A Conceptual Framework of Digital Transformation

M. Hanefi CALP

Hacı Bayram Veli University

Resul BUTUNER

Beypazarı Fatih Vocational and Technical Anatolian High School

Muhammed BUTUNER

Konya Karapınar Martyr Oğuzhan Aydınbelge Vocational and Technical Anatolian High School

Introduction

The concepts of digital transformation or digitization are widely used in almost every field today. The term digital is derived from the word digitus (Latin: finger) and means digitization. Digitalization first emerged as the automation of business processes with the use of software and later affected the business processes or business models of institutions thanks to many digital technologies. The digitalization process started with the digitization of analog data and the use of computers where digital data was managed. In summary, this process has been expressed as digital transformation with the rapid development of digital technologies and the integration of these technologies into systems/processes (Klein, 2020). At this point, digital transformation has become much more important with the decrease in resource use, demographic changes, globalization of markets, and increased international competition (Marquardt, 2017). The rapid technological change, which is also called the digital age, has made its effects felt in all areas and thus the concept of digital transformation has come to the fore. Using digital technologies, digital transformation enables users to develop new business models, make things easier, increase efficiency and improve processes (Tasci & Taslibeyaz, 2021; Wade, 2015).

According to another definition, digital transformation is the creation of new processes, innovative business models, smart products/services, and the integration of advanced digital technologies and digital systems (European Commission, 2019). Therefore, the basic elements of digital transformation are individual, process, and technology. In this context, digital transformation is a change by using digital technologies in order to facilitate the work (procedures, strategies, policies, etc.) of individuals (corporate employees, customers, etc.). This change affects individuals, structures, and strategies as a process that affects many areas (culture, health, agriculture, economy, industry, etc.) in line with the needs of society (Tasci & Taslibeyaz, 2021; Wade, 2015).

Digital transformation is defined as the process of creating value by utilizing digital technologies, strengthening social structures, and achieving efficient results thanks to digital technologies. However, transformation is not to completely eliminate the previous system, but rather to adapt the previous system to adapt to the transformation process and improve the existing system. According to this approach, transformation is important

in order to process the collected data and achieve a better future by reaching wisdom from the information. Digital transformation is a process that includes many steps and covers business models, strategies, and technical and social dimensions of institutions. digital transformation; mobile applications, IoT platforms, sensors and automation, cyber security, 3D printers, digital twins and smart systems, big data, artificial intelligence, augmented reality, and cloud computing (Calp & Er, 2019; Kahveci, 2022; Bozkurt et al., 2021).

In general, digital transformation is a process of change that occurs with the integration of information technology environments such as social technology, cloud computing, and the internet of things, and is considered as the integration of digital technology with operational processes in the digital economy. It is also expressed as the ability of processes to innovate comprehensively to improve their business capacity. (Balli, 2022; White, 2008; Westerman et al., 2014; Liu et al., 2001).

Digital Information Age, Digital Competence and Digital Literacy

Knowledge is a relative concept in its nature and can be defined in different ways according to time, environment, context, and culture. Information is a concept that progresses by accumulation, is produced at a certain time, and grows exponentially. One of the reasons why information is increasing day by day is that information is easily accessible with technologies (computer, internet, and other online technologies, etc.), the barrier between users who want to access information and information sources is removed, and new information spreads rapidly. In this context, there are three phases that affect the change and transformation of societies. First, it is the agrarian society that replaces the hunter-gatherer society. The second is the industrial society in which the mass is effective. The third is the information society, which is called the post-industrial era. The distinguishing feature of the information society from other societies is that knowledge is the determinant of power (Bozkurt, Hamutoglu, Kaban, Tasci & Aykul, 2021). Digital transformation, which provides an opportunity to manage (perceive, obtain (collect), allocate, share and use (application)) of information, plays an important and facilitating role for the transformation to be achieved in business processes through information and culture (tasks, information flows) (Calp, 2020; Heilig et al., 2017).

Digital competencies are one of the most prominent concepts recently. Digital competencies can be developed in areas such as education, economic, political, and socio-cultural. Digital competencies are a level of literacy both to see the change in education levels as a result of digitalization and to support lifelong learning. It is very important to have digital competencies in today's world where the information structure is constantly changing and the information is increasing day by day. Digital competencies are defined as competencies required to live, work and learn in a digital society. Digital competencies consist of knowledge, skills, and attitudes. In this context, digital skills and competencies include performing certain functions using information and communication technologies and digital tools, managing information, collaborating, and sharing content by developing (Lissitsa & Chachashvili-Bolotin, 2019; Ilomäki et al., 2016). Digital competencies include knowledge, skills, and competence. However, digital competence covers both technical skills and behaviors (such as behaving, learning, and teaching) in the field of knowledge, skills, and competence through digital technologies (Tømte, 2013). When the digital competence concept map proposed by Ala-Mutka (2011) is examined (Figure 1), "Information and Communication Technologies Literacy" in the center, "Internet Literacy" in the upper circle, "Media Literacy", " Digital Literacy" and

“ Knowledge Literacy” in the upper circle. It is seen that there is “Digital Literacy”. This concept map also includes skills such as knowledge management, problem-solving, creativity, cooperation, personal development, responsibility, entrepreneurship, and critical attitude (Ala-Mutka, 2011).

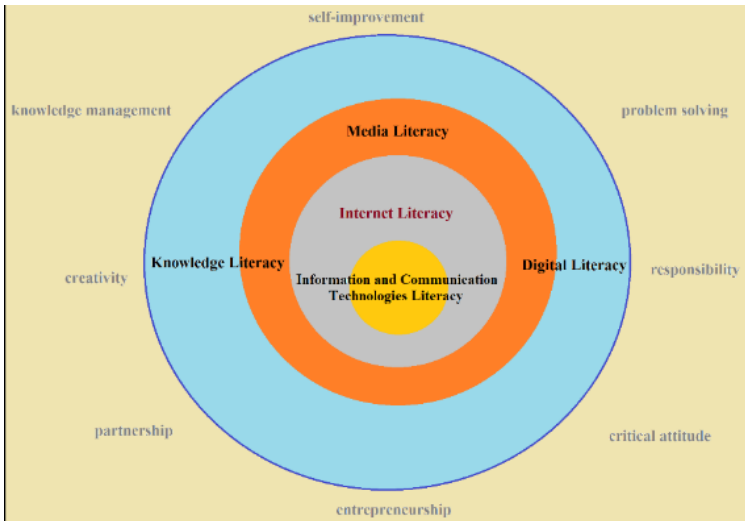

Figure 1. Digital competence map (Ala-Mutka, 2011).

Digital literacy involves a process as well as having certain technical, cognitive, and social-emotional skills. Digital literacy is defined as an “individual’s ability to appropriately identify, access, manage, adapt, evaluate, analyze and synthesize digital resources, digital tools and possibilities, construct new knowledge, create media expressions and communicate with others, engage in constructive social actions in the context of private life situations, and reflecting in this process is defined as “awareness, attitude and ability” (Martin, 2005; Kazu & Erten, 2014).

Digital Society and Digitization

The digital society can be defined as an element that determines the basic characteristics of society and the society that occurs as a result of digitalization, or it can be expressed as the society in the digitalized world. Digital technologies and information that enable digitalization are produced by people (Bozkurt, Hamutoglu, Kaban, Tasci & Aykul, 2021; Martin, 2008). The change in digitization rates all over the world is increasing day by day. The change in question is above the world average in Türkiye. In the digitalized world with Society 5.0, it has been understood that technology can be used to ensure the peace, welfare, and benefit of society. Society 5.0 puts people at its center in the process of solving the problems experienced in information and communication technologies and ensuring sustainable technology development (Bozkurt, Hamutoglu, Kaban, Tasci & Aykul, 2021; Fukuyama, 2018).

When we look at the concept of digitalization, it is discussed whether this concept is a digital transformation or whether it is a different issue from digitalization. For example, while process automation is seen as the first digitization phase in some sources, it is argued in some sources that the digitalization and digital transformation phase have been passed in recent years, and digital transformation and digitalization are defined together. According to another definition, digital transformation is stated as the transformation of organizational strategies and structures with digitalization (Berghaus & Back, 2016). When the definitions related to digital transformation are examined, it is seen that digital transformation has a multidimensional change process and affects business models, job

descriptions, customer relations, personnel abilities, and corporate culture as well as business processes of institutions. However, definitions of digitalization are very similar to definitions of digital transformation. At this point, the potential of digitalization activities in institutions to be realized on a larger scale with Industry 4.0 has led to the definition of digitalization with digital transformation. Depending on the development of digital technologies or digitalization, there are four digitization phases in institutions (Figure 2): These are the Personal computer phase, the Internet phase, the Social Media phase, and the Internet of Things Phase. Each phase is integrated with the other and uses the other's technologies (Klein, 2019).

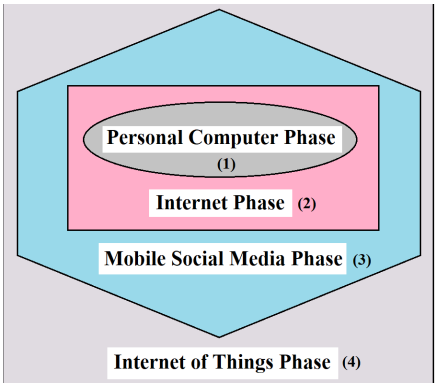

Figure 2. Digitization phases (Klein, 2019).

The first digitization phase, the "Personal Computer Phase", started with the digitization and transfer of data to digital media and continued with the automation of the processes. Thanks to automation, the business processes of organizations have been carried out faster and more efficiently (Savić, 2019). The development of data banks and network technologies has increased productivity and reduced costs (Klein, 2019).

The second phase of digitalization has begun with the use of the Internet and there have been some changes in the communication between the stakeholders (internal or external) of the organizations. Thanks to the Internet, organizations have gained easy access to information and have been able to share information effectively. In addition, the Internet has been an important factor for businesses to do electronic commerce (Wigand, 1997). Electronic commerce has moved some of the business value chains of organizations to the network environment and digitized it. Thus, new business processes and models have been developed. In the second digitization phase, the aim is to increase the efficiency of organizations. (Klein, 2019). The third phase of digitization (The mobile social media phase) has been on the agenda with the use of Web 2.0 technology and mobile devices in every field. Web 2.0 technology has made it possible to develop an interactive Internet environment in which the user can actively produce content. Web 2.0-based social media research and applications have taken their place in businesses in the third digitization phase (Liang & Turban, 2011). The digitalization phase of the Internet of Things started with the fourth industrial revolution (Industry 4.0). The integrated use of sensor and network technologies has enabled the establishment of cyber-physical systems in which objects can be monitored in the network environment and communicate with other objects. With Industry 4.0, not only the production processes of the enterprise, but the entire business value chain is changing. By analyzing all data obtained from customers, businesses provide access to customers with innovative business models and offer personalized services. The Internet of Things enables the development of collaborative, data-driven, and service-as-valued business models on the platform (Burmeister, Luttgens & Piller, 2016).

Strategies of Digital Transformation

Regardless of industry or business, digital transformation strategies can be expressed under four main headings. These are the ***use/utilization of technologies, changes in value creation, structural/formal changes, and financial situations.*** The use/utilization of technologies addresses an enterprise's attitudes towards new technologies and their use skills. The use of technologies addresses an enterprise's attitudes towards new technologies and their use skills. Thus, it includes the strategic role of a business for IT and technological purposes. A firm needs to decide whether it wants to become the market leader in terms of technology use, whether it chooses to create its own technological standards or refer to already established standards, and whether it sees technology as a means of carrying out business operations.

The use of new technologies is generally understood as changes in value creation. This shows the impact of digital transformation strategies on firms' value chains. In other words, it reveals how new digital activities differ from traditional/analog business processes. Considering new customer segments and other markets, digitizing services and products enables different forms of revenue generation and streamlines business processes for businesses. Structural changes are often needed for new processes/operations, with different technologies currently used and different ways of creating value. Structural changes are driven by changes in the functional and organizational structure of a business, particularly integrating new digital activities into the corporate structure. If the scope or scope of these changes is limited, it may be more appropriate to integrate new business models, processes or operations into existing organizational structures. However, the previous three dimensions can be transformed only after taking into account the financial aspects. These include the urgency to take action based on an organization's ability to finance the expenditures it makes in the digital transformation process. Financial aspects are a limiting force for transformation and change. Low financial pressure on the core business may fuel perceived urgency, while companies already under financial pressure may lack external means of financing a transformation. Therefore, businesses should stand firm against the need to realize digital transformation and identify alternatives clearly and at the right time (Calp, 2020; Matt et al., 2015).

Challenges of Digital Transformation

Most businesses are performing the appropriate digital transformation to compete and survive. He noted that executives are digitally transforming three key areas of their business: customer experience, operational processes, and business models. At this point, some difficulties are encountered in the digital transformation process. These challenges can be summarized as follows (Calp, 2020; Westerman et al., 2012; Tiersky, 2017; Panetta, 2016; Newman, 2016; Davenport & Kirby, 2016; Filkins et al., 2016; Bharadwaj et al., 2013).

Priorities

The first dilemma is whether improving the efficiency of existing operations is a top priority or whether customers and meeting needs are the focus. The two tasks can be incompatible, and focusing on efficiency can reduce customer satisfaction, customer loyalty, and purchases.

Aggregate Data or Personalize

Emphasizing predicting customer behavior can lead to model searches and ignoring serving individual customers. Meeting needs often require personalization, while too much emphasis on patterns and customer categories leads to personalization. Normally, managers will pay attention to the interests and needs of customers and employees and will understand and serve the individual.

Providing More Resources to IT Staff for More Self-Service Analytics

Both IT staff and non-IT staff require more resources. More data scientists and IT staff are harder to return than more training and resources for managers and staff in functional areas.

Storing All Data for Selecting Data which will be Store that Serves a Specific Purpose

All data can be stored at a cost. It is much more difficult to understand which data to select and available for analysis. While finding opportunities to aggregate data sources, indexing data sources, and assessing data quality presents even more challenges. Data is both an opportunity and a problem. Unused or unavailable data is worthless.

Works Which Done by Humans Versus Computer Machines

Information machines and robots will continue to replace unskilled and semi-skilled workers. The ongoing transformation that includes Q/A bots, personal assistants, and decision automation shows that skilled workers can be replaced as well.

Security and Accessibility

It can be easy to access and use force data. Administrators must balance data importance and sensitivity with accessibility concerns. This is a real dilemma in healthcare.

Confidentiality of Individuals Against the Understanding of Individuals

While digital transformation has its challenges, current research shows that the digital phenomenon is an opportunity to innovate and redefine the way organizations do business.

Conclusion and Recommendations

Knowledge is a key element of change and transformation in the digital age or digital society. Since information grows and determines the balances day by day, it is very important today and digital transformation should be applied in every field. Digital transformation is a comprehensive change that will affect all business and functioning of organizations, models, leadership understanding and working styles, supplier, customer and employee relations, and organizational structure. Therefore, there is a need for a strategy, understanding, and roadmap that will successfully understand and manage this process of change and transformation. In order to create a useful digital transformation strategy and implement this strategy effectively, organizations need to know how they want to transform, and what their goals and expectations are. The realization of the transformation is only possible with the combination of different elements. Because there are some difficulties or threats in the transformation process.

In order to turn the threats or crises encountered in the digital transformation process into opportunities, these difficulties must first be defined correctly and these problems must be solved completely. In addition, it is important to carry out theoretical and practical studies by providing coordination toward digital transformation and digital literacy. It is very important to have a fast and efficient digital transformation strategy with innovative technologies in order to survive in the developing and changing world. In this context, technologies such as forecasting and analysis, artificial intelligence control, machine learning, design and development, big data and analysis, cloud computing technologies, blockchain technologies, internet of things (IoT), and RFID is expected that will be used extensively in every field in the near future within the framework of digital transformation.

References

Ala-Mutka, K. (2011). Mapping digital competence: Towards a conceptual understanding. European Union. http://www.dctest.org/uploads/6/8/7/0/68701431/jrc67075_tn.pdf.

Balli, A. (2022). Digital Transformation and Entrepreneurship in Turkey. Third Sector Social Economic Review, 57(1), 251-279.

Berghaus, S., & Back, A. (2016, September). Stages in digital business transformation: results of an empirical maturity study. In MCIS (p. 22).

Bharadwaj, A., El Sawy, O., Pavlou, P., & Venkatraman, N. (2013). Digital business strategy: toward a next generation of insights. Academic Press.

Bozkurt, A., Hamutoglu, N. B., Kaban, A. L., Tasci, G., & Aykul, M. (2021). Digital information age: Digital society, digital transformation, digital education and digital competencies. *Journal of Open Education Applications and Research*, 7(2), 35-63.

Burmeister, C., Lüttgens, D., & Piller, F. T. (2016). Business model innovation for Industrie 4.0: why the "Industrial Internet" mandates a new perspective on innovation. Die Unternehmung, 70(2), 124-152.

Calp, M. H. (2020). The role of artificial intelligence within the scope of digital transformation in enterprises. In Advanced MIS and digital transformation for increased creativity and innovation in business (pp. 122-146). IGI Global.

Calp, M.H. (2020). The role of artificial intelligence within the scope of digital transformation in enterprises. In Advanced MIS and digital transformation for increased creativity and innovation in business (pp. 122-146). IGI Global.

Calp, M.H., Er, B. (2019). Industry 4.0 and Regional Development: Opportunities and Threats, *2nd International Turkish World Engineering and Science Congress*, November 7-10, 2019, Turkey.

Davenport, T. H., & Kirby, J. (2016). Just how smart are smart machines? MIT Sloan Management Review, 57(3), 21.

European Commission (2019). Digital transformation. https://ec.europa.eu/growth/industry/policy/digital-transformation_en (Erişim: Mayıs 2022).

Filkins, B. L., Kim, J. Y., Roberts, B., Armstrong, W., Miller, M. A., Hultner, M. L., ... Steinhubl, S. R. (2016). Privacy and security in the era of digital health: What should translational researchers know and do about it? *American Journal of Translational Research*, 8(3), 1560. PMID:27186282.

Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. MIT Sloan management review, 55(2), 1.

Fitzgerald, M., Kruschwitz, N., Bonnet, D., Welch, M., 2014. Embracing digital technology: a new strategic imperative. MIT Sloan Manag. Rev. 55 (2), 1.

Fukuyama, M. (2018). Society 5.0: Aiming for a new human-centered society. Japan Spotlight, 27, 47-50.

Heilig, L., Schwarze, S., & Voß, S. (2017). An analysis of digital transformation in the history and future of modern ports.

Ilomäki, L., Paavola, S., Lakkala, M., & Kantosalo, A. (2016). Digital competence–an emergent boundary concept for policy and educational research. Education and Information Technologies, 21(3), 655-679. https://doi.org/10.1007/s10639-014-9346-4

Kahveci, O. U. A. (2022). Industry 4.0 in the Scope of Digital Transformation and Its Possible Effects on International Trade. Current Approaches and Evaluations in International Trade and Logistics, 2, 21.

Kazu, I. Y., & Erten, P. (2014). A Prospective Teachers' Digital Empowerment Levels. *Bartin University Journal Of Faculty Of Education*, 3(2), 132-152. https://dergipark.org.tr/en/pub/buefad/issue/3815/51196.

Klein, M. (2019). Company 2.0 in the Scope of Business 4.0 – Use of Social Software in Business Processes. Ankara: Nobel Academic Publishing.

Klein, M. (2020). Digital transformation scenarios of businesses -A conceptual model proposal. *Electronic Journal of Social Sciences*, 19(74), 997-1019.

Liang, T. P., & Turban, E. (2011). Introduction to the special issue social commerce: a research framework for social commerce. *International Journal of electronic commerce*, 16(2), 5-14.

Lissitsa, S., & Chachashvili-Bolotin, S. (2019). The effect of digital variables on perceived employability in an ethnic minority and the hegemonic group. Israel Affairs, 25(6), 1082- 1104. https://doi.org/10.1080/13537121.2019.1670471.

Liu, Day, Yang, Shou, Wei Chen, and Tzu, Chuan Chou. "Resource Fit in Digital Transformation." Management Decision 49, no. 10 (November 15, 2011): 1728-1742. DOI: 10.1108/00251741111183852.

Marquardt, K. (2017, July). Smart services–characteristics, challenges, opportunities and business models. *In Proceedings of the International Conference on Business Excellence* (Vol. 11, No. 1, pp. 789-801).

Martin, A. (2005). DigEuLit–a European framework for digital literacy: a progress report. *Journal of eLiteracy,* 2(2), 130-136.

Martin, A. (2008). Digital literacy and the "digital society". Digital literacies: Concepts, Policies and Practices, 30(2008), 151-176.

Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. Business & Information Systems Engineering, 57(5), 339-343.

Newman, D. (2016). Top 10 trends for digital transformation in 2017. Retrieved from https://www.forbes.com/sites/danielnewman/2016/08/30/top-10-trends-fordigital-transformationin-2017/#5ce914d947a5.

Savić, D. (2019). From Digitization, Through Digitalization, to Digital Transformation. Online Searcher, 43(1), 36-39.

Sezen, H. K., & Eren Şenaras, A. (2022). A Discussion on Concepts of Digitization, Digitalization, Digital Transformation. *Pamukkale University Journal of Social Sciences Institute*, (51).

Tasci, Y., & Taslibeyaz, E. (2021). Review of the Studies on Digital Transformation in Higher Education Institutions. *Journal of Higher Education and Science*, 11(1), 172-183.

Tiersky, H. (2017). 5 top challenges to digital transformation in the enterprise. Retrieved from https://www.cio.com/article/3179607/e-commerce/5-top-challengesto-digitaltransformation-in-the-enterprise.htmls.

Tømte, C. E. (2013). Educating Teachers for the New Millennium?-Teacher training, ICT and digital competence. Nordic Journal of Digital Literacy, 10, 138-154. https://doi.org/10.18261/issn.1891-943x-2018-01-01.

Wade, M. (2015). A conceptual framework for digital business transformation. Global Center for Digital Business Transformation. An IMD and Cisco initiative, Lausanne, Switzerland.

Westerman, G., Bonnet, D., McAfee, A. (2014). Leading Digital: Turning Technology into Business Transformation, Boston: Harvard Business Review Press, (2014).

Westerman, G., Tannou, M., Bonnet, D., Ferraris, P., & McAfee, A. (2012). The Digital Advantage: How digital leaders outperform their peers in every industry. MIT Sloan Management and Capgemini Consulting, MA, 2, 2-23.

White, H. C. "Identity and Control: How Social Formations Emerge, Princeton, 427 p. White, HC 2008b,'Notes on the constituents of social structure'." Sociologica 1 (2008): 1-14.

Wigand, R. T. (1997). Electronic commerce: Definition, theory, and context. The information society, 13(1), 1-16.

About the Authors

M. Hanefi CALP received Ph.D. degree from the department of Management Information Systems at Gazi University, one of the most prestigious universities in Türkiye. He works as an Associate Professor in the Department of Management Information Systems of the Faculty of Economics & Administrative Sciences of the Ankara Hacı Bayram Veli University. His research interest includes Management Information Systems, Digital Transformation, Artificial Neural Networks, Expert Systems, Fuzzy Logic, Risk Management, Risk Analysis, Human-Computer Interaction, Technology Management, Knowledge Management, and Project Management.

E-mail: hanefi.calp@hbv.edu.tr, **ORCID:** 0000-0001-7991-438X

Resul BUTUNER is a Computer Teacher at the Department of Information Technologies, Ankara Beypazarı Vocational and Technical Anatolian High School in Ankara, Türkiye. He has a master's degree in Computer Engineering from Necmettin Erbakan University. His main areas of interest are artificial intelligence, robotic coding, data mining, and augmented reality applications.

He is an instructor in the field of Robotic coding within TUBITAK. He continues to write a book in the field of robotic coding at the Ministry of National Education. He worked as a coordinator in budgeted projects related to student education.

E-mail: rbutuner@gmail.com, **ORCID:** 0000-0002-9778-2349

Muhammed BUTUNER is a computer teacher at Konya Karapınar Martyr Oğuzhan Aydınbelge Vocational and Technical Anatolian High School. He worked as a coordinator in projects related to student education at the Ministry of National Education. Ministry of Youth and Sports Projects, eTwinning, Tubitak, Mevka, KOP etc. He has worked on national projects. He is an enthusiastic, energetic person with skills in Robotic Coding, software development, and networking.

E-mail: muhammedbutuner42@gmail.com, **ORCID:** 0000-0002-9143-1943

Similarity Index

The similarity index obtained from the plagiarism software for this book chapter is 16%

To Cite This Chapter

Calp, M.H. & Butuner, R. & Butuner, M. (2022). A Conceptual Framework of Digital Transformation, M.H. Calp. & R. Butuner (Eds .), *Current Studies in Digital Transformation and Productivity* (pp. 1–11). ISRES Publishing.