

## THE EFFECTS OF DEVELOPMENT IN INFORMATION TECHNOLOGIES ON THE PRODUCTIVITY OF BUSINESS ENTERPRISES

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### **ABSTRACT**

*Information and information technologies are the main items of the new economic order, and in that order, the firms have to increase their productivities for standing in the competitive sector. After increasing the information technologies investments, the firms can restructure their organization structures and management models, decrease their costs greatly and make their personals more effective and qualified. All that positive activities enable the firms to increase their productivities and to have a more powerful position economically.*

Keywords: **Information Technologies, Productivity, Productivity for the Enterprises.**

### **GİRİŞ**

**W**ith the globalization fact that has been felt denser since 1980s in particular, there have been crucial changes within the social and economic life in the contemporary world. One of the most important changes is the transition from being an industrial society to being an information society. Thanks to this, there have been transitions from traditional approaches to information economies supported with technology and for the enterprises, there have arrived a new process in which traditional approaches are replaced with information and technology based strategies. This status have led the enterprises weigh on research and development activities and innovative technologies more, and made way for investing on information technologies within the production process in escalating amounts other than labor, soil, capital and traditional production factors.

With the use of local networks, broad communication networks and sophisticated computer networks such as internet within the enterprises and commercial life, the strategies of the enterprises are being reorganized according to the economic orders, and the organization structures are being developed with the support of technology. These developments provide the enterprises with advantages such as being able to work more efficiently, spend less and use the man power more productively. It is observed that information technologies and various technologic innovations are the foundation of this process that accelerated after 1990's in particular.

Information technologies, defined as accumulation, processing, safekeeping of information and transferring information to somewhere or reaching this information from somewhere, strengthen the relationships and loyalty between the suppliers of the enterprises and their customers as well as contributing to a new process leading to productivity growth by effecting enterprise strategies immensely. Within this process, enterprises restructure their strategies, organizational schemes and executive systems; turn their employees into more qualified workers while decreasing their number, and the most important of all, they can reduce expenses concerning all the stages of production. In a manner of speaking, all these developments increase the productivity of the enterprises.

Within this study, after referring to the basic facts that will enable a better understanding of information technologies, there will be a general evaluation of information technologies concept and the development of these technologies will be mentioned according to their periods. After the productivity issue, which is extremely important both individually and institutionally, is evaluated within the enterprises' aspect, the relationships between information technologies and the productivity of the enterprises will be detailed. The effects of information technologies over the strategies of enterprises, their organizational, personnel and financial structures will be presented within this context.

### **1. Information Technologies and Their Development**

As information society replaces industrial society, individuals, firms, sectors, economies, to sum up, all the fields of socioeconomic life are being reconstructed in an important extent. In this new era, the leading factors of industrial society, labor and capital, are losing their

importance, and information and knowledge based technologies are taking their places.

In today's world, where information is gaining more and more importance within economic and social life, the source of economic development is changing from tangible capital to manpower that can process and produce knowledge, science and technology are gaining more and more importance, and search and development activities are becoming the main determining factor in productivity process. The rapid technologic developments, led by computer networks and internet, in the information and communication technologies are being solutions to the geographical distances between buyers and sellers and thus, enlarging the consumption areas, the markets that is, and providing them an international characteristic. Today, for the developed countries in particular, knowledge assets like knowledge, money, patent, copyright, brain power, experience etc. are becoming more important than tangible capital means such as money, labor, equipment, energy, factory etc. and we are going through an era where the first one plays an effective role.<sup>256</sup>

#### *1.a. Main Facts Concerning Information Technologies*

Before explaining information technologies concept, it will be useful to explain informatics, knowledge, technology, computer networks and knowledge society, which are elements directly related to the topic.

##### *1.a.i. Informatics*

It is the useful, meaningful and organized state of raw facts and figures that are used in information production and are suitable for illation.<sup>257</sup> Informatics, with its most common form, is the processing of information, safekeeping it by storing, transferring the information by means of the easiest and fastest way and providing the information flow. This process constitutes the starting point of information technologies at the same time.<sup>258</sup>

##### *1.a.ii. Information*

Information, an informatics group and understanding how to get use of this informatics the best way, is the main input of administration

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<sup>256</sup> Arzu Akolaş, 'Bilişim Sistemleri ve Bilişim Teknolojisinin Küreselleşme Olgusu ve Küreselleşme Üzerine Yansımaları', *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (Vol.:12, 2004), p. 8.

<sup>257</sup> H. Bahadır Akın, 'Bilişim Teknolojilerinin Evrimi ve Bilişim Teknolojilerinin Çağdaş İşletmelerde Stratejik Yönetim Üzerindeki Etkileri', *Çukurova Üni. İİBF Dergisi*, (8-1, 1998), pp. 239-240.

<sup>258</sup> Sabahat Bayrak Kök, 'Bilişim Teknolojilerinin Yönetimsel ve Örgütsel Etkileri', *Ticaret ve Turizm Eğitim Fakültesi Dergisi*, (Vol.: 2, Year: 2006), p. 125.

and organization processes and seen as the most strategic source of social and economic life in the contemporary world.<sup>259</sup> The big revolutions and crucial developments that took place with the help of technology in the information field has played the major role in the transition from traditional sectors (iron and steel sector etc.) that require a lot of energy and based on mass production to industries that are bottomed on advanced technology and flexible production (micro electronics etc.). In these new industries information is more important than raw materials and man power.<sup>260</sup>

#### 1.a.iii. Technology

Technology, the ways and methods people use during production activities and all the methods people possess and use to change their environment, includes different techniques and their information, products manufactured via that information and the creation process of this products.<sup>261</sup> Technology is the application of information and information based methods in order to conduct any kind of work. If the information and the information based method let one save time for some particular work, technologic development can be mentioned. Technology and development supported by technology, which are two of the most important factors that led the industrial revolution to be experienced together with capitalism, are the main factors for the information society process to exist as information technologies have come into the production tools field and all other fields of life.<sup>262</sup>

#### 1.a.iv. Computer Networks

In its simplest meaning, network means communication between people. The computers, connected to each other through computer networks and using real-time fast communication systems, provides important opportunities in uniting the control systems both within the companies and among the companies, and in shortening and detailing the time. While computer networks provide horizontal connections among the functions that are geographically located in different places, they

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<sup>259</sup> Bayrak, 'Bilişim...', p. 124.

<sup>260</sup> Akolaş, 'Bilişim...', p. 38.

<sup>261</sup> Mikail Erol, Metin Atmaca and Levent Şahin, 'Bilişim Teknolojilerindeki Gelişmelerin Muhasebe Meslek Elemanlarının (SM-SMMM-YMM) Mesleki Faaliyetlerine Olan Etkileri ve Ampirik Bir Çalışma', *Muhasebe ve Denetim Bakış*, (Vol.:13, Year:4, September 2004), p. 32.

<sup>262</sup> İsmail Hakkı Yücel, *Türkiye'de Bilim Teknoloji Politikaları ve İktisadi Gelişiminin Yönü*, (Ankara: DPT, Number: 2690, 2006), p. 8.

contribute to a vertical integration between strategic administration and functional administration within the organization.<sup>263</sup>

There are three types of computer networks; local area networks (LAN), wide area networks (WAN) and internet.<sup>264</sup>

1. Local area networks are the most effective and low cost computer networks that can be used when a small number of users need to connect to each other often or for long term. These networks are usually used for providing information transfer among the units within the enterprise or the individuals.
2. Wide area networks are the networks used for connecting the remote users to each other.
3. The birth of internet, which provides information sharing through computer networks, was a consequence of the developments in military technologies as in many other technologic developments. The United States of America planted the seeds of internet within DARPA (Defense Advanced Research Project Agency) project after 1960's during the cold-hot war times against Russia, Cuba and Vietnam in order to be able to maintain communication in case of a atomic war. Later on, the meaning of internet evolved and it has become an academic medium that lets a lot of scientists in the world communicate and a commercial field. Together with the day by day increasing interest, the existing commerce fields have moved to the virtual world giving rise to new commerce fields both for the companies and the customers. Besides this, the markets have widened since the commerce fields easily reached everywhere in the world thanks to internet and this triggered globalization in the economic aspect. Today, internet provides a lot more than commerce; information concerning medicine, culture, art, education and many other fields are offered for individuals to use.<sup>265</sup>

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<sup>263</sup> Akın, 'Bilişim...', pp. 242-243.

<sup>264</sup> Erol, Atmaca and Şahin, 'Bilişim...', p. 33.

<sup>265</sup> İzzet Uslu, 'Küresel Pazar ve Elektronik Ticaret', [http://www.bilgionetimi.org/cm/pages/mkl\\_gos.php?nt=458](http://www.bilgionetimi.org/cm/pages/mkl_gos.php?nt=458), p. 9, 21.01.2006.

Computer networks remove the hindrances to communication and cooperation, and supports synergy formation and joint entrepreneurship within enterprises. As a consequence of increasing networking, the controlling and commanding activities are lessening and becoming easier, the hierarchy is weakening and thus computer networks are affecting the structural, technologic and cultural dimensions of the change in different extents. According to this;<sup>266</sup>

1. Structural Change: Together with the spreading of computer networks, the general structure of the organization turns into a flexible, reactive and flowing shape. Within this structure, the information technology removes functional borders and contributes to the formation of dynamic and self-governing groups. In the field that concerns the relationships among companies, computer networks are weakening the exterior boundaries and providing an opportunity for virtual enterprises to be able have continuous communication both with their customers and their suppliers and see the opportunities within the rapidly changing markets.

2. Technological Change: As the computer and communication technologies develop, the computer networks are developing even more and gain even more importance for the enterprises. Together with technologic developments, computer networks are playing a key role in coordinating and controlling the production and distribution in different geographical regions.

3. Cultural Change: The success within the application process of enterprises depends on the character and method of the administration, and the personality and activities of the administrators. It is essential that the administrators analyze the information extremely good. The administrators have to adopt and carry out an approach in which they pave way for their employees to be able move more flexible to provide more efficient reactions for the customers' demands, to improve themselves and to improve their skills to learn by themselves.

#### 1.a.v. Information Society

As information was accumulated, processed, transferred, used and there became big advances in production aimed technologies, a new society order emerged where people were running after innovation and creativity in all the fields and they had the inclination of competing with

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<sup>266</sup> Akın, 'Bilişim...', p. 243.

each other. The individuals living in this new era called information society were able to read all the information that a 17<sup>th</sup> century man could have gotten throughout a life time, inside the pages of a newspaper in one day. It can be explained as; the demands of the information society individuals from this new order have increased in parallel with technologic development.<sup>267</sup>

Today, in the developed countries, a rapid transition process is actualizing from information to information economics where there are industry and services based on intensive production. The main features of these economies, where information is dominant in all fields, can be lined up as below:<sup>268</sup>

1. Technologic development based on search and development,
2. The rapid growing intensive information and informatics activities,
3. As a consequence of intensive search and development, the reduction in time for the product to enter the market,
4. The convenience communication provides and the rapid globalization as the result,
5. The increase in the integrity of the products.

In traditional economies, while production functions are focused on laborers, capital, energy and raw material, information and technology are considered as production means that are effecting the production from the outside. For the information based economies, information is considered as a function that is effecting the production more directly. And this means; especially within the developed countries, the basis of leadership depends more on brain power and information-intensive technologies assisted by it than financial sovereignty or traditional cost advantages. Within this scheme, the enterprises are reconstructing their organizations setting out from a conjecture in which the world economy is dependent on competition and the ones who can shorten the life span of their products the most effectively will survive.<sup>269</sup>

#### *1.b. The Concept of Information Technologies*

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<sup>267</sup> Haldun Akpınar, *Daha Hızlı, Daha Güçlü, Daha Yüksek*, (Ankara: Türkiye Bankalar Birliği, No: 172, 1993), p. 4.

<sup>268</sup> Yücel, 'Türkiye'de...', p. 84.

<sup>269</sup> Yücel, 'Türkiye'de...', p. 63.





provide productive and efficient information usage, communication and deliver it to all the sections of the society be formed. Within this context, when the information technology concept is considered, it can be seen that all the equipments (computer, data accumulating means, network and communication means), applications and services that are developing in a rapid pace and used for providing information to enterprises and individuals are being intended.<sup>273</sup>

*I.c. The Development of Information Technologies*

The realization of the importance of the information technologies and for it to become widespread have started in 1950's when the computers were shifted to commercial field and used effectively. Through this process, the evolution of information technologies have actualized in three stages basically. These periods can be mentioned as data processing period, micro period and the network period that has gained pace in 2000's:<sup>274</sup>

1. Data Processing Period: During the data processing period that lasted about 20 years between 1960 and 1980, main computers, and hardwares and softwares connected to them have been the main elements. In this period, the enterprises get use of computer systems in sublevel accountancy and the automation of the factory works. The main application of this period is the usage of computers for the existing organizations to provide more efficiency; which is "automation". As a consequence of automation, the number of blue collar workers started to decrease considerably in the early 1970's and this process continued in the 1980's.

2. Micro Period: During the data processing period, the struggles of the professionals (information workers) in middle stages to shift to automation failed in an important extent because of the insufficiency of hardware and software in particular. The new paradigm formed for these demands to be supplied and spread the information technologies to more fields in the enterprises is described with the word "informaté". The difference of this period from data processing period is the usage of computers to help professionals unlike the automation process that would replace middle staged administrators. The micro computers made the development of the micro period possible. These computers were

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<sup>273</sup> Akolaş, 'Bilişim...', p. 33.

<sup>274</sup> Akın, 'Bilişim...', pp. 240-241.

enabling people use computers even though they don't know the programming language and they had graphic interfaces. In this period, the usage of computers spread among individuals as well. The start of the period is late 1970's and early 1980's. The first electronic chip was invented by Intel firm in 1971. Due to the advancements in micro technologies, the effects of micro computers are being felt and from consumer electronics to cars and credits cards, almost in all the products micro processors are being used.

3. Network Period: The growing investments in the fields such as the automation of sublevel works, supporting the information workers and advancing the services have constituted a basis for the networks to be set up and spread. Today, the transforming effects of both local and wide area networks are being felt in many fields. In the enterprises, the fast and efficient communication of the employees in all the posts, together with this, the interactive information traffic with the rivals outside the enterprise, ancillary industries and customers over the network, bring a lot of changes both organizational and sectoral.

Since all the countries in the world, especially the developed ones, have increased their investments on information technologies, the expenditure made on this sector has reached an important level in these countries' GDP. Especially, together with the development in the newly growing economies, the demand for information and communication technologies in the world has increased as well as the investments and between the years 2000-2005, there emerged a %5.6 growth rate worldwide. In this field, it is mentioned that China's information and communication technologies expenditures have increased %22 per year in American Dollars and reached 118 billion in 2005. In addition to China, the fastest increase rates took place in Russia with %25 and in India with %23. Since Indonesia, South Africa and East Europe are among the countries whose investments have increased a lot, it is apparent that the investments on technology are not just peculiar to developed countries.<sup>275</sup>

Due to the increasing importance of new technologies within economic and social life, every year the European Commission publishes a report and index (European Trend Chart on Innovation) evaluating the

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<sup>275</sup> OECD, *OECD Information Technology Outlook: 2006 Edition*, (OECD 2006: <http://www.oecd.org/dataoecd/15/30/37826938.pdf>), 21.04.2007.

innovation performances of the member and partner countries according to the Lisbon Strategy. In the report, the countries are classified as “Leading Countries”, “Average Performance”, “Catching Up” and “Losing Ground”. According to the results of 2005 report; Turkey is in the “losers” club together with Estonia, Spain, Bulgaria, Poland, Slovakia and Romania and is in the last place in the index with 0.06 point. The second worst Romania has 0.16 points while the leader country of the index and thus the one who cares about information and communication technologies the most is Sweden with 0.72 point. The report anticipates that the time needed to reach the Europe average is 20 years for the “Catching Up” group and over 50 years for the “Losing Ground”. This is an important indicator that shows how much our country has fallen behind in this field.<sup>276</sup>

On the other hand, United States of America is the world’s leading country regarding information technologies investments. Her yearly increase rate in information technology is higher than many other sectors. In 2004, the merchandise and goods production industry gained %3.1 value, service industry gained %5.1 value in American economy whereas information technologies gained a real value of %14.7 which is much more higher than the other sectors and this displays the facts clearly.<sup>277</sup>

If we check how the status of the American economy in general reflected to the enterprises in the country, we can see the investments made on information technologies increased about %28 per year between the period 1987-1999. It is found out that this rate, for the same period, is greater than the annual rate of investments made on labor factor, capital and all other fields other than information technologies. This status clearly proves the importance enterprises give to information technologies in America.<sup>278</sup>

## **2. Productivity For The Enterprises**

It is possible for the enterprises to get more quality and much more output by increasing the amount or the types of any of the

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<sup>276</sup> European Commission, *European Innovation Scoreboard 2005: European Trend Chart on Innovation*, (Brussels: 2005), pp. 12-13.

<sup>277</sup> Marco Iansiti and Gregory L. Richards, ‘The Information Technology Ecosystem: Structure, Health and Performance’, *The Antitrust Bulletin*, (Vol. 51, No. 1, Spring 2006), p. 89.

<sup>278</sup> Ronald Vincent Ramirez, *The Influence of Information Technology and Organizational Improvement Efforts on the Performance of Firms*, (Ann Arbor: ProQuest Information and Learning Company, 2003), p. 118.

production factors consisting of labor, capital, soil and natural resources or changing these. And this means an increase in productivity. A possible increase in the productivity will lessen the costs, if this money is returned to public it will serve for all the individuals, if the income is shared with the workers as well, the employees of the enterprise and their families will benefit. In other words, it will serve for the social welfare. And this portrays the importance of productivity for the enterprises as well as individuals and society.<sup>279</sup>

### *2.a. Definition and Importance*

There are two main definitions concerning productivity. The first one is a comprehensive one. It is explained as a rationalist life style having the aim of actualizing productivity and the right things in a right way and by conducting an economic study. It is not possible to define and evaluate such a huge productivity concept introducing simple relationships and commenting on the results. Even an enterprise level study requires the targets and post to be determined in the enterprises, the production resources to be provided, all the administrative functions concerning the usage of these, and the interaction and results among all the production resources to be determined and interpreted.<sup>280</sup>

Since considering productivity at this huge dimension comes together with describing and evaluating problems, the topic is approached with a narrower extent and by handling productivity within the enterprise level, a productivity definition is made taking the inputs and outputs within the production process as a basis. Thus, productivity is expressing the relationship between the input for the production and the outputs after the production and means producing by evaluating the resources the best and most efficient way.<sup>281</sup> Therefore, productivity is technically described as “the ratio between the product and services amount, and the expenditures made for this product and services and generally this ratio is formulized as output/input. However, since the fields other than economy are being subject to increasing amounts of

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<sup>279</sup> Kwang Sun Lim, Soo Cheon Kweon and Hyoun Jong Kim, ‘Productivity and Economic Performance of Information Technology’, *Technology and Society*, (June 1997), p. 262.

<sup>280</sup> Zühal Akal, *İşletmelerde Performans Ölçüm ve Denetimi*, (5. Ed., Ankara: Milli Prodüktivite Merkezi, No: 473, 2002), p. 24.

<sup>281</sup> Andreas Horstein and Per Krusell, ‘The IT Revolution: Is it Evident in the Productivity Numbers?’, *Economic Quarterly*, (Federal Reserve Bank of Richmond, 86-4, Fall 2000), p. 51.

examination, changes in the definition on productivity has been observed.

### *2.b. Methods to Increase Productivity*

Today, when we talk about productivity, it is considered together with enhancing the quality of the service provided, preserving the nature and environmental structure, providing the workers the best living and working conditions and meanwhile trying to increase the production amount per input.<sup>282</sup> Besides, for an enterprise of any sector to be successful, she has to be able to organize the output-input relationships in favor of the firm, that is to say to be able to increase the productivity. There are three methods for the the enterprises to increase their productivity regarding the input-output relationship aspect.<sup>283</sup>

1. Keeping the input amount stable and being able to produce more outputs.
2. Producing the same amount of output while decreasing the inputs.
3. While increasing the amount of inputs, providing more output amounts than the input.

The importance of the productivity dimension is even clearer considering the meaning of the increase in productivity for the administrators, workers and even national interests. According to this, productivity increases within the enterprise level mean more production with less cost, and more income and profit. If these benefits provided through efficient administration and working manner can be shared by workers and employees in a fair way, a welfare and social benefit increase for the people in general will take place.<sup>284</sup>

To be able to get use of all these advantages it is an inevitable fact that the enterprises should make increasing productivity one of their top priorities. Various ways can be traceable in order to increase productivity.<sup>285</sup>

1. One of the most popular ways of increasing productivity is getting use of scientific and technologic developments. According to this, the enterprises that are able to reconstruct their organization

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<sup>282</sup> Milli Produktivite Merkezi, 'Verimlilik Nedir?', <http://www.mpm.org.tr/verimlilik/>, 20.04.2007.

<sup>283</sup> Akal, *İşletmelerde...*, p. 25.

<sup>284</sup> Ibid, p. 27.

<sup>285</sup> Milli Produktivite Merkezi, 'Verimlilik...?'

structures and always keep them firm, will gain productivity increase and by increasing their income they will strengthen their competition capacity.

2. It can be possible to increase production by applying some changes within the scope of production process. For instance, if an establishment buys semi finished products and starts processing it, since the units that are having high costs and risks will be switched off, the productivity will increase.

3. Together with the developments in the organization and the administration, productivity can be increased. The enterprises that can be successful in putting forward targets and defining the means that are to be used in order to attain them, transporting the materials, planning the production, managing the active and passive assets, and finally managing people.

4. Using the capital capacity of the machineries and counters that cannot be changed much in a short time period and are being used in production in full capacity as well as man power and preventing the long term inactivity of these in particular, are one of the ways of increasing productivity.

5. Enhancing the quality of the inputs and most important of all enhancing the quality of man power will enable the enterprises increase their productivity for sure.

### **3. Information Technologies and The Productivity of the Enterprises**

Increasing the social welfare in a country depends on continuous growth and continuous employment. While continuous growth is possible by enhancing the competitiveness of the country, the most important means in preserving this competitiveness is seen as the increase in productivity of the country. On the other hand information and communication technologies are two of the most important factors in increasing the productivity. Within this context, the efficient production and usage of the information, reaching to it, processing it, sharing it and, including it to decision making processes are very important. And this makes the application of information Technologies in the companies a must.<sup>286</sup>

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<sup>286</sup> Peppers&Rogers Group, *Bilgi Toplumu Stratejisi: Strateji Belgesi*, (Ankara: DPT, 2006), p. 6.

Information technologies play an important role in the reconstruction of enterprise structures and work processes. The work processes mentioned are operations intended for product and services production, marketing and selling, processing and arranging the orders and conveying them to the customers, and after sales consumer services and the relationships with the customers. After installing the information technologies to the enterprises, the increase in system productivity, providing the customers with better quality goods and services, lessening the costs to the minimum level, developing new products based on information are possible. In addition, today it has come to a point that for the enterprises to gain competitiveness power, it is inevitable that they use information technologies.<sup>287</sup>

Providing the efficiency within the administrative functions depends basically on acquiring the right information and using it. For instance, reaching the right information about future is crucial for this function to operate properly. The effectiveness of the control function will increase with the usage of the right information concerning the situation that arises. It is known that one of the most important duties of the administrators, decision making, can only be effective with the right information. Information is one of the most important sources within all the administrative processes as in the case of the employees' motivation. Information technologies are being used in the administrative systems and increasing the efficiency as well as giving rise to radical changes in the administrative activities. According to this, the general effects of the usage of information technologies to the enterprises can be lined up as below:<sup>288</sup>

1. As the relationships and connections among the enterprises themselves and other enterprises, and between customers and producers, reach a fully solid infrastructure by the agency of information technologies, the economic relationships get denser in all the levels. The geographical borders can be removed and the costs of transportation and transmission processes can be reduced considerably.

2. The enterprises that have widened their customer range, will increase their incomes and will have the opportunity to reduce their expenditure as a result of the increasing productivity.

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<sup>287</sup> Elibol, 'Bilişim...', p. 159.

<sup>288</sup> Ibid, pp. 159-160.

3. The enterprises stabilize their positions within the industry by doing duly production, advertisement, sale, sufficient storage and meeting the demands and needs of the consumers. Thus, information technologies provide cost advantage regarding the effectiveness and productivity of administrative systems of the enterprises.

4. Information technologies, using some methods such as internal accountancy and data base transmission in particular, are almost completely removing operation durations. This prevents time waste and provides an opportunity for the remaining time to be directed for more productive works.

5. Thanks to information technologies, the enterprises can save and preserve all the information related to their activities and clients on the electronic medium and can recall easily in case of a possible need.

Yet, we should keep in mind that for the enterprises to get use of the advantages the information technologies provide and for the information technologies to play a main role in the growth of the enterprises, these technologies shouldn't be seen as simple office automation but perceived as a uniting part of a general strategy.<sup>289</sup> Consequently, it is useful to point out that considering information strategies increasing the productivity of an enterprise, not the number of the computers that they have bought but how efficiently they use this technologic means is determining.<sup>290</sup>

The information technologies increase the productivity of the enterprises in three ways:<sup>291</sup>

1. As a result of the increase in information and communication technologies the capital per employee is also increasing and this increases the productivity of the employees of the enterprise.

2. As a result of technologic developments for the production of information technologies and services, there is also an increase of productivity in the information industry and this reflects to other enterprises as external benefit.

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<sup>289</sup> Akın, 'Bilişim...', p. 249.

<sup>290</sup> Francesco Daveri, 'Delayed IT Usage: Is it Really the Drag on Europe's Productivity?', *IGIER Working Paper Series*, (No: 267, Milano, 2004), p. 6.

<sup>291</sup> Daveri, 'Delayed...', p. 26.



3. As the usage of information technologies in a country spreads to all sectors, in general the country economy and specifically the enterprises in the country have a total increase in productivity.

The increase of productivity in the enterprises using information technologies are achieved by changing the strategies of the enterprise, reconstructing the organizational structure, the vocational and technical education of the employees, thus improving their qualities, reducing any kind of costs of the enterprise etc. These developments and the effects of information technologies on the productivity of the enterprises are going to be analyzed in details below.

### *3.a. The Effects of Information Technologies on The Strategies of The Enterprises*

Entering the information age and the advancements in the information technologies have put the traditional administration mentality in an insufficient position and wore out in fact. Thus, the enterprises have to reconsider information and the role of information technologies regarding administrative process and institutional operation. It is an inevitable fact that the information technologies are very effective in the reconstruction of administration strategies and will be even more in the future. As we all know, the main condition of being able to compete in this information age is to follow innovative strategies that depend on technologic development. And innovative strategies can only be applied by the usage of information technologies. The information technologies, which have changed the administrative approach in the business world, are providing the enterprises, which apply themselves the best, be superior in the competitive sense.<sup>292</sup>

Information technologies, due to their reciprocal interactions with work processes and enterprise strategies, have been an important factor in creating a strategy. The effects of information technologies on the strategies of enterprises can be analyzed in three levels; sectoral, enterprise and strategic. According to this;<sup>293</sup>

1. Sectoral Level: While changing the structure of the products and services by substituting the physical content with informational content, the information technologies connects the sectors and markets that are previously not related to each other with widespread

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<sup>292</sup> Kk, 'Biliřim...', p. 128.

<sup>293</sup> Akın, 'Biliřim...', pp. 246-247.

communication networks and thus, change the marketing strategies. In addition, information technologies are bettering the cost structures of the enterprises and providing them remarkable advancements in institutional effectiveness and service quality levels. This makes it possible for the enterprises get the output with the lowest cost regarding the production economy and it quickens the product and service diversification. Due to intensive competition, all the enterprises within the field have to keep up with this application and the increasing productivity spreads to the whole sector.

2. **Entrepreneurial Level:** The strategic effects of information technologies on the entrepreneurial level are considered as; the effects they have on supplier, consumer, substitute product and services, the effects they have over the enterprises that are entering the sector and their effects on the rival enterprises. The effect of information technologies over the suppliers takes place as it quickens the relationships between supplier and buyer, and makes it more efficient. As for the consumers, the information technologies form a functional chain consisting of suppliers, buyers and customers in particular and create in depth effects in customer-enterprise relationships. In its effect over substitute products and services, information technologies, together with the developments in products and services provided by innovations, have changed the substitute ratio between products and services in some sectors. When their effects on the enterprises, which have recently entered the sector, are analyzed, it can be seen that information technologies are forming important investment fields for the enterprises in order to enter the sector and the industry, and the competition continues according to the advancements in this field. This circumstance has caused the information technologies be a precondition before entering some sectors.

3. **Strategic Level:** The information technologies, possessing a strategic importance today, have become an important factor for the enterprises to pursue their existence and develop. Especially, in the strategic level, the information technologies are creating important effects by providing low cost leadership and diversifying products, heading to new markets. In a similar approach, information technologies provide the opportunity for the details of the customers to be accumulated and analyzed which can be advantageous for the enterprises.

The firms getting use of the advantages, the information technologies are providing in sectoral, entrepreneurial, and strategic level

for the enterprises, will have productivity increase, and thus, their costs will reduce, they will have an effective customer portfolio, will enhance their competitiveness, will easily enter new markets with a strong administration. They will provide themselves a lot of strategic advantages and have more effective and productive structures. These are important facts to be considered.

### *3.b. The Effects of Information Technologies on Organizational Structure*

One the important effects of information technologies on enterprises regarding organizational structures is that it results in organizational shrinkage. Together with the decrease in the number of the staff and bureaucratic processes, the structure of the organization also narrows. The communication within the organization and outside the organization become more efficient, thus the effectiveness of the administrator decision increases.<sup>294</sup>

Whether the information technologies will lead to centralization of organizational structure or decentralization is a matter of discussion. According to this, some views are supporting that the coordination of the functions of information technologies within the computer medium are strengthening the centralist inclination, and claiming the information technologies are shifting the decision taking power to upper levels and within this context, even the middle level administrators who are transferring the information to upper level will disappear. On the other hand, some other thoughts are of the opinion that usage of information technologies won't centralize the organizational structure, on the contrary decentralize it. The general belief in this issue is that if a centralist structure is adopted in the usage of information technologies there will be a centralist structure; if decentralism is adopted then there will be a decentralist organizational structure. Today, this opinion is having a lot of support and that usage of information technologies aren't directly determining on the organizational structure, yet the structure that is developed according to the aims of the organization is affecting the usage of information technologies is more accepted.<sup>295</sup>

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<sup>294</sup> Halim Kazan, Himmet Karadal and Mutlu Uygun, 'Bilişim Teknolojilerine Geçiş Sürecinde Küçük ve Orta Ölçekli Sanayi İşletmelerinin Temel Üretim ve Yönetim Sorunları: Aksaray Örneği', [http://www.emu.edu.tr/smeconf/turkcepdf/bildiri\\_43.pdf](http://www.emu.edu.tr/smeconf/turkcepdf/bildiri_43.pdf), 10.04.2007.

<sup>295</sup> Kök, 'Bilişim...', pp. 132-133.

Information technologies rearrange the distribution of employees in the enterprises according to vocational and technical education and consequently in favor of the ones who are more knowledgeable, and the decision making authority and organizational structure is getting shaped according to the situation.<sup>296</sup> Together with the start of the usage of the information technologies in the enterprises some of the workers are replaced with computers. With this application, a new organizational level involving supervision and administration is formed and the need for authority assignments has disappeared. By this way, for the information based organizations, which are operating with the opportunities the information technologies are providing, the need to form a separate organizational level for the supervision function, which is mostly data processing, vanished. Owing to this, the information technologies are decreasing the number of positions in the enterprises and bringing the organizations from hierarchic structures to plain organizational structures. Besides the decrease in the number of administration positions in the enterprises, it will be possible for the works to be done more efficiently and more carefully by the help of information technologies and the enterprises will be institutions that can work more productively.<sup>297</sup>

Eventually, within a small organization structure the bureaucratic oriented delays and lubberliness won't be there thanks to information technologies and at the same time the information workers in the middle level will be replaced with the equipments of information technologies. Thus, the organizational structure will be affected positively and this will increase the productivity of the enterprise.

The usage of information technologies provides remarkable amenities while setting up an innovative administration and a solid organizational structure. After this kind of a organization structure has been set up, the enterprises will employ educated and experienced employees and if they can increase their investments in favor of the innovative technologies they will be able to gain considerable developments. For the firms that can set up such kind of an organizational structure consisting of positive and encouraging elements,

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<sup>296</sup> Ramirez, 'The Influence...', p. 3.

<sup>297</sup> Kk, 'Biliřim...', p. 136.

now the productivity and new technology cycle will emerge and it is only rational that this will bring more innovations and more productivity.<sup>298</sup>

### *3.c. The Effects of Information Technologies on Staff Structure*

Together with technologic developments in the occupation and administrative structure, it creates and contributes to the productivity of the employees and this situation is forming big changes within the employment structures of the enterprises. The increasing productivity of the employees makes it possible to get the same amount of output by using less input. In this process, the employees being more efficient and qualified are one of the most important effects of information technologies over labor factor. As labor factor is used with less cost and more productively, the productivity of the enterprises will increase directly.<sup>299</sup>

In addition to information technologies developing the enterprise employees' vocational skills and talents, and increasing their productivity, another thing that has emerged regarding the ones working in the enterprises is the reduction in the number of the employees working in the enterprises since, due to technologic innovations, computers, internet, data saving tools etc. took place of workers who were working in fields such as data collection, evaluation, transmission and safekeeping. Information technologies are operating better than employees regarding data collection and evaluation. After these technologies had been introduced, the jobs of officers in the middle positions working as information workers, some of the secretaries, some sales and buying representatives, some controllers and supervisors working in the controlling and supervising departments were started to be done by electronic equipments and the labor cost for the enterprises have decreased.<sup>300</sup>

Today, together with the technologic developments and changes as a result of globalization, unification of the firms and new firm organizations, the demand for unqualified man power is gradually diminishing. Today, employees who have improved themselves in the vocational and technical grounds, who have brain power rather than man

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<sup>298</sup> Thomas Hempell, 'What's Spurious, What's Real? Measuring the Productivity Impacts of ICT at the Firm-Level', *Empirical Economics*, (Vol. 30, 2005), p. 430.

<sup>299</sup> Jeremy Greenwood, 'The Third Industrial Revolution: Technology, Productivity and Income Inequality', *Economic Review*, (Federal Reserve Bank of Cleveland, 35-2, Second Quarter 1999), p. 10.

<sup>300</sup> Greenwood, 'The Third...', p. 10.

power, are preferred by the enterprises. Thus, the enterprises that can include these kinds of employees to their organizations, can have high rates of productivity increases and head for the sector leadership.<sup>301</sup>

### *3.d. The Effects of Information Technologies on the Costs of Enterprises*

While setting up and using the information technologies, which are important strategic elements within the information development and evaluation capacities of the enterprises, some kind of expenses rooting from information technologies themselves such as equipment investments, software development expenses, the education and bettering of the employees who are going to use the technologic means and the expenses being made to maintain and support them constitute some amount of money to be spent and thus increase the costs in the beginning. These expenditures are necessary cost elements in order for the attainment, processing and development of information, and make it compatible for activities of the enterprise.<sup>302</sup>

However, the enterprises are focusing on the profit maximization since once the information technologies are set up, they decrease the general costs, increase the sales, increase employee and system productivity and more importantly the operational productivity, strengthen the competitiveness aspect of the firm, they don't pay too much attention to the expenditures mentioned above. And this portrays the main reason lying under the continuously increasing investments being made by the enterprises on information technologies in the globalizing world.<sup>303</sup>

The usage of information technologies can reduce the costs of an enterprise in many ways. For instance, if information technologies are being the substitute for a more expensive production factor it means the costs for the same amount of output will be lower. The development in the processing and transmitting of information technologies will lower the costs and at the same time contribute to the easier adaptation of the enterprises to the changes within the organizational structure. The lessening effect of information technologies over the costs of enterprises

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<sup>301</sup> Yücel, 'Türkiye'de...', p. 95.

<sup>302</sup> Ramirez, 'The Influence...', p. 42.

<sup>303</sup> Aylin Ataay, 'Information Technology Business Value: Effects of IT Usage on Labor Productivity', *Journal of American Academy of Business*, (Vol. 9, No: 2, Cambridge, September 2006), p. 230.

can be analyzed in three aspects; the external coordination costs of the enterprises, the internal coordination costs and operational costs:<sup>304</sup>

1. External Coordination Costs: The effect of information technologies over external coordination costs are lessening. At this point; information technologies provide flexibility of the production processes, axe the hardships rooting from geographical limitations and the costs, enable the safekeeping of the information once it is acquired and be used again when necessary and let the non-expert employees of the enterprise improve their knowledge accumulation and lessen the external coordination costs. At the same time, information technologies let the suppliers and customers communicate at any time and hear about the innovations in the market immediately. Thus, preventing the possible negations that can root from asymmetric information beforehand and let the enterprises structure a more productive cost. This helps the enterprises in decreasing their disadvantages rooting from external grounds to minimum.

2. Internal Coordination Costs: Information technologies provide the information transfer among the hierarchic units within the enterprise, safekeeping of the necessary information and enable it to adapt to the enterprise. At the same time, it lessens the disadvantages rooting from lack of information to minimum when a quick decision has to be made and enables the enterprises to lessen their internal coordination costs. Moreover, an effective controlling and supervising network would reduce the costs to minimum and enable the enterprises work more productively.

3. Operational Costs: The operational costs of an enterprise are the costs that are handled in the production process and the costs faced during the marketing of the products. The greater amount of information technology the enterprises have, the easier the attainment, safekeeping and processing of the information is. This won't bring extra cost to the enterprises if the information is required again within the production process. The costs will be able to be reduced within all the units related to the information and participating in the production process. Together with the enlargement of the information technologies, the network of suppliers and the customers of the enterprises will become broader and the incomes will increase. At the same time, since all the information

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<sup>304</sup> Ramirez, 'The Influence...', pp. 44-48.

transmitted to these extra institutions or individuals will have already been stored and used, there won't be any costs.

The cost lessening effect of information technologies on external and internal coordination costs and operational costs encourage the enterprises get use of these technologies. This also gives rise to the usage of information technologies by the enterprises while they arrange their firm sizes and organizational structuring to get maximum productivity.

Together with the positive affects of the information technologies over the strategies and organizational structures of the enterprises, if the enterprises take rear office applications such as finance and human resources, the supply chain applications such as buying, storage management and forwarding, and the applications intended for sales and marketing such as customer and campaign management, to the electronic medium in parallel with elements that enable the employees be more productive and lessen costs, their productivity will increase.

Thus, the surveys are supporting this opinion and show that the investments that are made for information technologies are increasing the productivity of the enterprises. The studies conducted together with the Euro region indicates that the sectors, which have produced information and communication technologies during the 1990's, are way ahead of all the other sectors both in the output and productivity level and this also supports the case. At the same time, the increase of productivity within the enterprises that produce information technologies spread to the enterprises that started using these technologies in time and this led to total factor productivity increase of information technologies regarding all the economies.<sup>305</sup>

Another point concerning the productivity of the information technologies is that the big scale companies are investing on information technologies more than the small scale ones. As a matter of fact, in a survey carried out between the years 1992-1997 in Los Angeles, it is pointed out that the firms that were having the most productivity increase (%66) were the biggest scaled ones while between the same years the small and middle scaled enterprises had a smaller productivity rate of %32. The fact that the big firms invested on the information technologies the most and cared for them displays that one of the main reasons of

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<sup>305</sup> Focco Vijselaar and Ronald Albers, 'New Technologies and Productivity Growth in the Euro Area', *Empirical Economics*, (Vol. 29, 2004), p. 632.



productivity increase is the investments made on information technologies.<sup>306</sup>

It is an important point to be stressed out that the enterprises that will have the most productivity within information technologies will be the ones that are able to internalize new technologies within themselves better than the others and that are having complementary factors such as having educated and experienced employees, innovative administration mentality and a solid organizational structure.<sup>307</sup> But at this point it should also be mentioned that information technologies alone won't be enough to increase productivity. According to this, if information technologies are applied as a part of the whole in order to increase the performance of the enterprise and could be united with elements such as highly educated man power, right and efficient administration, they are one of the means that can play the lead in increasing the productivity of the enterprises.<sup>308</sup>

### CONCLUSION

The ever increasing importance of the information within the economic and social life results in the enterprises' gradually increasing investments on information technologies and the reconstruction of organizations with the support of technology. Today, the enterprises attach more importance to information technology based innovations such as information, patent, brain power, copyright etc. This provides enterprises a lot of advantages such as reducing the costs, which is the main one, transforming the organizational structures into more efficient ones and axing risk elements and asymmetric information during decision making process. The best part of all these advantages for the enterprises is that they provide remarkable increases in the productivity.

In this globalizing economy, for the firms to exist and continue profiting, there has to be continuous growth and increase in competitiveness. With the importance given to the productivity factor, which is the key to obtaining this power, the enterprises inclined to invest more on information technology starting in 1990's in particular. The increasing expenses of information technologies and their usage provided the

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<sup>306</sup> Ken Dozier and David Chang, 'The Effect of Company Size on the Productivity Impact of Information Technology Investments', *Journal of Information Technology Theory and Application*, (Vol. 8, No: 1, 2006), p. 44.

<sup>307</sup> Hempell, 'What's...', p. 430.

<sup>308</sup> Greenwood, 'The Third...', p. 6.

production and support process be more efficient and productive ranging from supplying the inputs for the production to customer technical services support. Thus, the positive effects of usage of information technologies on enterprise productivity are accepted by all the enterprises and have become an important activity that has been put into practice. But we should also mention that for the information technologies be able to provide productivity increase, together with information technologies, highly educated and experienced man power, and an efficient administration should be applied.