

# Cloud system in digital human resources management in Turkey

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**Serap Ergen**

seraap.ergen@gmail.com

 <https://orcid.org/0000-0003-2859-6048>

Ege University Campus 35100, Bornova – Izmir, Turkey

## Abstract

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*With the changing technology, humanity has reached Industry 4.0 starting from the steam engine. With these developments, human resources in the organisations need to store and process data. A new application that enables digital human resources to easily access its data is cloud computing. The aim of this article is analyse how cloud technologies affect human resources management in Turkey. A descriptive method was used in this paper to explain the concept of digitalism in the discussed area and analyse the relationship between cloud system and digital human resources management. Data was drawn from the scientific and professional literature documents on this subject. Many organisations do not have enough knowledge about cloud computing in Turkey. There are also concerns about cloud systems security and economic equilibrium of companies. It is predicted that companies that adopt this technology will have a more efficient and comfortable human resources process and become more prosperous. Organisations should work for the development of human resources management system by digitising it. Organisations whose number of employees is increasing day by day, face problems, but they can handle this situation through the careful implementation of cloud computing. Cloud systems provide organisations with benefits such as storage capacity and easy access to data anytime and anywhere.*

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## Keywords:

cloud system, digital human resources management, Industry 5.0

### Article info

Received: 22 April 2020

Revised: 16 May 2020

Accepted: 19 May 2020

Available online: 19 June 2020

DOI: <http://doi.org/10.35467/sdq/122607>

## Introduction

The concept of industry is constantly changing. Since the 18th century, humanity has been witnessing industrial change. The effect of inventions on production and the fact that machines operating with steam power gave birth to the mechanised industry is the beginning of this chain. Every day, humanity comes up with a new invention. Constant innovations are an inherent feature of our era and it may lead to a situation where mass production, digital revolution and then technologies can be unmanned.

The industrial revolution has caused important changes in the social system, including work and education. Digitalisation and new technologies have started to be used in human resources management. As a result, factories were transformed into smart factories and the opportunity to work independently from the office emerged (digital nomads). The transfer of physical power to machines and the increase in the importance of mental power also changed the workforce as a quality. It can be noticed that the transition from traditional production to smart factories based on sensors requires automation-based robot use, training the workforce, orientation, and adaptation to change. This also means the personnel management process changes altogether with its meaning. Human resources do not see an employee as an expense factor, but sees the worker as an investment and a competitive advantage. Transferring human resources functions to digital environment saves time and reduces costs. Therefore, human resources management needs to change and be perceived by companies as a competitive advantage. In addition, the concept of Industry 5.0 has appeared, which influences human resources management. The aim of this study is to analyse how cloud technologies develop and how they affect human resources management in Turkey. In this study, the concepts of Industry 4.0 and developing industry 5.0 are explained and they are shown to be effective in human resources management. The last step of digital human resources management, Cloud Computing, is defined and assessed. Also, some concerns about data security were raised. All the issues were depicted in the characteristics of digital human management in Turkey.

## Industry 4.0

Germany was the first country to start talking about Industry 4.0. The German Artificial Intelligence Research Centre tried for the first time to show how the system would work in a small smart factory created in Kaiserslautern (Wang *et al.*, 2016). It shows that the process of production and management rapidly changes. Industry 4.0 was preceded by three phases of industrial development. The First Industrial Revolution (Industry 1.0) started in the 18th century with steam machines and the first industrial activities aimed at increasing production. The Second Industrial Revolution (Industry 2.0) began in the 20th century. It opened the way to mass production and the use of electrical energy. The next revolution, Industry 3.0 integrated analogue and digital systems. These three industries brought mechanisation, electricity, and information technology to human productions to increase efficiency in production ([Türkiye'nin Endüstri 4.0 Platformu](#), no date).

Today, we are experiencing the Fourth Industrial Revolution (Industry 4.0), which is understood as the “increased flexibility in manufacturing along with mass customisation, better quality, and improved productivity” (Zhong *et al.*, 2017). In addition, this technology is a smart production aimed at enabling all objects to communicate and interact with others through the Internet. This revolution is also affected by the development of 3D printers, robotics, artificial intelligence, bio, nano and space technologies. One of the most important features of Industry 4.0 style production is that production has a memory. The machines keep all the features of the production that they made through technologies. Everything is ready for the next production process (Proto Pars, 2019). What is remarkable, a fear of

unemployment, especially with the implementation in the Dark factories (machine power, factories with no human labour), is one of the consequences of the Fourth Industrial Revolution. However, this fear was present in the previous revolutions. For instance, in Industry 1.0, steam machines opened new fields of employment such as steam technology which required division of labour and specialisation. The use of steam machines in a production process, resulted in an increase in the unemployment rate for a workforce not familiar with new solutions. Similarly, the transition from Industry 3.0 to Industry 4.0 also brought social anxiety due to automatisisation of production (Yıldız, 2018). The factories are being created thanks to robotic systems, automation and control systems and additive manufacturing. The fear related to Industry 4.0 concerns just the future solutions in the industry. It can be noticed that by sharing knowledge it is passed down from generation to generation, with society constantly demanding greater power and continuous development. Now it is done with the effect of digitalisation, caused by the increased use of mobile devices and the Internet. Smart factories, big data and the cloud system, the Internet of Things (IoT) are the most prominent elements of 4.0 Industry (Almada-Lobo, 2015).

## Smart factories

In intelligent factories that are also called dark factories and unmanned, labour productivity, low productivity, absenteeism, salary payment, transportation, nutrition, health expenses, legal compensation, and collective labour agreements are not present (Gökten, 2018). Elements that create cost to the employer are eliminated. Fixed consumption expenses of the workplace are eliminated to save energy. Work accidents caused by employee errors are also decreasing. In Industry 4.0, the machine interacts with other machines, and they create a safe, new working environment where all processes are monitored via the Internet - robots that work effectively.

## Big data and cloud system

The foundations of the cloud computing idea were laid in the 1950s. Thanks to the development of cloud computing technology, the storage and accessibility of big data became possible. In today's technology, since the users want to store more and more data, hosting capacity causes big problems. However, the features and capacities of the devices (mobile, personal computers) are increasing together with their prices. Cloud Technology, which emerged as a solution to all these problems, is defined over the internet as software applications, data storage service and processing capacity (Mell and Grance, 2011). Even with the lowest capacity device, it provides access to all kinds of information and personal data from any place. For all these operations, it makes multiple server connections through a digital network. When needed, business managers and consumers can access this data in daily life (Yin and Kaynak, 2015; Pamuk and Soysal, 2018, p. 46). The new developments in cloud technology have brought about radical changes in software and Internet services.

## Internet of Things

The Internet of Things is a network structure where machines or devices collect data and decide with information gathered, without the need for human intervention or manual input of any data. The IoT, also called the Industrial Internet, forms the basis of smart factories, smart products, and smart services (Lee, 2015, p. 4). It is being used in many areas, such as education involving ubiquitous learning (Domalewska, 2012), safety purposes (Gawlik-Kobylińska, 2016a), and management (Ben-Daya *et al.*, 2019). Increasingly, organisations in various industries are using IoT technology to work more efficiently, provide better customer service, improve decision making and business value, and better understand customers (Proente Otomayson, 2020).

## Industry 5.0

While introducing the philosophy of Industry 5.0, also known as Society 5.0, the Japanese Prime Minister, Shinzo Abe, said that technology should be perceived as an aid, not a threat by communities. The document which describes the foundations of Industry 5.0 is a 26-page study prepared the Japanese Federation of Economic Organisations, Keidanren (Federation, 2016). It aims to explain the reform and its implications on the economy and society. The document also has an educational role, which is to prepare societies for the new trends at micro and macro level. The Society 5.0 philosophy in Japan suggests the implementation of some goals, such as:

- developing solutions against an ageing world population,
- making the virtual and the real world work together,
- benefiting from the Internet of things by considering the interests of the society,
- producing solutions for environmental pollution and natural disasters (Federation, 2016).

On the other hand, if we consider having a “world-wide” social transformation, we face specific obstacles. Keidanren lists five important barriers (“five walls”) that need to be demolished before Society 5.0 can be developed. They are:

- barriers in the legal system,
- scientific gaps in the digitisation of objects,
- lack of qualified personnel,
- socio-political prejudices,
- social resistance (Federation, 2016, p.14).

Society 5.0 actually raises some concerns. The most important of these concerns is the possibility of creating an “employment problem”. Increased automatisisation may pose a risk of unemployment, especially among blue-collar and white-collar workers. Furthermore, digital transformation brings a risk of manipulation, disinformation, and information pollution (Domalewska, 2019). These concerns have been raised in many countries, among others, in Turkey. Needless to say, with the imposed Industry 5.0 patterns, human resources management will evolve (Yazar, 2017).

## Human resources management

In a globalised world, human resources management has become one of the most important values of today's businesses. It was created to manage people in organisations. Advances in technology create a need for a new form of management. Simultaneously, changes in the workforce quality and education increase the importance of human resources management. Human resources management relies on planning the workforce, provides personnel to a company, manages performance and wages, organises the necessary training, ensures the health and safety of employees, and conducts many activities to improve the organisation (Köroğlu, 2010, p. 143). Human resources management is an organisational task carried out by the employee responsible for human resources management. It covers many topics such as recruitment, training and remuneration. Following globalisation and

technology trends, human resources management requires continuous control of the actions. Every aspect of the process of management can be now performed digitally.

## Digitalisation in Human Resources Management

The area called human resources refers to personnel management in organisations (Hacıoğlu, 2020, p. 241). The concept of personnel management, is more administrative in nature, applies to recruitment and dismissal in organisations, payroll, and complying with employment law. However, with the changing world and advancing technology, it could not adapt to the present day. Human resources, on the other hand, have a human-oriented approach (Ünver, 2005). It addresses the issues such as establishing business objectives and determining strategic decisions. Therefore, there has been a transition from personnel management to human resources management, which is much broader in its scope. As more technology entered the area, digital human resources management evolved (Hacıoğlu, 2020). The globalising world and developments in Internet technology influenced human resources management and turned it digital.

### Digital human resources management driving forces

Human resources started to be digitalised due to some factors and they had to. John W. Jones (1997) bases the evolution of digital human resources departments on six driving forces.

- Information technology:

Human resources managers will have to deal with advanced technology in future. Digital human resources will become an obligatory part of the future with increasing confusion and decreasing costs with information age technology (Jones, 1997; Güler, 2006, pp. 19–20)

- Plan rescheduling and editing the process:

Human resource managers should continually investigate their adaptation to the newer trends to make the processes more efficient. Basic business processes can be re-planned and advanced with information technology (Jones, 1997; Güler, 2006, pp. 19–20).

- High speed management:

Businesses must be smarter and faster to gain competitive advantage. Digital human resources management is smarter and faster than the traditional one (Jones, 1997; Güler, 2006, pp. 19–20).

- Network organisations:

Departments of digital human resources are network companies when compared to traditional and bureaucratic companies. Businesses are looking for a solution to be more productive and less bureaucratic (Jones, 1997; Güler, 2006, pp. 19–20).

- Knowledge workers:

Learning organisations rely on self-managing knowledge workers. The task of information workers is to reduce costs and find out important business opportunities using information. Digital human resources have to employ information workers in order to catch the innovations of the age (Jones, 1997; Güler, 2006, pp. 19–20).

- Globalisation:

Today, businesses have to adopt global strategies to gain a competitive advantage. If the departments of human resources want to exist in the world market, competitive advantage should be one of the goals (Jones, 1997; Güler, 2006: 19–20).

- Future trends in human resources technologies

Emerging tools which can be used for human management resources include cloud computing, human resources software/data on a single platform, mobile and wearable technologies. They are expected to be used worldwide.

- Investing in cloud computing for human resources management:

Cloud computing, among other things, helps companies boost their performance, centralises data, and maintains high-quality and effective talent management. Thanks to cloud computing, the human resources department and employees can access the data they want at any time (Seyrek, 2016).

- Human resources data sources

All transactions should be created and performed based on the data. To do this, data must be properly maintained and strengthened.

- Human resources software/data on a single platform:

It is the collection and management of data contained in different software within a single database.

- Mobile and wearable technologies:

They contribute to increasing the efficiency of a company, reducing costs and improving business processes by combining human resources processes with selection and placement, training, job security, internal communication, brand, employee happiness, and wearable technology products (Ogoo Dijital Blog, 2017).

These technologies have begun to be used or will be used in the near future. One of the main tools for digital transformation, integrating all the technologies, is cloud computing.

## **Cloud computing in digital human resource management**

Cloud computing is the hardware and software resources in the Internet service provider in general. It 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.” (Mell and Grance, 2011, p. 3).

It allows for obtaining the required resources whenever desired, merging user's data, and presenting data on workers' performance. Such cloud services are usually paid according to the preferences (Mell and Grance, 2011; Dokuz and Çelik, 2017, p. 317).

There are advantages and disadvantages to cloud computing. Some advantages concern reducing the costs of any kinds of operations, improvement of performance by quick updates, endless storage capacity, compatibility of file formats and with operating systems, as well as data security, which is constantly improving. Since cloud computing works on remote servers, there are some vulnerable aspects, for instance to work in a cloud, an Internet connection is required. Data security is also sometimes questioned as more and more malware appear. Finally, errors may occur in system updates.

## Threats and restrictions resulting from the use of modern technologies

Successful digital human resources management strongly depends on data protection. In recent years, with the development and spread of modern technologies, harmful software threatening information systems have diversified and their effects have increased. Since the beginning of the 21st century, ransomware has been used by cyber attackers as an effective tool (Çeliktaş and Çelik, 2018). The digital transformation of traditional companies, which have reached their customers through physical offices and stores, digital economy through cloud computing brings new and potentially unknown risks. Any kinds of organisations, from government agencies to small businesses may encounter key problems related to data security, threats to systems, and system vulnerabilities. Banks, government agencies, health care, insurance and technology companies consider cyber attacks or data breaches as a key one risk. These industries tend to be the most targeted for an attack (AON Empower Results, 2019). The system vulnerabilities are also related to introducing disruptive technologies, which entail new IT challenges, such as digital data protection. In some cases, employees are not aware of the fact that such novelties may pose a major threat to the cyber security of their institution. Therefore, any innovations have to be analysed as they may not finally meet security requirements. Besides this, organisations need to develop a comprehensive approach to reduce internal cyber security risks. Accordingly, strong data management, communication of cyber security policies across the organisation, effective access and data protection controls should be implemented. It is also important to focus on the security of their platforms, services and products to ensure that the adoption of modern technology is resistant to smart cyber attackers. The technologies have great potential, but an enthusiastic approach requires preparation to ensure the safety and security of data. Today, businesses invest more in optimising their security, they create new strategies, implement new infrastructure, and take advantage of modern tools to make sure that they are ready to fight cyber threats (Raza, 2020).

## Cloud computing in Turkey

Adaptations to digital working environments becomes a must for the business world. Organisations should use information technologies and digital applications to continue their activities. Thanks to the investments, commercialisation of research results, and cooperation between science and business (Gawlik-Kobylińska, 2016b), the use of human resources technology is increasing and becoming widespread. These technologies support employees in fields such as easy reporting, analysis and follow-up for human resources, saving time and taking strategic decisions. With regard to Turkey, it is gradually implementing cloud computing solutions (Akar and Mardiyani, 2016). Companies are aware of the benefits and risks of cloud computing systems. Apart from security issues, a problem which arises is the rapidly changing currency movements which is problematic for the company's investments and stability (Kanat, 2018, pp. 20). Other obstacles are the restrictions imposed by laws such as SPK, BDDK, KVKK<sup>1</sup> and the fact that some of the regulations are not clearly defined (Uyar, 2019). In these conditions, companies are afraid of problems with potential

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1. KVKK (Kişisel Verilerin Korunması Kanunu) - Personal Data Protection Law; BDDK (Bankacılık Düzenleme Ve Denetleme Kurumu) - Banking Regulation and Supervision Agency; SPK (Sermaye Piyasası Kurulu) - Turkey's Capital Markets Board.

cyber attacks, currency rises and falls, and inspections, which may happen at an unfavourable time for the company. However, it is predicted that Turkish companies that develop enterprise applications on a global or national scale will use cloud technology in the nearest future. The increased use of cloud technology in Turkish companies means more growth and an increase in national income (Ungan, 2019). Regarding the optimistic approach, the human workforce will not be reduced as it will be engaged in tasks which require a machine-human interaction. Human resources managers have an important role preparing the workforce for new conditions and providing the employees with all the necessary training. There is also a pessimistic approach, which is related to the vision that machines will replace muscle strength. Even activities connected with creativity such as design and design will be carried out by artificial intelligence devices. Some scenarios are likely to happen, not only in Turkey, but worldwide; therefore, constant specialist training is again required for employee reshuffling. It may involve not only merit, but also soft skills to deal with organisational culture and intercultural cooperation (Świerszcz, 2017; Gawlik-Kobylińska *et al.*, 2016c). Last but not least, in order to prevent any failures in digital human resources management implementation, the IT infrastructure of the workplace must be prepared and function properly. Individuals should be able to benefit from technology, be supported and encouraged for better performance.

## Conclusion

Globalisation, technological advances, and a changing workforce affect all areas of human activity, among others human resources management. Like many organisations across the world, companies in Turkey are trying to adapt to the emerging trends. In order to keep up with the times, against odds such as cyber attacks, or periodical economically unfavourable conditions, changes in human resources management are required. The first step to achieve success in developing modern practices is digitising operations. Things are faster and easier thanks to cloud computing and digital equipment. As a result, the satisfaction of both managers and employees increases with digital human resources management. However, decisions on implementation are often burdened with the feeling of uncertainty among decision-makers if a given system is likely to be beneficial in a longer period of time and safe. In order to implement a given solution successfully, specific training is required (Szczepaniuk *et al.*, 2018). High speed Internet should be provided in order to fully establish the digital human resources management culture. The process of management can rely on cloud computing which provides popular storage and computing services. In face of mobile devices capacity development and a large increase in the quantity of any type of data, such a solution meets the requirements of contemporary organisations. It provides access to all kinds of information, even that delivered through devices with very low capacity. Cloud computing has been implemented and shared by many organisations such as companies and universities. Using cloud computing technology, personal computer load decreases and various applications are easily provided. All transactions are processed by clouds. Applications, programs, and data that belong to an individual are stored and can be easily accessed at anytime and anywhere, where Internet access is available. The identified and analysed issues provide incentives for implementation of a cloud system together with digital human resources management by Turkish organisations. Such alterations, a turn towards the future, will be positively perceived and influence the sense of stability and security among employers.

### Funding

This research received no external funding.

### Disclosure statement

No potential conflict of interest was reported by the authors.

## References

**Akar, E., Mardiyani, S.** (2016) 'Analyzing Factors Affecting the Adoption of Cloud Computing: A Case of Turkey', *KSII Transactions on Internet & Information Systems*, 10(1), pp. 18–37.

**Almada-Lobo, F.** (2015) 'The Industry 4.0 revolution and the future of Manufacturing Execution Systems (MES)', *Journal of innovation management*, 3(4), pp. 16–21.

**AON Empower Results** (2019) 'Managing Risk: How To Maximize Performance In Volatile Times' Available at: <https://www.aon.com/2019-top-global-risks-management-economics-geopolitics-brand-damage-insights/index.html> (Accessed: 15 May 2020).

**Ben-Daya, M., Hassini, E., Bahroun, Z.** (2019) 'Internet of things and supply chain management: a literature review', *International Journal of Production Research*, 57(15-16), pp. 4719–4742.

**Çelik, S., Çelikaş, B.** (2018) 'Güncel Siber Güvenlik Tehditleri: Fidyeye Yazılımlar. [Current Cyber Security Threats: Ransomware]', *CyberPolitik Journal*, 3(5), 105132. Available at: <http://cyberpolitikjournal.org/index.php/2018-volume-3-issue-5/> (Accessed: 15 May 2018).

**Dokuz, A. Ş., Çelik, M.** (2017) 'Bulut bilişim sistemlerinde verinin farklı boyutları üzerine derleme [Compiling on different dimensions of data in cloud computing systems]', *Ömer Halisdemir Üniversitesi Mühendislik Bilimleri Dergisi*, 6(2), pp. 316–338.

**Domalewska, D.** (2012) 'An ecological approach to using ubiquitous handheld devices in the classroom', in *Proceedings of International e-Learning Conference 2012(IEC2012). Smart Innovations in Education and Lifelong Learning*. Thailand: IMPACT, pp. 101–106.

**Domalewska, D.** (2019) 'The role of social media in emergency management during the 2019 flood in Poland', *Security and Defence Quarterly*, 27(5), pp. 32–43. doi: [10.35467/sdq/110722](https://doi.org/10.35467/sdq/110722)

**Federation, K. J. B.** (2016) 'Toward realization of the New Economy and Society—Reform of the Economy and Society by the Deepening of "Society 5.0"'. Available at: [http://www.keidanren.or.jp/en/policy/2016/029\\_outline.pdf](http://www.keidanren.or.jp/en/policy/2016/029_outline.pdf) (Accessed: 23 March 2020).

**Gawlik-Kobylińska, M.** (2016a) *Nowe technologie w edukacji dla bezpieczeństwa. Kształcenie w paradygmacie społeczeństwa informacyjnego i jego przyszłość [New technologies in education for security and safety. Education in the information society paradigm and its future]*. Rozpisanie.pl: Warszawa

**Gawlik-Kobylińska, M.** (2016b) 'Academic entrepreneurship based on the activities of Harvard University. Technology transfer for the security discipline', *Bezpieczeństwo i Technika Pożarnicza*, 44(4), pp.15–22. Available at: <https://sft.cnbop.pl/pl/bi-tp-vol-44-issue-4-2016-przedsiębiorczosc-akademicka-na-przykladzie-universytetu-harvarda-transfer-doswiadczen-dla-kreowania-bezpieczenstwa> (Accessed: 23 March 2020).

**Gawlik-Kobylińska, M., Trochowska, K., Maciejewski, P.** (2016c) 'Civil-military intercultural education and training in the form of blended learning', *E-Mentor*, (3)65, pp. 24–34. doi: [10.15219/em65.1251](https://doi.org/10.15219/em65.1251).

**Gökten, P. O.** (2018) 'Karanlıkta Üretim: Yeniçağda Maliyetin Kapsamı [Production in Darkness: The Scope of Cost in New Age]', *Muhasebe Bilim Dünyası Dergisi*, 20(4), pp. 880–897. Available at: <https://dergipark.org.tr/en/download/article-file/624020> (Accessed: 25 March 2020).

**Güler, E.** (2006) 'İşletmelerin e-İnsan Kaynakları Yönetimi ve e-İşe Alım Süreçlerindeki Gelişmeler [Enterprises in e-Human Resources Management and e-Recruitment Processes]', *Ege Akademik Bakış Dergisi*, 6(1), pp. 17–23.

Available at: <https://dergipark.org.tr/en/download/article-file/556907> (Accessed: 25 March 2020).

**Hacıoğlu, U.** (2020) *Digital Business Strategies in Blockchain Ecosystems*. New York: Springer International Publishing.

**Jones, J. W.** (1997) *Virtual HR: Human Resources Management in the Information Age*. Hamilton: Crisp Publications.

**Kanat, E.** (2018) 'Türkiye'nin Teknoloji Sektörü Ve Döviz Kurları İle İlişkisi: Borsa İstanbul Teknoloji Endeksi [*Turkey's Relations with the Technology Sector and Currency Converter: Istanbul Stock Exchange Technology Index*]', *Finans Politik & Ekonomik Yorumlar*, 55(645), pp.61–74.

**Koroğlu, Ö. T.** (2010) 'Türkiye'de Personel Yönetiminden İnsan Kaynaklarına Geçişte Esneklik ve Memur Statüsü [*Flexibility and Access to Human Resource Management Officer in the Personnel Status in Turkey*]', *Türk İdare Dergisi*, 469 pp. 139–164. Available at: <http://www.tid.gov.tr/Makaleler/ozlemtanerkoroglu.pdf> (Accessed: 25 March 2020).

**Lee, J., Davari, H., Yang, S. and Bagheri, B.**, (2015) 'Industrial Big Data Analytics and Cyber-Physical Systems Future Maintenance & Service Innovation', *Procedia CIRP* Vol. 38, 2015, pp. 3–7. doi: [10.1016/j.procir.2015.08.026](https://doi.org/10.1016/j.procir.2015.08.026).

**Mell, P. M., Grance, T.** (2011) 'The NIST Definition of Cloud Computing', *NIST Special Publication*, U.S. Department of Commerce. Available at: <https://www.nist.gov/publications/nist-definition-cloud-computing> (Accessed: 25 March 2020).

**Ogoo Dijital Blog** (2017) Available at: <http://blog.ogoodigital.com> (Accessed: 10 April 2020).

**Pamuk, N. S., Soysal, M.** (2018) 'Yeni sanayi devrimi endüstri 4.0 üzerine bir inceleme [*A review of the new industrial revolution industry 4.0*]', *Verimlilik Dergisi*, (1), pp. 41–66.

**Proente Otomasyon** (2020) 'Nesnelerin İnterneti Nedir? IoT Ne işe yarar? [*What is the Internet of Things? What does IoT do?*]', 9 April. Available at: <https://proente.com/nesnelerin-interneti-nedir/> (Accessed: 25 March 2020).

**Proto Pars** (2019) 'Endüstri 4.0 Gelişim Süreci [*Industry 4.0 Development Process*]', 31 March. Available at: <https://www.protopars.com/endustri-4-0-gelisim-sureci/> (Accessed: 25 March 2020).

**Raza, A.** (2020) 'Cybersecurity, Modern Technology and Business Threats'. Available at: <https://readwrite.com/2020/04/04/cyber-security-modern-technology-and-business-threats/> (Accessed: 15 May 2020).

**Seyrek, I.** (2011) 'Bulut Bilişim: İşletmeler için Fırsatlar ve Zorluklar [*Cloud Computing: Opportunities and Challenges for Businesses*]', *Gaziantep Üniversitesi Sosyal Bilimler Dergisi*, 10(2), pp. 701–713. Available at: <http://sbe.gantep.edu.tr> (Accessed: 20 March 2020).

**Szczepaniuk, E., Gawlik-Kobylińska, M., Krzemiński, W.** (2018) *Technologie informacyjne w zarządzaniu* [*Information technologies in management*]. Warsaw: Akademia Sztuki Wojennej.

**Türkiye'nin Endüstri 4.0 Platformu no date.** *Endüstri 4.0 Yolculuğuna Nereden Başlamalıyım* [*Where to Start Industry 4.0 Journey*] Available at: <https://www.endustri40.com/endustri-tarihine-kisa-bir-yolculuk/> (Accessed: 25 March 2020).

**Świerszcz, K.** (2017) 'Integration of organizational culture for company's customers and employees', *Economics & Management*, 1(1), pp. 316–319.

**Ungan, H.** (2019) 'Türkiye ve Bulut Bilişim Gerçeği' [*Turkey and Cloud Computing truth*], 8 June. Available at: <https://medium.com/sabancidx/t%C3%BCrkiye-ve-bulut-bili%C5%9Fim-ger%C3%A7e%C4%9Fi>

[c78d0345db51](#) (Accessed: 25 March 2020).

**Uyar, E.** (2019) 'Bulut Bilişim (Cloud Computing) ve Hukuki Boyutu', 10 July. Available at: <https://www.hukukihaber.net/bulut-bilisim-cloud-computing-ve-hukuki-boyutu-makale,6831.html> (Accessed: 31 March 2020).

**Ünver, Y.** (2015) İşletmelerde Kariyer Yönetimi Ve Performans Değerlendirme Sistemleri [*Career Management and Performance Evaluation Systems in Business*] (doctoral dissertation). Available at: <https://dspace.ankara.edu.tr/xmlui/bitstream/handle/20.500.12575/27672/628.pdf?sequence=1reference> (Accessed: 1 April 2020).

**Wang, S., Wan, J., Li, D., Zhang, C.** (2016) 'Implementing smart factory of industrie 4.0: an outlook', *International Journal of Distributed Sensor Networks*, 12(1). Available at: <https://doi.org/10.1155/2016/3159805> (Accessed: 25 March 2020).

**Yazar, K.** (2017) 'Toplum 5.0: Teknolojik gücü doğru yönetecek akıllı toplum felsefesi [*Society 5.0: Smart social philosophy that will manage technological power correctly*]' 15 of May. Available at: <http://webrazzi.com/2017/05/14/toplum-5-0/> (Accessed: 25 March 2020).

**Yin, S., Kaynak, O.** (2015) 'Big data for modern industry: challenges and trends [point of view]', *Proceedings of the IEEE*, 103(2), pp. 143–146.

**Yıldız, A.** (2018) 'Endüstri 4.0 ve akıllı fabrikalar [*Industry 4.0 and smart factories*]', *Sakarya Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 22(2), pp. 546–556.

**Zhong, R., Xu, X., Klotz, E., Newman, S.** (2017) 'Intelligent manufacturing in the context of industry 4.0: a review', *Engineering*, (3)5, pp. 616–630. Available at: <https://www.sciencedirect.com/science/article/pii/S2095809917307130> (Accessed: 20 March 2020).