LEARNING OBJECTIVES
Once you have mastered the materials in this chapter, you will be able to:

• explain the developments regarding technology,
• identify different types of innovation,
• understand the importance of technology in innovation,
• identify the new technologies in business organizations,
• discuss how technology impacts on innovation.

CHAPTER OUTLINE
This chapter reveals how the recent rapid transformations in technology affect the business world and businesses in a conceptual framework. In this context, primarily the effects of technological developments on organizational structure, business models and the business process were addressed, and subsequently, the most commonly employed technological instruments in the business world and their major benefits were defined. In the subsequent chapters of the study, the effect of technology on innovation was investigated and discussed on the basis of empirical studies.

KEYWORDS
Technology, innovation, organizational structure, business process, business model.
1 INTRODUCTION
Recently, particularly in highly competitive sectors, it has been emphasized that the innovation capacity of companies has become important for success. For this reason companies put the issue of innovation on their agendas and focus on the preservation and development of their positions in the market by creating innovation. Today, innovation has been added to the managers’ agenda even in traditional goods and service sectors where changes to products are minimal. There are many studies defining and explaining innovation; these studies also point out several different internal and external elements that played a role in the emergence of innovation in business. This conceptual paper aims to investigate the effects of technology use on innovation processes in the light of the recent literature. In this context, we first attempt to redefine the understanding of business and applications. In the following section, new technologies in the most recognized manner are presented as four different categories. Finally, the effects on innovation of these technologies, which are widely used in business, are discussed.

2 TECHNOLOGY AND THE NEW BUSINESS STRUCTURE
Nowadays, developments in information technologies in business life have gained considerable pace. Technically, digital technologies have developed incredibly in the last 30 years (De Kare-Silver 2011). It is well known that these changes and transformations heavily influence the technologies that are applied in the business world, business organizations, the employees of these businesses and their customers, and the processes between all of these.

Technologies that appear over time rapidly change enterprises’ structures, processes, customers, suppliers, interaction and networks. The development of mass production and the use of main frame computers lasted for about twenty years whereas mobile devices began to be used widely after seven years of development and social media after three years (De Kare-Silver 2011). Today, most technologies are available for users less than a year after their development.

When the general status of entrepreneurism is considered, this recent technological transformation can be analyzed through a few basic focus points. In the first stage, it is observed that this transformation
makes an impact on business models. With this transformation, several new business models and organizational structures have emerged. The relations between businesses have become more elaborate. Secondly, it should be emphasized that this transformation shapes business processes considerably. For example, it is clear that the occurrence of this technological transformation covers a wide scope ranging from communication methods of the business with its employees and customers to traditional administrative practices and from sales channels to public relations activities. In the following study, three basic areas that experienced changes due to the penetration of technologies in business life are examined under the following titles: the impact of technology on organizational structure, business models and business processes.

2.1 Impact of Technology on Organizational Structure

The most apparent effect of technology use in business occurs on the organizational structure. Technology affects both ways of doing business and ways of coordination of these businesses. These technologies allow organizations to have fewer mistakes, easier control, and less problematic production. They also help managers to make better decisions and to establish control through various information systems and provide faster access to the information needed. Nowadays, in order to make organizations effective, managers are required to manage information, promote information technologies for employees and transform their companies into learning organizations.

In addition, information technologies in organizations influence the scope of business, the functions of employees and their required properties. Technological developments have caused a change in the labor force. An educated and specialized profile has come into prominence. From this point of view, the number of information workers has increased. Traditional working skills have been replaced by new skills that are based on dynamism and flexibility. In such an environment, with the support of technology, new organizational structures emerged (Scarborough and Corbett 2013). For example, today many businesses spend their capital on creating virtual organizations or an online portfolio by using new technological tools. The organizations, which operate with the mentality of inexpensive but higher quality...
service, benefit from information technologies and form virtual organizations (Holtshouse 2013). Furthermore, consideration of information technologies together with a flexible working environment has brought flexible working concepts such as teleworking, which is a new way of working and living today. These concepts are expressed in different ways, such as employment at home or mobile work; they provide opportunities for employees such as part-time work, working on networks, division of labor and mobile working (Coenen and Kok 2014). It is estimated that flexible working, together with digitalized working processes, will remain popular in time to come. In summary, due to novelties in information technologies, the classical organizational model has been replaced by a virtual organizational model, which operates 24/7 and provides goods and services to customers who are independent from a physical site. This model has brought several novelties in product and service marketing, sales and customer relations.

2.2 Impact of Technology on Business Models
Another area in which technological developments have had significant effect is the business models that are employed by business. The rapid spread of the internet has made electronic commerce a new and very effective tool in the execution of commercial activities. Businesses change their organizations and working styles in order to adapt to this type of commerce. They abolish barriers between company-customer-supplier through e-commerce and m-commerce. Together with this changing style of consumer, sellers have the opportunity to sell their products and services to the whole world, and buyers are able to select the presented products and services easily (Barnes and Hunt 2013). E-commerce activities on open networks have increased electronic communication; this situation has enabled businesses to reach all customers and other businesses in a more inexpensive and easier way. Many businesses have become able to market their products through this method without establishing a marketing network. With these structures, which bring superiority in competition and an increase in service quality, sellers have become closer to their customers and gained a competitive advantage over their competitors. Due to technological developments, E-commerce enables a decrease in costs of production, and marketing and distribution activities and this has provided a
competitive advantage to enterprises on national and international levels and increased competition. Thanks to these structures, companies can establish customer needs in a detailed and fast way and they are now able to present special services at more economical prices (Onetti et al. 2012). Due to the rapid change of technology, today companies are able to deliver goods and services to customers through m/e-commerce and without recourse. For this reason, cost and time have become advantageous for both seller and buyer. The time period between order and delivery of products is kept to the minimum, time-oriented costs and inventory costs are reduced and intermediaries are not used. As transactions in the electronic environment cost much less than normal transactions, both seller and buyer are able to save considerable amounts of money. Documents that are needed for electronic commerce are prepared in the electronic environment and this information and the documents are made available to whom they may concern. Thus, these transactions are done with minimum errors in a rapid way and without red tape costs. E-commerce has changed the relative importance of time, the significance of geographical proximity to the market has been challenged and efficiency on behalf of the enterprises increases through web-based marketing (Zhang and Wang 2015).

In discussing the impacts of technology on business models, it is important to separately analyze another technological tool called the internet, which has left its mark on the last quarter-century. Web-based technologies, which are popular ways of doing business online, bring buyer and seller into the same digital environment and provide entrepreneurial opportunities. It is also observed that the perception of digitalization was brought into question rapidly by industrial companies. Due to the web applications that are formed through user friendly interfaces, companies can present designing options to customers about desired goods and services. They can obtain feedback from customers about these goods and services and they can sell them on the same platforms. In addition, the increase of sales of goods and services on social media encourages companies to use these tools and to invest in these channels.
2.3 Impact of Technology on Business Processes

When the effects of technology on business processes are considered, it is important to emphasize that technology has particularly changed communication types. This change can be analyzed in a broad perspective ranging from communication between employees within the business to the types and tools of communication with customers. This platform, which includes the coexistence of different communication types, that is to say unified communications, helps to differentiate user habits and business processes of the employees, makes rapid communication possible in daily life environments and influences ways of doing business. These structures are particularly compatible with mobile working environments. They provide ways of doing business that are independent of time and place. Due to the unified communications technologies, managers can easily administer staff that work in different places and supervise their performance by using unified infrastructures. Today’s working and living spaces have changed due to the concept of mobility. Smart phones and tablets play an important role in this situation. As the skills of unified communication systems develop, their effectiveness in business life also increases. These technologies are preferred by more and more business especially for reporting. It is observed that the employees who use these devices during business processes are happier and have better motivation. These devices also provide efficiency and savings for business. In terms of employees, technological changes caused the digitalization of many business processes in both the public and private sectors. These changes provide more flexible and mobile working conditions and influence employees who can log in to the system in any environment. Moreover, most of the processes and services are transferred to the electronic environment so that customers can benefit from these services in an easy and quick way (Davenport 2013). Internet provides the infrastructure for the data sharing and cooperation of employees. Companies can gather employees in different geographical locations through tools such as newsgroups and chat rooms, establish working groups and operate transactions through virtual platforms. In terms of customer relations, companies make use of audio and visual elements in an interactive way and can sell their products to customers in virtual shops.
Another support mechanism that is provided by technology to businesses is information management. Offline data storage systems, which are used widely nowadays, are inefficient to store, process and archive high volume data; therefore they channel big data phenomena to cloud computing. Big data analytics, social media analysis and data mining applications that are presented on cloud computing make companies more efficient. They introduce a totally new understanding in order to reduce storage costs, facilitate business processes and maximize profits. Thanks to these structures, businesses are able to produce more beneficial and useful information from current data and market this information to other companies. Cloud computing eliminates operating costs such as renovation of hardware, maintenance, software update storage caused by servers and data storage systems that are established within the companies. In the big data age, it also contributes to new age working solutions with its right perspective towards data storage and processing. With digitalization, information is stored in the electronic environment. Therefore, managers and employees can have direct access to information anywhere and anytime they need.

3  THE NEW TECHNOLOGIES IN BUSINESS ORGANIZATIONS

3.1  IT and Business: The Journey of Technology

Although the tech wave has existed for a long time, it has recently gained considerable pace. The last decade witnessed noteworthy developments in digital technologies. Web 2.0 began to be used widely in 2004 and this initiated a new period in content generation for the World Wide Web. The rise of Facebook, Twitter, Wikipedia and other user-generated content tools has really created a new version of the web. In addition, new generation computing devices, particularly iPhone and iPad, which were released by Apple respectively in 2007 and 2010, have pioneered the age of the smart phone and tablets. They were also important steps and expectation-leading devices for mobile computing. The most important outcome of this fascinating development in technology is the radical change in the lives of individuals and the ways that businesses conduct business (Westerman et al. 2014).

Nowadays, technology and its use are very important for business. Although globalization and off-shoring are key factors in determination of the strategies of business, technology precedes these factors.
Digitalization has abolished limits on many spheres of life. It is creating new possibilities influencing individuals’ lives and business. Businesses, which desire to know about their customers independently from surveys or focus groups, use social networks whereas businesses that desire employees to be independent from time and place and efficient use mobile computing. Big data considerably facilitates business to make better decisions. Businesses, which aim to achieve new organizational structures and business processes, to present new offers to their customers and to renew these processes as conditions change, can easily accomplish these processes with the help of technology (Westerman et al. 2014). In the following section we list and attempt to explain the most important and recognized technologies that have led to the transformation of business.

3.2 Cloud Computing

Cloud computing is commonly used new technology in the business world. Cloud computing is a global technology including an alternative path that can be used by any sort of business to possess an information system. Although there are several definitions for cloud computing, the most accepted was made by the National Institute of Standards and Technology (NIST):

“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.” NIST, U.S. Department of Commerce, http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800–145.pdf

In today’s competitive world, businesses are well aware of the fact that they need a reliable computing system in order to achieve their goals. Particularly for small and medium sized businesses, having a functional computing system means time and cost. Since cloud computing has become an applicable option, many business decided to use this service (Srinivasan 2014). Cloud computing was developed from a traditional outsourcing model. In this model, the service that is necessary for business is developed by a specialized company. Small and medium
sized businesses usually prefer to make a deal with a specialist for the management of information systems instead of outsourcing. The basic point that makes cloud computing attractive for business is the fact that a system, which is selected for a fully functional computing system, can be owned in a few hours or in a few days, depending on its complexity level. The cloud computing platform provides all possible options ranging from the necessary type of hardware to service type and from applications to storage quantity. Customers can access the system via the internet. Customers who want to perform their communications on a higher protection level with cloud can use Virtual Private Network (VPN) that is provided by an Internet Service Provider (ISP). Access to cloud is proportional to ISP connection speed (Hurwitz et al. 2012). Another important benefit provided by cloud services to business is to increase or decrease computing resource use. At the same time, business pay-per-use can reach a wide variety of applications without a license. The most important contribution of all these opportunities to business is that they do not have to manage the service that is needed. Therefore, source and time use of the business is reduced considerably. Customers can choose among cloud service providers. Outsourced and mostly niche service clouds such as payroll processing, human resource management and customer relations management (CRM) can be used as services. Cloud computing service has several service types and deployment models.

The most common service types are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). The most common service deployment models are Public cloud, Private cloud, Hybrid cloud and Community cloud. The major cloud service providers are Amazon Web Services (AWS), Microsoft Office 365 and Windows Azure, Google Apps, Rackspace and Salesforce. AWS is the largest cloud service provider worldwide. It provides office software such as Office 365, Word, Excel, PowerPoint and Outlook. It enables access to storage and database services like Azure Skydrive and includes several niche services such as Google Apps Gmail, Google Docs and Google Drive. It has basic cloud services including Rackspace web hosting. SalesForce is a world leader in cloud-based CRM software (Srinivasan 2014).
Figure 1 shows cloud service models that are defined by NIST. The first model layer is Software as a Service (SaaS) when going upwards to the physical layer. SaaS provides both server hardware and software to businesses that are freed from the complexity of IT system management. SaaS represents all software-based services that can be accessed on the internet and employed outside of the institution. The simplest example for SaaS can be an e-mail service for a business. Google’s Gmail is one of the popular cloud computing applications. A business can adopt Gmail without considering maintenance, security, uptime and infrastructure management (Hill et al. 2013). The end user receives e-mail service but does not think about how it is provided. In addition, these services enable employees to access private files and folders and also institutional computer applications on the internet. Private database applications, archive and backup solutions, online messaging and meeting applications are among the services that can be used in this category. Thanks to this service, applications can be reached by any device that is connected to the internet. Applications can be used both for personal and institutional use. Maintenance, updates and high-availability of the application are done by SaaS constantly. Instead of the institution’s data center, applications in the data center help to build a faster and more secure structure. Today, large commercial SaaS providers are Amazon, Google, Microsoft and Salesforce.

Platform as a Service (PaaS) is located just under SaaS. PaaS gives more freedom to the subscriber in selecting the desired computing
platform. It provides the necessary platform to persons and institutions to develop some applications. For example, it provides convenient hardware, software and various components that are needed by a software developer in order to develop certain software. Unlike the SaaS user, the PaaS user should have sufficient numbers of computer specialists in order to manage the platform of which he is a member. Similar to SaaS, PaaS is also compatible with pay-as-you-go models. PaaS provides server capacity to customers to operate applications and a platform such as the Windows operating system. Users have to take care of the security of the platform that they use. For instance, if a user works with SQL Server database on his platform, he should be aware of security gaps of the database systems. In addition, customers should know about applications that are used on the platform. Another benefit that PaaS brings to users is that when there is a need for change of hardware for the applications on a platform or a Linux/UNIX platform is needed, PaaS can complete a task in a few days instead of new systems information, which can last a few weeks. Google App Engine, Salesforce.com and Windows Azure are examples of PaaS providers.

Infrastructure as a Service (IaaS) is known as a service referring to all hardware, network equipment and storage units that are needed by an institution. It provides the same properties as PaaS to customers but they are totally responsible for leased infrastructure control. IaaS is also known as “utility computing” as they do not directly invest computer resources that they need but use resources. The service provided here consists of the hardware and related services (data centers, physical hardware, networking equipment and firewalls etc.). IaaS is the most expensive of these three models and is used by large scale business. The most significant advantage that this platform provides to businesses is that they do not need to make hardware investment. Moreover, other important gains are flexibility and pay-per-use systems. At the same time, businesses are not obliged to make constant investments. IaaS’s simplification of management and dynamic activities makes it more important (Rimal et al. 2011). Amazon, Rackspace, Xerox and IBM are examples of IaaS providers. The size of the business is directly correlated with which of these three cloud services meet customer needs on different hardware and software levels. There are deployment models that are associated with service types. These models can be
classified as Public Cloud, Private Cloud, Hybrid Cloud and Community Cloud. Public cloud is the most popular and it constitutes the basic cloud computing structure. A public cloud, as its name dictates, can be reached by the general public. It is the sharing of all services on the internet between multiple institutions, associations and individuals. Small and medium sized businesses generally use this model. In general, large scale businesses do not want to carry their own critical structures and applications on the public cloud due to security concerns (Li 2011).

Private cloud provides customers with a higher level of control but it is a more expensive service than public cloud. Therefore, it is used only by large businesses. Community cloud meets the private needs of business in certain sectors such as automotive, energy, financial sectors and health care. Community cloud is a closed system and only member organizations can use it. Hybrid cloud is a composition of two or more different cloud infrastructures (private, community or public) (NIST, 2011).

Table 1 summarizes the benefits of cloud use to enterprises of different sizes. Businesses of different sizes make use of the advantages of cloud service in different ways. Small and medium sized businesses can reach costly computing services through cloud. Cloud service providers operate on the basis of the pay-per-use principle. Large corporations such as Microsoft and Adobe have begun to present their products on cloud without complicated license processes. All Microsoft Office’s 365 Office Suite applications can be used on the internet. Similarly, Adobe’s PDF and PhotoShop products can be accessed via cloud. At the same time, cloud users can easily communicate with other users and share their work. Without cloud infrastructure, access to this type of service is costly for users and they cannot easily share their work with other users.
Table 1  Summary of business benefits for use of cloud computing

<table>
<thead>
<tr>
<th>Business Benefit</th>
<th>Small business</th>
<th>Medium sized business</th>
<th>Large business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service availability</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Service reliability</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Meeting demand elasticity</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Ability to pay-as-you-go</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Service automation</td>
<td>–</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Email support</td>
<td>√</td>
<td>√</td>
<td>–</td>
</tr>
<tr>
<td>Database support</td>
<td>√</td>
<td>√</td>
<td>–</td>
</tr>
<tr>
<td>Customer relations management support</td>
<td>–</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Access control support</td>
<td>–</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td>Security</td>
<td>–</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Business continuity</td>
<td>–</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Data storage</td>
<td>–</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Data backup and recovery</td>
<td>–</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td>Meeting regulatory compliance</td>
<td>–</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td>Meeting industry compliance</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>


In addition, the issue of storage, caused by data increase, is an important problem for businesses. At the same time, storage causes information security problems for businesses. Cloud storage presents very effective
solutions for this situation. Cloud services support business continuity with their capacity to store data in different locations and to provide access from different locations (Srinivasan 2014).

3.3 Web 2.0 and Social Networks

Other new technologies employed in the business world are Web 2.0 and social networks. Web 2.0 was developed after the web 1.0 period in which users could only see internet sites but could not change content. In Web 2.0 users can intervene in content in different ways. Another concept that is accompanied by Web 2.0 is social media. Although these two concepts are used with similar meanings, they are different. Social media include activities of individuals in a society who get together online, use conversational media and share information and opinions. Conversational media are the web-based applications that are used to deliver content in word, image, video or audio format. Web 2.0 might be perceived as a new version of the World Wide Web. However, it not. When we explain this situation with an analogy, in which the World Wide Web is like a highway, Web 2.0 refers not only to upgrading the highway to four lanes but also to developing different alternatives of vehicles to travel on it (Kaplan and Haenlein 2010; Safko and Brake 2009).

Social networks (Facebook, LinkedIn, Google+ etc.), which appeared in 1997 with SixDegrees, have become very popular internet platforms. Initially these networks were designed for personal use but later they have become targets for businesses that aim to promote their products and brands. Nowadays, businesses that desire to increase communication and interaction with customers have carried their activities online and gradually increased their use of social networks. Social networks offer new opportunities to businesses and enable them to establish closer relations with their customers.

Businesses can investigate trends and approvals of users about a product on social networks for product development and market research. They can launch social media campaigns for marketing and sales activities and through them they can establish private advertisements. In addition, they provide online support by designing social network pages for customer services and after sales support. Social networks at the same time play a role in human resources departments, in hiring
people for businesses. Businesses look at applicants’ histories on social networks and search engines and reach more detailed information about them. Table 2 shows business areas where social networks are used.

Table 2  Business areas of application of online social networks

<table>
<thead>
<tr>
<th>Business Area</th>
<th>Selected Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and development</td>
<td>Product development</td>
</tr>
<tr>
<td></td>
<td>Market research</td>
</tr>
<tr>
<td>Marketing and sales</td>
<td>Marketing campaigns</td>
</tr>
<tr>
<td></td>
<td>Word-of-mouth marketing</td>
</tr>
<tr>
<td></td>
<td>Targeted advertising</td>
</tr>
<tr>
<td></td>
<td>Social CRM</td>
</tr>
<tr>
<td>Customer service</td>
<td>Customer support</td>
</tr>
<tr>
<td></td>
<td>After sales support</td>
</tr>
<tr>
<td>Human resources</td>
<td>Recruiting</td>
</tr>
<tr>
<td></td>
<td>Employer branding</td>
</tr>
<tr>
<td>Internal applications</td>
<td>Expert search</td>
</tr>
<tr>
<td></td>
<td>Collaboration in virtual teams</td>
</tr>
<tr>
<td></td>
<td>Knowledge management</td>
</tr>
</tbody>
</table>


Businesses can include social network users in the research and development process. For example, users on “open source spaces” can develop software, share information and gather together to discuss their innovative ideas. Including their customers as innovators in the product development process will help businesses to make important predictions concerning customer needs. There are many businesses that employ social networks in product development. An automotive company, Fiat, included more than 170,000 customers in the product development process on social media for the design of the Fiat 500 model and acquired this design free of charge. Similarly, the Lego Company shaped its new
Lego design according to the comments of its customers. The volume of accessible data on newsfeeds and groups brings many benefits to market research. Another area that can be used by businesses is marketing and sales. Social networks might be used as an effective and active marketing channel in various business activities such as conducting marketing, word-of-mouth marketing or targeted advertising. Here, the main idea is to make thousands of people know about products and services of a company due to people’s conversations with their friends. Studies emphasize that the performance of a business increases when the social structure of a social network on Viral Marketing Campaigns is taken into consideration. Current literature shows that people trust user comments more than advertisements (Bampo et al. 2008; Ermecke et al. 2009; Heidemann et al. 2012). Nevertheless, social networks cause considerable advantages as traditional advertising is in decline. Another field in which social networks developed is social Customer Relationship Management (CRM). This “social” concept attached to CRM brings important contributions in generating business values and analyzing future job opportunities. Every day more and more companies begin to use social networks as new channels of sales. Businesses include promising fields in social network applications to create a value chain. In generation innovation, providing social support, enhancing knowledge and increasing sales through marketing campaigns, social network use is beneficial in many perspectives. Huge amounts of data, the rapid spread of information on social networks and effective use of social networks will reduce costs and increase profits (Bonchi et al. 2011).

On the other hand, the use of social networks in the business context is accompanied by several difficulties and risks. Businesses, marketing agencies or media giants generally believe that the use of social networks as a new channel is enough to solve their problems. However, businesses should firstly deeply analyze social networks and their purposes. In order to create business value, they should determine what kind of business functions social networks require (Clemons 2009). Another difficulty that businesses can face on social networks is their loss of control over social network content. In fact, social networks are open to risks. Loss of control of social network content might cause unintended consequences. However, businesses should be aware of all these risks; they should consider the status of the business, its sources, culture and
know-how and develop an outcome-oriented strategy to minimize risks. This will bring success for businesses.

3.4 Web 3.0

Web 3.0 is also called the semantic web. Google’s CEO Eric Schmidt defines it as “applications which are pieced together - relatively small, the data are in the cloud and it can be run on any device (pc or mobile), very fast, very customizable and distributed virally (social network, email, etc.).” Yahoo founder Jerry Yang defined web 3.0 with these words:

“.. you don’t have to be a computer scientist to create a program. We are seeing that manifest in Web 2.0 and 3.0 will be a great extension of that, a true communal medium ... the distinction between professional, semi-professional and consumers will get blurred, creating a network effect of business and applications”.

Web 3.0 has become very popular in the last few years due to its development of applications and services. Nowadays, search engines can find more accurate and target-oriented information, and users can establish better contacts with friends through social media applications. Due to the increasing capacity of saving and storing knowledge, it became more useful and preferable for web users. Social web, semantic web, web 3D and media-centric web can be considered as some key elements of Web 3.0.

Recently, social networks have become media where like-minded people and community groups share their ideas through Web 3.0 instead of giving links to documents. Social web is considered an effective and attractive way to communicate with people anywhere on the globe. Semantic web is an evolving and extensive version of Web 3.0; it enables people to find information at a much deeper level in the meaning of the terms that are searched and the context that is used. Machines, just like human beings, can read and understand such structured information without any uncertainty. Web 3D provides an avatar in a virtual world and paves the way for meeting people and participating in individual and/or group activities just like in the real world. Applications such as Second Life and Red Light, which have become very popular in the last few years, are examples of Web 3D. According to the media-centric web approach, in the near future search engines can use elements like audio,
video and images as input. For example, it will be enough to upload a car image to the search engine in order to do a search on cars. Search engines can find similar cars in accordance with the properties of images.

Table 3  Comparison among the Webs

<table>
<thead>
<tr>
<th>Web 1.0</th>
<th>Web 2.0</th>
<th>Web 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read-only</td>
<td>Read-write</td>
<td>Read-write intelligent</td>
</tr>
<tr>
<td>Static web</td>
<td>interactive web</td>
<td>web</td>
</tr>
<tr>
<td>Company-oriented</td>
<td>Community-oriented</td>
<td>Individually oriented</td>
</tr>
<tr>
<td>Low-portability</td>
<td>Medium portability</td>
<td>High portability (mobile</td>
</tr>
<tr>
<td>(computing equipment)</td>
<td>(mobile)</td>
<td>and consumer electronics</td>
</tr>
<tr>
<td>Professionally</td>
<td>User-developed</td>
<td>User-developed smart</td>
</tr>
<tr>
<td>developed stand-alone</td>
<td>open applications</td>
<td>applications</td>
</tr>
<tr>
<td>applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syntax-aware</td>
<td>Syntax-aware</td>
<td>Content (semantic)-aware</td>
</tr>
<tr>
<td>basic browsing and search</td>
<td>advanced browsing</td>
<td>and context-aware next-</td>
</tr>
<tr>
<td>capabilities</td>
<td>and search capabilities</td>
<td>generation browsing and</td>
</tr>
<tr>
<td>Low data richness</td>
<td>Medium data richness</td>
<td>search capabilities</td>
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<tr>
<td>(HTML)</td>
<td>(XML)</td>
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<tr>
<td>Point-to-point/hub &amp; spoke</td>
<td>Service-oriented</td>
<td>Web oriented</td>
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<td>architecture</td>
<td>architecture (SOA)</td>
<td>architecture (WOA)</td>
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<td>Sliced data</td>
<td>Light interlinked</td>
<td>and internet of things</td>
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<td></td>
<td>Worldwide database</td>
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Another benefit that Web 3.0 presents to businesses is about decision making processes. Decision making is one of the most important difficulties during management. The amount and quality of existing
information play important roles in decisions that are made at operational, tactical and strategic levels by managers in order to reduce risks. For managers the web has been relatively important as a source of information for years. After the novelties that were brought by Web 1.0 and 2.0, the accessible amount of information has increased, and managers have found it difficult to structure and filter information. With Web 3.0, the paradigm has change from read-only to read-write and current information can be adapted to specific user needs (Naik and Shivalingaiah 2008). In terms of business perspective, Web 3.0 is a significant opportunity to establish new working areas in addition to developing them. Web 3.0 presents a more personified web experience and makes time management more effective. On the other hand, Web 3.0 presents opportunities to businesses to rethink business processes and strategies. It provides important advantages in increasing operational effectiveness and reducing costs.

3.5 Big Data and The Internet of Things

In today’s business world, businesses are exposed to a bombardment of data that have different structures and formats and are fed by different sources. Big data is not a new concept; it is a target that changes according to technological development. With cloud based solutions, data storage costs are reduced and the use of commercial databases is encouraged. Through the NoSQL database and new and active database designs such as Hadoop, which allow sharing work load with many servers while dealing with high volume data, big data sets have become real. By 2012, every day there was 2.5 Exabyte data production and this amount doubles every 40 months. These big and complicated data sets have caused the concept of big data to emerge. Due to uncontrollable growth and diversification of big data, businesses use several techniques and technologies in order to collect, analyze and visualize big data. Analysis techniques include A/B analysis, data mining, sentiment analysis, machine learning, space analysis, simulation, and time series analyses. The following technologies are used: Big Table, Cassandra, Google File System, Hadoop, Apache Hbase, MapReduce, MongoDB and Oracle NoSQL DB. In addition, techniques such as Alterian, TweetReach, NM Incite, Social Mention, SocMetrics and Attensity are used (Altunışık 2015).
The internet is not the only source for big data. Today, data production does not occur via internet use but through sensors, computers and automatized devices in businesses. In addition to interaction between machines and devices, social platforms have considerable impact on the globe. Big data is an expression demonstrating the change of data capture, acquisition and storage. In fact, each individual produces important amounts of digital data every day. E-mail correspondence, surfing on websites, use of online tools, use of social media, online payments, games and many similar activities are recorded digitally and stored in the cloud environment. Due to increasing competition in the business world and customer expectations, businesses prefer to collect more data more frequently. Moreover, the increase in multimedia content also influenced big data to emerge.

Another important factor for development of big data is the phenomenon of relationships between machines without human interaction, called “the internet of things”. With rapidly developing technology, particularly since 2010, new generation computer technologies emerged with concepts such as Smart Systems, Smart Things, Smart Environment, Machine-to-Machine (M2M), Internet of Things, Web of Things, Internet of EveryThing, Web of EveryThing and Pervasive-Ubiquitous computing. Machine-to-Machine (M2M) systems are embedded systems that establish cabled or wireless communication through the internet. Internet of Things uses RFID (Radio Frequency IDentification) technology and communicates with other systems on the internet. It is an embedded system that works with a battery and consumes less energy. Here, things can be any sensor on any physical device. In the Internet of Things, there are machines, things, media, infrastructures and smart machines that communicate and interact. Physical devices and things that make smart decisions interrelatedly on the web are called the Internet of Things. In the Internet of Things, only the interaction of things, devices and machines is present whereas the Internet of EveryThing additionally includes connections between humans and humans and machines. For example, when data acquired from a sensor on a medical device is delivered to a specialist in real time, he immediately takes the action that is necessary for the cure. On the other hand, in the Web of Things, different from the Internet of Things, things communicate by using WEB standards. In the Web of EveryThing,
things, machines and humans communicate with each other with WEB standards. Ubiquitous Computing/Pervasive Computing is a computer concept indicating that a computer can be everywhere and anywhere (Çamurcu et al. 2014).

Businesses have become aware that new data collection and analysis techniques provide opportunities to increase efficiency, rehabilitate decision making processes and gain competitive advantage. The effects of big data are not limited by economic dimensions. Businesses obtain significant advantages through real time information that is provided by big data. For example, big data, which is multidimensional and received in real time, will facilitate smarter management of daily life, traffic jams in cities, interactions between social networks, energy management, e-government applications, data transfer and financial transactions (Altunışık 2015). This situation not only makes businesses more efficient but also positively affects processes within businesses such as decision making, management, innovation and creativity.

4 INNOVATION: THE NEW CHALLENGE FOR BUSINESS

First of all, we need to define the concept of innovation, while discussing the impacts of technology on innovation, which is this article’s topic. A widely recognized description of the concept, on which this study is based, is OECD-Eurostat’s (2005) definition of innovation. Accordingly, innovation is “the implementation of a new or significantly improved product (good or service) or process, a new marketing method or realization of a new organizational method”. Innovation is considered as situations of transfiguration of an unknown or existing product, new production process, new market creation or the finding of a new source concerning raw or semi-manufactured products (Schumpeter 1989). It is sometimes confused with the concept of technology; most of the time innovation is understood as technology. In another definition, innovation is the transformation of an idea to an economically beneficial, marketable, commercial good with the help of science and technology. Therefore, it is not a novelty but a process from a new idea to a new product. World famous management scientist Peter Drucker defines innovation as “a change that creates a new dimension of performance”. Another recognized definition in the literature came from Westland, who defines innovation as togetherness of invention and commercial
achievement (Westland 2008). Another scientist, Trott (2005), defines innovation as "the solution producing process of individual and societal problems by creative individuals, competitive and progressive companies with scientific and technological approaches". The OECD and European Commission joint publication, the Oslo Manual, classifies innovation under four types.

*Product innovation* is the release of a new or considerably developed/improved (in terms of intended use) good or service to market. This includes significant developments/improvements in technical properties, parts and materials, firmware, ease of use and other functional properties. Particularly the products that are produced in parallel with the rapid development of technology have experienced a fast transformation. Production of innovative products used to take a long time but recently this duration has been shortened.

*Process innovation* is the implementation of new or considerably developed/improved distribution or production methods. This includes considerable changes in techniques, equipment and/or software. Again, process innovation, where business processes have experienced transformation due to technological developments, has gained a different format. The change in ways of doing business has reflected on business processes and technology-intensive processes have gradually increased. Integrated communication technologies, transformations in production lines, and cloud computing technologies have brought different perspectives on mobility process flows and processing.

*Marketing innovation* is the implementation of a new marketing method, which includes considerable changes in product design or packaging, product placement, product promotion or pricing. Especially the rise of digital marketing has brought important transformations in this area. The constant increase of virtual shopping and the access of the masses to products and goods online brought different perspectives and focus to the issue.

*Organizational innovation* is the implementation of a new organizational method in a company’s business practices, workplace organization or external affairs. Organizational innovation is also considerably affected by transformations in technology. Particularly, rapid inclusion of smart systems, specialist systems and learning
organizations into the process has brought a transformation with regard to organizational innovation.

As definitions indicate, innovation for companies necessitates an assessment of a new invention that comes into being in a theoretical framework and in terms of commercial success. From Trott's (2008) perspective, innovation is an economic process, causing significant increases of objective functions of units such as individuals, companies, states and societies. Innovation is defined as a process of new and significant economic asset creation that increases the welfare and gains of these units and outputs of this process. As a result, innovation in a broad sense can be defined as a new and important economic asset creation process/outcome, which significantly contributes to human welfare.

Today, the most important contribution to these processes is associated with developments in science and technology. Rapid transformation and development of technology makes new products and services possible through new technologies and allows new entrepreneurs who convert these technologies into commercial values. Despite different approaches to define innovation, there is a common view about its importance. The most important factor in a country’s economic development and competitive power is technology. Technological innovation is a mechanism that is used for increasing social welfare and life quality. It is necessary to make economic growth sustainable. The success and competitive power on an international level of developed countries and their nations’ welfare and prosperity depend on their capacity to develop new products and processes and to create constant innovation in order to increase efficiency. Innovation is a tool in the transformation of a society’s resources into products and services and the marketing of them. For this reason, innovation is not only an economic system but also makes technology a social system, which is used on behalf of humans to generate employment and to contribute to environmental protection (Turanlı and Sarıdoğan 2010).

Schumpeter (1939) was one of the first economists to emphasize the importance of new products to keep economic developments in motion and to demonstrate that acceleration of economic growth is a product of technological progress. Schumpeter claims that the competition created by new products is more important than marginal changes in
the production of current products. In addition, it is suggested that modern companies, which are equipped with technology and research and development activities, are central actors of innovation. Other scientists also contributed ideas over the years (Trott 2005). After Nelson Winter’s book “The Evolutionary Theory of Economic Growth” (1982), the term “evolutionary approach” has become popular. In the light of Schumpeter’s work, this approach regards technological innovation as the engine of economic growth in the long run. In evolutionary analysis, the technological innovation process has a central role.

Schumpeter (1934, 1942) talks about two different structures of innovation in terms of companies. He states that in one of these structures, the basic source of innovation is small companies of entrepreneurial spirit that work against severe competition. In another structure, the basic source of innovation is big companies, which have large research and development facilities and work with oligopolistic competition. He suggests that the real competition line of researcher companies is not on the basis of prices, but is about products, processes, and novelties in markets and strategies.

Moreover, entrepreneurs’ achievements of new products and services, new production and transportation methods, new markets and new industrial organizational structures are regarded as central elements of development. As long as the entrepreneurial spirit continues to make achievements, development continues, whereas when the entrepreneurial and innovative spirit finishes, development stops (Heertje 2006). According to Schumpeter, the initial stage of a long economic structure is characterized by creative destruction. In this stage, the basic actors are innovative companies and enterprises. Technological involvement in industry is easy. Innovative and new companies evolve in industry with new innovations and constantly demolish all production, organization and distribution structures of existing companies and capture quasi rent that has been created by former innovations. Smaller companies and pioneer sectors grow mature in the extension phase of the conjecture. Therefore, creative accumulation appears. In this stage, current companies are strong and they provide obstacles to new companies when they enter the industry. Towards the end of the conjuncture, new innovations appear. These create new pioneer sectors and lead previous sectors to reconstruct (Turanlı and Sarıdoğan 2010).
During the twentieth century innovation was a politics-oriented concept. Since the mid-1960s, with the expected outputs of technological innovation, science policies were mostly concerned with providing funds for scientific research (Godin 2007). In the 1960s this process, which was called science policy, turned into science and technology policy and by the 1990s, it became innovation policy (Lundvall and Barros 2005). In the 2000s, where the process of information revolution was experienced, technology and innovation policies, which were among the important factors in economic growth and competitive power of counties, became gradually more and more important. It is observed that policy makers specially emphasize these issues.

In the literature, there are many indicators on multiple levels demonstrating innovation. Indicators on levels such as country, industry and company are mentioned. For example, on the country level, research and development expenses, export of high technology, industrial added-value, innovation capacity and export of information and communications technology reflect innovation. On the industry level, it is reflected by elements such as development of new manufacturing processes, the appearance of a new research system, new sources of raw materials, advanced production techniques and patent ownership. On the company level, it is emphasized that new or enhanced products and services, new sales approaches, new management styles, financial factors and technological sufficiency are determinants in producing innovation. When these innovation indicators are considered, it is obvious that different technological processes and tools affect innovation.

5 THE ROLE OF TECHNOLOGY IN INNOVATION

As mentioned in the previous sections of the study, a necessity that the business world is faced with in the in the recent period is innovation. In this respect, the main question addressed in this conceptual paper is, “how does technology, which has been undergoing relatively rapid change recently, affect innovation practices in businesses”. Many studies claim that change and development in technology and subsequent innovations do not only cause significant changes on levels of industry and companies but also social, political and social changes. After above-mentioned statements, this part focuses on how technology affects innovation efforts in companies.
There are many empirical studies examining the relationship between technology and innovation in the literature. According to one of these studies, there is a significant and positive relationship between elements of IT focus on technological advancement (e-Commerce) to KM and innovation performance (Gloet and Terziovski 2004). In another research, Huang and Liu (2005) indicated that there is a positive correlation between IT and innovation. Moreover, it was asserted that adopting technology and technological proactivity have a positive effect on innovation (García et al. 2007). In their research, Liu and Buck (2007) concluded that expansion originating from exports and imports is positively associated with the innovation capacities of domestic firms. Koellinger (2008), in turn, examined the relationship between technology, innovation and company performance in a study conducted on 7,302 firms. According to the results of this research, Internet-based technologies were significant promoters of innovation. The research also revealed that both Internet-based and non-Internet-based product and process innovations brought sales and employment increases. Another finding of the research was that innovation was a mediating variable of technological investment performance. In another research, the innovation strategies and performances of low-tech companies were compared with the innovation strategies and performances of medium- and high-tech companies. It is identified that low technology companies’ innovation performance of products and services are behind innovation performance of middle and advanced technology companies (Kirner et al. 2008). Another research conducted on 753 companies addressed technological innovation performances. The impact of low-and medium-tech companies’ efforts to research and generate technological innovation on their innovation performances was investigated. The research identified that innovation performances of companies with low R&D investments were lower (Tsai and Wang 2009). Moreover, it was indicated that technological innovation is employed rather extensively in generating value added and improving performance, and particularly brings achievements and competitive advantage in production (Lee et al. 2009). The researches on technology transfer, integration of technology to the company, and advancement of innovation, in turn, highlighted that unless external technology is combined with the company’s own R&D, it will not be sufficient for innovation (Li and Wu 2010).
research conducted on 254 SMEs, the relation between SMEs’ R&D competencies and their technological and innovation performances was examined. The research identified a correlation between companies’ abilities to commercialize their technological products and their R&D and innovation performances (Kim et al. 2011). In a study conducted on employees, on the other hand, the relationship between convenience in utilizing technology, innovation propensity and perceived utility among employees, and the intention to use technology was investigated. The research identified a significant correlation between innovation propensity and the intention to use technology (Farmani et al. 2012). Furthermore, it was understood that the broadness of technological opportunities had a positive impact on innovation. Accordingly, the effects of science and technology parks in Spain on innovation was examined. The research revealed that science and technology parks had a strong and positive impact on companies’ innovation performances (Vásquez et al. 2014). Another research conducted on 175 SMEs investigated the impact of online information sharing on innovation performance. The research identified that information sharing in electronic environment served as a mediator between human resources practices and innovation performance (Acosta et al. 2016).

Researchers, who generally emphasize that technology in an important factor in the production of innovation, identify a significant and positive relationship between technology that is employed in all businesses and business process and innovation. Technology’s positive effect on innovation has been confirmed by empirical studies that are presented in Table 4. Researchers state that technology, innovation and research and development activities are among leading factors that determine growth rates of countries in the long run. Businesses are basic actors of this economic development. They support this development considerably with their research and development and innovation activities. Especially the active use of technology, which has been accompanied by new innovative products, locates businesses in an advantageous position in many ways. Adaptation of technology by businesses in their own structure, their technological proactivity or rapid adaptation to digital technologies positively affects innovation processes. Researchers frequently state that companies that were not able to keep pace with technology achieve success later than others. It is
also assumed that catching up with innovation could be more difficult if businesses are not able to integrate new and different technologies with their development and research activities.

6 DISCUSSION
The previous sections of the study addressed the ongoing transformation in technologies utilized in businesses, organizational processes and business models respectively and elaborately. Even though these issues have been on the agenda of businesses for decades, the rate of the ongoing transformation in these fields has relatively gained pace recently. The main issue at stake here is the rapid transformation in technology. The transformation and renovation of technology at an ever increasing pace is being reflected on the business world, leading to changes in organizational structures, business models and processes. Within this framework, the interesting question according to this paper is to see how these technology-driven transformations affect innovation. It seems possible to provide an answer to this question on the basis of secondary resources which also include empirical findings. For instance, cloud computing, which has rapidly become more of an issue for businesses and the business benefits of which is defined in Table 1, assists businesses of different scales in storing and managing their data in a reliable way by transforming them into information, and hence facilitates information management, which is a major source of innovation. Furthermore, it was revealed that social networks, which have recently become extremely popular among individuals, can also become useful tools for businesses, and may have a positive impact on, for instance, product development and marketing research processes, which in turn lead to innovation. Considering another technology which may be of importance to businesses, Web 3.0, it can be suggested that its properties such as being individually oriented, high probability, user-developed smart applications etc. may make significant contributions to form a basis required by innovation. In view of the fact that innovations do not only originate from employees, but also from customers and consumers today, it appears that effective use of Web 3.0 may serve as a significant input to innovations to be made in products and services.
7 CONCLUSION

Due to technology and its extension, the point we reach today includes a much more rapid development than in previous years. Nowadays in both social life and business life, developments in information technologies make breakthroughs every day. Businesses first used digital transformations in order to enhance their working orders. Then they have spread these transformations to all fields of business and gathered more efficiency and performance. In addition, in connection with new technology use, increase in business performance makes businesses keep technology constantly on the agenda. Therefore, widespread use of new technologies in businesses has become an important factor in innovative products and innovation processes. The rapid change of new technologies and the emergence of innovations at short intervals keep businesses alive and motivate them to look for novelties constantly. These novelties made by businesses in their structures and processes help to reduce costs and increase quality. Due to innovations of products, it is easier to respond to customer needs and demands in a faster and more comprehensive way. Therefore, companies can be more competitive. In today’s conditions, it is not enough to produce goods and services that are only compatible with needs. Innovations within businesses, quests for marketing products or services, novelties in processes, and developments in educating and directing customers about products play important roles in the determination of competition strategies. This situation pushes businesses to present innovative products. The importance of technology in developing innovation becomes more and more prominent. Technologies that are employed in businesses create dynamism. When factors such as intensive interaction, which is made possible through these technologies, a creative atmosphere thanks to the use of technological devices and the increasing tendency of employees and customers to lean towards technology together are taken into consideration, this technological framework constitutes an important base for innovations to emerge.
REFERENCES


The Role of New Technologies in Innovation


**KEY TERMS**
Big data  
Business model  
Business process  
Cloud computing  
Innovation  
Internet of things  
Organizational structure  
Social network  
Technology  
Web 3.0
QUESTIONS FOR FURTHER STUDY
1. Discuss how technology transforms business life.
2. Introduce the basic technologies employed by businesses, and explain how these technologies affect innovation.
3. Explain types of innovation and discuss the relative importance of these innovation types for businesses using arguments.
4. How does technological development affect organizational structures?
5. Do all businesses have to follow technological developments closely? Discuss.
6. While certain industries are so adept in innovation generation, other industries are relatively slow. Discuss.

EXERCISES
Imagine that you are the innovation manager of an automotive plant in a developing country. Which technological tools would you use the most for innovation?

Imagine that you are managing an e-commerce company. How would you use social networks while designing innovations related with your services?

Imagine that you are managing a traditional bakery. What kind of innovations would you introduce in such a bakery?

Imagine you are the general manager of a bank. Which communities would you interact the most in order to innovate?

FURTHER READING


