies to be ready for a venture capital application or an IPO. It is almost impossible to develop this kind of know-how within our own bodies. And private consultancy firms ask too much to afford. We don't know how things are going on and so we are simply afraid of taking risks.

A manager of another firm stresses the existing uncertainties in Turkish software industry to attract investments. He uses an allegory about venture capital investments in software industry that he says; "it is too risky for venture capitalists to invest in software firms in Turkey". Yet he also mentions the benefits of venture capital about the know-how they may bring to the companies.

Another manager has a different explanation for the reluctance of investors to invest in high-tech sectors. He identifies the reason behind the lack of consensus between investors and high-tech firms as the avoidance of investors to spend money on R&D. There is a need of financial commitment for high-tech firms which rarely exists. This is implicitly stated by another firm's manager. He states

that in the following 4 to 5 years, it is crucial to bring high-tech firms and investors who previously made money out of secondary/ancillary industries but unable to continue production today due to fierce foreign competition in their sectors. He warns the potential threat about the takeover of Turkish software industry by foreigners.

An initial public offering is out of the scope of firms considering their volume of production and sales. Only one firm considers an IPO as a way of finance in the future, but its manager is prudent because of the rising administrative costs of firms after being public and the consultancy costs and fees of an IPO at ISE. He complains about the speculative nature of stock market in Turkey and regarding the low volume of capitalization for high-tech firms, the risks are greater for software industry. He proposes a specialized stock market for small and medium size firms.

6.7 Government Support

Another important question was about government-related subsidy programs to the software industry and the experiences of firms with the supports offered. All of the firms interviewed used these supports but some of the firms utilize these programs more intensive than others. For example one firm benefits only the advantage of technoparks like income tax exemptions but another one regularly applies for Tübitak's R&D funding and performs its fifth project in 2009.

All of the firms are positive with government-related R&D funding and regard the importance of the resources they maintain through the funding applications. However they have some complaints about the funding schemes and several administrative and financial issues attached to the funding. The list below reveals the issues with government-related funding (grants or cheap loans).

- Unequal distribution of funds between firms
- Discouragement of small and medium size firms
- Necessity of sufficient financial capacity to sustain funded R&D projects
- Lags of payments after R&D expenditures
- Bureaucratic difficulties with grant application
- Lack of commercialization grants for software firms
- Disagreements between firms and technical advisors of funding institutions
- Lack of strategic planning for government funding
- Lack of targeting specific areas for funding

In effect, Tübitak or TTGV funding schemes and technopark advantages are the primary financial sources of firms after profit retention for their R&D activities. A manager claims that with the help of the R&D grants his firm is able to hire 20% more R&D personnel and the grants contribute 10% of the total expenditures. Another manager makes a comparison between R&D loans and bank loans that he states it is impossible to perform their project without subsidized loans as bank loans are impossible to afford for his firm.

Some managers emphasize the networking role of R&D funding with universities and research centers. A manager stresses the role of networking which allow his firm to be involved in development of state-of-the-art software technologies. However two others complain about the lack of commercial/marketing knowledge of academic consultants evaluating their projects if they are eligible for grants.

6.8 Opinions about Foreign Capital

I also tried to identify the opinions of software firms about foreign investments in software industry either through financial intermediaries like venture capital funds or direct investments in software industry in Turkey. Managers of firms have a variety of ideas about the benefits and disadvantages of the foreign investments. The benefits include the know-how transfer from foreign firms, the high potential of capacity improvements in technical and administrative knowledge through project partnerships, collaborations and mergers, inflow of financial sources to be used in high end R&D and capitalization of the software firms in Turkey.

However, all of the managers question the potential of software in Turkey to attract foreign investment. A manager highlights the volatility of Turkish economy to attract finance for high-tech sectors. Another manager emphasizes the lack of government policy providing incentives for software firms in Turkey which also help them to attract foreign capital. Two managers discuss the importance of genuine products to attract foreigners to invest in domestic firms. Package products are more important to attract capital than the project-based software services and in order to develop genuine products firms need more financial resources. There is a vicious circle for small and medium firms here.

Moreover, a manager draws attention to the network effect of foreign capital. Foreign firms in Turkey bring their software preferences with the investment

they make. They ask their partners or potential partners to use foreign software products. Therefore there is a crowding out of domestic products from the market.

6.9 Opinions about Software Strategies

One of the major strategies for the domestic software industry should be to create specialized and sophisticated products and to perform continuous innovations. Managers complain about the fierce competition which leads firms to offer low quality and cheaper products. Such a situation damages the sector as a whole. Some managers indicate the wrong allocation of government resources regarding software procurements of public organizations. Government as a major customer for many software firms should be more selective and should take quality/innovativeness issues into consideration.

A national strategy on software industry is essential. All of the managers emphasize the role of a national industrial planning and reorganization of subsidy system. R&D supports are important and existing subsidy schemes are relevant. However, an integrated national strategy which regulates finance, employment, competition and R&D supports should be implemented. Otherwise the potential of the sector cannot be realized. The comment of a manager is striking. He sees a similar future for software industry to the automotive industry in Turkey; less R&D with low tech growth potential.

Individual strategic plans for software companies are also important. Managers mention the necessity of organizational improvements and business development practices. However, they remind the prevalent uncertainties, high turnover rates which harm knowledge accumulation, high costs of consultancy and difficulties in visibility of companies to do strategic partnerships.

In this sense, three managers emphasize the role of project-based partnerships. Regardless of the size of firms, managers stress the difficulties of mergers and highlight the potential of partnerships. However they complain about the limited partnership opportunities and the lack of appropriate models for partnerships. Two other managers complain about the unequal power relations between firms in outsourcing and contracting activities. They try to develop their organizational capabilities alone but with limited financial sources.

6.10 Funding Organizations

After conceiving the ideas as well as demands of software firms regarding finance, it was also necessary to learn about the providers of financial sources for high-tech firms. Their opinions about the finance of the software industry were critical to gain a broader and multi-faceted perspective. For that reason I interviewed with representatives of three different funding organizations. I encountered with several interesting considerations about finance of high-tech firms.

My first impression was the disparity of organizations about their expectations from their investees. Three funding organizations I interviewed are composed of a venture capital firm focused on early-stage investment on high-tech firms, an intermediary organization for R&D supports to private sector firms and a private equity firm with a focus on high-growth potential SMEs. Depending on their preferred stage of investment, sectoral focus and funding schemes, organizations have different perspectives. The venture capital fund with a focus on early-stage investment considers the innovativeness of the firm as the major criterion. However the other fund which invests on expansion-stage firms primarily focuses on the institutionalization of the firm regarding the organizational strength, performance of the administrative body, existing business activity and the exit potential. For the R&D supporter organization, the main criteria are the innovativeness and commercial potential of the product to be developed.

I also questioned the representatives of funding with a focus of financial issues of high-tech firms. I asked about their investment priorities, criteria for the selection of investee firms and further expectations.

All of the organizations care about the innovativeness of the firms to be invested. For a high-tech firm innovativeness should be an asset. Moreover, the ability of the firms to commercialize products or services is also necessary for funding. After the productive capacity, infrastructure and human capital of the firm are critical. The IT infrastructure, background of the R&D personnel, necessary administrative and market knowledge are other crucial assets to be expected from firms.

The relations after the investment between the firms and investors are also important. The flexibility offered to the firms about the requirements to their

investors, investors' contribution to the decision-making or consultancy and networking offered to the firms are essential assets of investors for their investees. The contribution of the investors in terms of institutionalization and business relations are also confirmed by the firms interviewed.

Lastly, in order to identify the approach of investors towards software industry, their sector specific investment decisions were also questioned. For the R&D funding organization the problem with the software firms is the lack of guarantees to be offered to the investor. The capital of software firms is their human sources and they face with problems in seeking guarantees to be used for funding applications. This is a major handicap for the industry. The venture capital firm emphasizes the potential of innovativeness of the software firms in Turkey. Because the competition among software firms is still based on costs and prices offered, the venture capitalists hesitate to invest into the industry as their investment focus is quite different than mainstream approaches. The private equity firm also stresses the lack of institutionalization and organizational strengths of software firms that the uncertainties of the business environment for the software industry hamper them to invest into the sector with bigger amounts.

6.11 Perspective

Findings prove that the similarity of financial problems of software firms set forth an industrial development challenge for the software industry in Turkey. The barriers to growth of software firms are mainly centered on the structural issues of industrial production and the difficulties in the access to financial sources. Software firms are forced to behave excessively prudent and risk-averse and they base their strategic plans only on their internal sources.

In that sense, the trade-off between technology and finance works for Turkish software industry. Given underdeveloped financial infrastructure capable of funding expensive activities like technology development or innovation, software firms are introverted and focused on their internal product developments.

The perspective about external finance is generally positive. However the prevalent disinterest of investors to the high-tech sectors hinder the great potential available among innovative firms relating their growth potential and the demand available for ICT goods and services in Turkey as a developing economy. Many issues about different external finance models are still beyond

the level of discussion due to the underdeveloped angel investing, venture capital or IPO infrastructure for high-tech firms. Moreover the risks and uncertainties associated to high-tech sectors in Turkey make software firms still hesitant about external finance despite their positive attitude.

Marketing is one of the basic issues for software firms to grow. Even they are capable of producing complex solutions for their customers, it is sometimes impossible to advertise their products and to develop and customize them due to the lack of resources. This is also relevant for export of their products. It is a costly process to market their products abroad. Therefore specialized supports for domestic and foreign marketing efforts are critical.

Competitiveness is generally considered as the main strength for ICT companies (Heeks, 2007). Beside various factors determining competitiveness including finance, human capital, production processes and organizational structures, collaborations of companies and economies of scale are also critical to compete at national or international levels. Therefore, to increase productivity and to provide cost-effectiveness, collaborations may help to foster the growth of the sector. Thanks to R&D grants and partnership opportunities they are offered through international projects, software firms have the opportunity to inform about technological as well as organizational know-how available.

The major issue the interviewees propose is the public disinterest to the sector. All of the managers emphasize the role of a national industrial planning and reorganization of subsidy system. Therefore an industrial strategy is essential. The question of the industrial competitiveness still remains to be answered and it is only attained with such a strategy. In that sense, software firms generally refer government to act but the interest of private finance mechanisms and non-governmental industrial organizations are also critical.

The approach of the funding organizations to the software sector is questioning. They have some questions about the innovativeness, growth potential and institutionalization of the sector. Yet they are capable to distinguish the differences of high-tech sectors in terms of risks and uncertainties they carry and committed financial investment they need. They are also constrained with their limited financial capacity to invest as they may carry risks to invest solely on high-tech sectors. So they try to diversify their investments. As far as their stage of development is considered, their contribution to innovative firms is restricted.

Despite major similarities, software firms also have various differences based on their line of business activity, product specifications, size, access to external sources and partnership opportunities. The diversity of their activity as well as their demands and future expectations bring out the need for a complex set of an industrial policy answer.

CHAPTER 7

CONCLUSION

This thesis tries to analyze the conditions of finance for software industry in Turkey. Whether it is not the only precondition needed for the success of the industry, finance is an important part of a broader scheme of high-tech industry formation and growth. To repeat, finance is one of the major social conditions of an innovative enterprise as only a steady flow of financial resources may provide the accumulation of capabilities to generate innovative products and processes plus organizational learning.

The analysis throughout the thesis shows that finance of Turkish software industry has two aspects. First the structural problems of the relations between finance and other industries in Turkey affect the software industry negatively. Second, the underdevelopment of a national industrial strategy which may also cover financial commitment for high-tech sectors remains software industry weak and immature. Today the industry is squeezed by external deficiencies despite its potential growth and export capacity.

The relations between finance and industry in Turkey have always been problematic. Early government efforts to develop the industrial base of the country is continued with the efforts of private actors to establish businesses and industrial plants while government remained as an intermediary actor and financial and infrastructural supporter. Along the different strategies of industrialization in the previous century, banks became the major actor of finance for the industrial production.

However the restructuring of capitalism at the end of the 20th century had also great implications over developing economies. Various structural issues of economic development in Turkey like low level of national savings, underinvestment, high unemployment or financial instability persisted and the links between finance and industry remained weak and instable.

The weaknesses of the relationships between business actors in Turkey, the underdevelopment of collaboration efforts and the lack of strategic thinking, flexibility and decision making ability of public and private actors of the economy on industrial issues contributed to the instability. Regarding the social conditions of an innovative enterprise; the financial and economic instability and the underdevelopment of the relations between different business actors including industrialists, financial investors and government harm the development of high-tech industries.

Globally the main sources of finance for technology firms are generally seen as venture capital and stock market. This is especially relevant for venture capital as these firms be categorized as 'ventures' due to the inherent risks and uncertainties they bear. The model presented in the thesis also provides the details for the financial needs of high-tech firms along their development paths where venture capital is a bridge between start-up and expansion levels of firms. In between the two levels the strongest commitment is needed. However there is always confusion between promoting venture capital activity and the overall developmentalist strategy within a country especially for developing economies like Turkey. It is not enough to develop innovative capacity of an industry by only supporting venture capital or other financial intermediaries. Venture capital is itself an industry; a component of economy but not an overall developmentalist strategy. The history of science and technology development in the advanced economies as well as in rapidly growing developing economies shows that the innovative capabilities could only be created through strong state commitment into new technologies and states also provided the channels for the practices of innovations made by private initiatives. Therefore, it is important to figure out that venture capital or other risk-bearing finance methods are not the primary sources of finance for the development of the high-tech industries in developing economies. Nevertheless they are the complements of technology development and can play important roles to fill the blanks of mainstream finance models and of government orientation.

Today debt financing methods like bank loans are out of interest of small high-tech companies. These companies do not have enough securities to have access to bank loans, and generally have negative cash flows and unsteady revenue recognitions. Moreover, as a structural problem, the sources of bank loans as well as government funds for industrial development in Turkey have generally been provided by foreign institutions. This is a major threat to the sustainability

of the financial markets as well as to their deepening. World Bank loans are now replacing with European Union funds and the practice of external borrowing dependent growth strategy of the country in the last 30 years now replicates itself in externally funded finance systems. This causes domestic financial channels and finance methods remain underdeveloped. As a consequence, during a period of recession or a bottleneck of finance, banks are reluctant to offer loans to the industries which hamper the development of stronger relations between sectors.

Stock market as a source of finance is generally seen as the biggest promoter of high-tech sectors in light of the fact that the US high-tech sectors owe much to the public equity demand available. For Turkey, the development of the stock market has been controversial as the number of IPOs has been limited, so the capital base remained weak. It can be foreseen that stock market as a source of finance will also remain unpopular in the following years. This is also an important aspect for the exit options of venture capital investments within the country. Similarly an option of listing in foreign stock markets is not a viable strategy due to the low level of networking between domestic and foreign high-tech industries as well as financial markets. For venture capital investment opportunities, buyouts, acquisitions and selling back to the previous major shareholders will continue the major forms of exit. This also highlights the importance of investor loyalty to the early stage firms that they are required to stay in for longer periods rather than looking for quick, high-return exit opportunities.

The growth-cycle model helps us to identify the potential. However it does not say anything beyond the representation of a general picture of sources of finance. Moreover it is critical to identify the country specific conditions while working on model-based research areas. For Turkey, each specific source needs to be reconsidered. For example, venture capital in Turkey is an industry which also needs to be promoted. Various developing country cases show that the role of the state in the development of venture capital is beyond question. Similarly the role of Turkish government should be instructive and should go beyond providing the legal framework. Some institutional as well as financial supports should be provided. One important point is the potential support of a scientific and institutional committee which is highly relevant for high-tech sectors. Such a committee is essential for the valuation of high-tech firms and their projects. R&D supports of government are increasingly available for firms but there is no

other support than the R&D funding and some help for project management. Evaluation of marketing potential, organizational knowledge creation or legal counseling supports are the major non-financial components of venture capital or simply equity-based investments that Turkish state should also consider in fostering the financial support for high-tech sectors. It is important to redirect savings to the productive areas. Unfortunately, such an approach has been ignored for decades. Conventional finance methods in Turkey have been insufficient to foster the economic development through science, technology and innovation.

Furthermore, SME-biased loan programs should be differentiated for different sectors. High-tech as well as ICT-focused programs should be developed in order to materialize the potential of these sectors. The last but not least evaluation of these programs is highly critical. The additionality of these programs should be regularly monitored. This is an important handicap today that the effects of loan as well as R&D grant providing efforts of the government are not fully articulated in Turkey (Taymaz & Özçelik, 2008).

Another pervasive belief about the finance for high-tech sectors is the potential positive effect of foreign capital. The private investments in the last 30 years remained low in high-tech sectors. For the ICT sectors, the biggest investments still consist of formerly state controlled communication and electronics firms and regional offices of global software companies. Information available for the R&D activities of these companies reveals that they have little intention for R&D in Turkey. Details on the activities of global software companies in Turkey are not publicly available but it is a fact that their positioning is sales and marketing oriented. A general approach of these multinationals is to consider Turkey as a regional centre of technical support for customers' services and other commercial operations.

Sectoral differences within high-tech industries should also be monitored in order to differentiate the scope of finance. The experiences of various countries about the successes of specific industries and the role of finance should be evaluated. For example, the reason why Taiwan has been successful in hardware while Ireland has been in software should be analyzed with respect to country-specific financial structures. It should be considered that similar applications for different high-tech sectors can bring different outcomes.

To conclude, a working financial atmosphere and innovativeness of high-tech sectors in order to maintain economic development are two sides of the same coin. In Turkey both sides have structural problems need to be addressed and the interrelations between finance and technology development should be critically evaluated. Science and technology policy and specifically the ICT policy should consider the role of different financial models and each model should be separately evaluated.

In order to break out of the simple contract manufacturing as a vicious circle for developing economies today, policy makers try to increase the national capacity of R&D and to institutionalize it. In that sense, finance as a major condition in fostering innovation and technologic development should be securely integrated into the national policies and industrial development. In Turkey, despite the efforts of government institutions to develop industrial strategies and national targets in technology-related areas, these initiatives have not been internalized by related industrial organizations, regulatory bodies and financial sources of the economy ranging from banks and other financial institutions to holding groups, other big foreign or domestic companies in related industries and private investors. Moreover the ideological belief behind the restructuring; the idea of neoliberalism kept governments as distant as possible to regulate the industrial activity and several mechanisms like tax exemptions, infrastructural investment and basic education have been seen as enough for a general industrial policy.

The course of domestic science and technology policies and their interaction with the broader economic and social development should also be considered in order to identify the national orientation of technology development. Public policy should improve the connections between finance and technology development. Herein, a consensus between government, financial institutions, high-tech industries and academic organizations is fundamental. A strong financial commitment based primarily on national savings is crucial to provide the propulsive power for economic development based on new technologies. Thus it is possible to catch up with the developed world in terms of economic and social development with integrated and specialized industrial policies.

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