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The Impact of Digitalisation on Employment: A Study on Occupations Classified by Skill Levels in Turkey[1]

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Abstract

Technological change has always been a significant determiner of economic growth and development. Nevertheless, it also means a serious challenge in terms of labour market. Indeed, serious transformations have been encountered in labour markets in parallel to technological change in historical period. Today, this change and transformation process is cited and discussed with the concept of digitalisation. In this study, the effects of digitalisation process on labour market have been analyzed especially in the context of sectoral employment, skills and occupations in the sample of Turkey. In the study, the effects of digitalisation on total employment and occupations classified by skills in industrial and service sectors in Turkey have been investigated with panel data analysis method, using the data of 2010-2019 period. Within the context of sectors dealt with in the cited period, it has been found that digitalisation has positive impact on employment growth in general. Nevertheless, it has been concluded that digitalisation's effect on employment in occupations with low, medium and high level of skills differs. In parallel to the increase in the tendency for digitalisation in the firms functioning in the mentioned sectors, employment growth has been seen to be in question in occupations requiring higher levels of skills.

Keywords: Digitalisation, Turkey, Employment, Occupation, Skills, Panel Data Analysis.

Article Type: Research Article

Dijitalleşmenin İstihdam Üzerine Etkisi: Türkiye'de Beceri Düzeyine Göre Sınıflandırılmış Meslek Grupları Üzerine Bir Araştırma

Öz

Teknolojik değişim her zaman ekonomik büyüme ve gelişmenin önemli bir belirleyicisi olmuştur. Bununla birlikte, işgücü piyasaları açısından da ciddi bir meydan okuma anlamına gelmektedir. Gerçekten, tarihsel süreçte teknolojik değişime koşut olarak işgücü piyasalarında ciddi dönüşümler yaşanmıştır. Günümüzde de bu değişim ve dönüşüm süreci dijitalleşme kavramı ile birlikte anılmakta ve tartışılmaktadır. Bu çalışmada, dijitalleşme sürecinin işgücü piyasasına etkisi Türkiye örneğinde özellikle sektörel istihdam ile vasıf ve meslekler bağlamında incelenmiştir. Çalışmada dijitalleşmenin Türkiye'de sanayi ve hizmet sektörleri bağlamında toplam istihdam ve vasıf düzeyine göre sınıflandırılmış meslek grupları üzerine etkileri, 2010-2019 dönemi verileri kullanılarak panel veri analizi yöntemiyle araştırılmıştır. Söz konusu dönemde ele alınan sektörler bağlamında dijitalleşmenin genel olarak istihdam artışına pozitif yönde etkisinin olduğu bulgusuna ulaşılmıştır. Bununla birlikte, dijitalleşmenin yüksek, orta ve düşük vasıf düzeyine sahip mesleklerde istihdam üzerindeki etkisinin farklılık gösterdiği sonucu elde edilmiştir. Ele alınan sektörlerde faaliyet gösteren firmalarda dijitalleşmeye yönelik eğilimin artmasına koşut olarak daha yüksek vasıf gerektiren mesleklerde istihdam artışının söz konusu olduğu görülmüştür.

Anahtar Kelimeler: Dijitalleşme, Türkiye, İstihdam, Meslek, Beceri, Panel Veri Analizi.

Makale Türü: Araştırma Makalesi

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1. INTRODUCTION

Technological change has always been the driving force of economic growth and development. Nowadays, technological change is stated with the term digitalisation and within the frame of this concept similar debates are made. Digitalisation is, in a broad sense, used to express the transformation brought by the wide adaptation of digital technologies. Digitalisation shows itself with the fact that the new and developing digital technologies -such as cyber physical systems, the internet of things, artificial intelligence, smart robots and big data- become increasingly widespread in almost every field of life and bring many radical changes together with them. Nevertheless, digitalisation also symbolizes the transformation process which takes place in economic and social structure and which is directed with enormous broadening of the capacity of information storage, process and transmission by using digital technologies and digitalised data. This process, is also considered to be a new historical milestone which comes to the forefront by widely using digital technologies in economy, politics and different aspects of all other human activities.

Indeed, in the last few decades, technological innovations and their speed of spreading among countries have been surprising. In fact, the rate of telephone usage in houses in the USA has taken over 70 years to rise up from 10% to 90%, while the similar or the same spreading speed for mobile phones has taken place only in fifteen years and for smart phones in slightly over eight years. So, the effects of such technological leaps on people's living and working ways have been very fast and great (OECD, 2019a: 40).

Every process of technological change and transformation means a serious challenge for labour markets. Therefore, two questions have come to the agenda in examining the relationship between technological development and labour market. The first is whether technological change really destroy the jobs in certain sectors or not, or, to what extent it will create new job opportunities; the second one is what the effects of technological change are on labour force and employment in terms of certain sectors and occupations. In fact, digitalisation process, on the one hand, creates new jobs and increases employment in labour market, on the other hand, destroys some jobs, causing the unemployment problem to grow more and also changes the nature of jobs and leads to the change of labour demand in terms of quantity and quality.

The objective of this study is to examine, at an empirical level, the effect of digitalisation on total employment and different occupational groups classified by skills in the context of industrial and service sectors in Turkey. In this context, the study has been carried out by utilizing the data of the years 2010- 2019 and using panel data analysis method. In the first section of the paper, a literature summary is primarily included about the empirical studies in which the relationship between digitalisation and labour market was analyzed. Then, an explanation has been made about the data set, model and method of the study in which the effects of digitalisation process have been examined over total employment and occupational groups classified according to level of skills in industrial and service sectors in Turkey, and a detailed evaluation has been made over the obtained data.

2. DIGITALISATION AND ITS IMPACT ON EMPLOYMENT: LITERATURE REVIEW

Digitalisation has today the potential to bring radical changes together with it in terms of labour market. Although some of the main effects of digital technologies on labour market are already distinguishable at certain degree, their possible essential effects for the coming years remain uncertain. A complete agreement hasn't yet made related to the today's and future's possible effects of the changes,

which take place in parallel to the spread of digital technologies, over employment, and are being investigated both theoretically and empirically.

Within this context, two main approaches come to the forefront in the theoretical discussions related to the effect of digitalisation over employment. According to the first of these approaches, it is advocated that the developments in digital technologies can cause serious job losses, may make human labour increasingly unnecessary, so can increase unemployment in labour market. According to the other approach, while employment opportunities are argued to increase with digitalisation, this prediction is stated to depend generally on the fact that there take place new occupations, new jobs even new sectors as well as the increase of demand for new products and services. Accordingly, even if there are those individuals who lose their jobs because of the change in technology, it is suggested that new jobs will emerge in the fields in which new products and services are produced and technology will start a new period of prosperity. Thus, it is emphasised a possible unemployment problem caused by transformation can be compensated. However, it is foreseen that the nature of the job can change depending on digitalisation, therefore the skills the needed labour force should have will change considerably and suffer a change (The World Bank: 2016: 118; Balliester and Elsheikhi, 2018: 8; Frey and Osborne, 2013: 2-7; Degryse, 2016: 5-23; Nübler, 2016: 1-20; Hirsch-Kreinsen, 2016: 3-5).

In literature, there are a great number of empirical studies which support theoretical discussion mentioned above and which investigate the effects of digitalisation on labour force and employment. These empirical studies have been carried out in different countries and have concentrated on different aspects of digitalisation and labour market.

One of the first studies on this subject was performed by Atasoy (2013). In the study, the effect of the spread of broadband connection used in representation of technological development over labour market in 1999-2007 in the USA was examined. In the conducted study, it was concluded that there was a statistically significant and positive relationship between the access to broadband connection and employment. The obtained findings within this context showed that the access to broadband connection caused an increase of about 1.8% in the rate of employment. Also, it was emphasized that broadband technology and skilled labour force complement each other, the demand for skilled labour force increased as the broadband use got spread and, depending on this, the waged got increased. Accordingly, the findings of the study were stated to be compatible with the skill-biased technological change approach.

Frey and Osborne (2013), in their study in 2013 in which they investigated 702 detailed occupations and the possibility of them to be substituted by computerization, in other words, to be performed by computers, concluded that 47% of the current jobs in the USA are under high risk in the coming years. Because of the current and future technological developments, Frey and Osborne (2013), having adopted the occupation-based approach depending on the fact that occupations as a whole will suffer automation rather than the tasks in occupations, detected the high, medium and low risk occupations depending on their possibility to be carried out by computers. In the study, they revealed that the occupations with a large number of simple and repetitive tasks such as transportation, logistics, office services, and accounting are under high risks. Nevertheless, it was concluded that there is a strong negative relationship between the educational level required for the occupation and automation potential of the mentioned occupation.

Evangelista et al. (2014) analyzed the impacts of digitalisation on economic variables in EU-27 member countries between 2004-2008, using Generalized Method of Moments. Using a great number of variables reflecting different dimensions regarding digitalisation in the study, their impacts on labour

force productivity, Gross Domestic Product (GDP), total level of employment, and employment of certain disadvantaged groups (women, elderly, and long-period unemployed) have been examined. In the consequence of the study, it has been concluded that digitalisation can cause an increase in productivity and employment. Also, they suggested that the use of information and communication technologies support the participation of disadvantaged groups in labour market.

Using GMM-SYS method, Meschi et al. (2015) examined the effect of globalization and technological change in 1992-2001 period over skilled and unskilled labour force employment and wages in Turkish manufacturing sector. The findings obtained from the study showed that technology and commerce made positive contribution to creating employment in Turkish manufacturing sector. Also, the general results of the study were stated to support the hypothesis of skill-biased technological change. Accordingly, it was disclosed that with the effect of technological developments, the demand for skilled labour force and wage level of skilled labour force have considerably increased more than the demand for unskilled labour force and the wage level of this labour force.

Arntz et al. (2017), in their study in which they empirically examined the effect of cutting-edge digital technologies on total employment in Germany in 2011-2016 period, concluded that the mentioned technologies have positive but weak effect on employment. They obtained the finding that the technological investments of firms increased total employment by 0.17% on the average in a year in Germany, and this ratio was less than the half of the yearly average employment increase ratio (0.41%). Nevertheless, they found out that important structural changes appear between occupations and sectors in parallel to technological change; technology mostly causes a decrease in employment in occupations with routine task intensity, while it causes an increase in employment in occupations with non-routine task intensity; a growth occur in the employment of service sector depending on technological change.

Chiacchio et al. (2018) examined the effect of industrial robots on employment and wages in six EU countries (Finland, France, Germany, Italy, Spain, and Sweden) and concluded that the use of one additional robot for each one thousand workers decreases the employment rate by 0.16% - 0.20%. They also stated that especially young and middle school graduate-workers are affected by industrial robots' becoming widespread.

Houngbonon and Liang (2018), examined the impacts of the spread of broadband in manufacturing industry and service sub-sectors in France in 2009-2013 over employment through the use of the difference in difference estimation strategy. The obtained findings showed that the spread of broadband decreased the employment. Nevertheless, they actually emphasized that this negative effect on employment appeared especially in sub-sectors of manufacturing industry, on the contrary, the spread of broadband created employment in service sector. They also concluded that increasing the education level of workers contributes to decreasing the negative impact of the spread of broadband on employment and stressed the complementary role of education.

Balsmeier and Woerter (2019) examined the effects of investments in digital technologies such as robots, 3D printers, internet of things, enterprise resource planning over employment creation in Sweden with micro data at the firm level using Ordinary Least Squares method. At the end of the study, it was found that there is a significant relationship between the changes in the investments in digital technologies within the firm and the changes in employment. The obtained results showed that the investment made in digital technologies have a positive relationship with employment. Nevertheless, it was concluded that there is a positive relationship between the investment in digital technologies and the employment of high-skilled workers but there is a negative relationship between it and the employment of low-skilled workers. Also, it was determined that the main effect on employment was

caused almost by firms using machine-based digital technologies such as robots, 3D printers or the internet of things and that the use of not machine based digital technologies such as enterprise resource planning or e-commerce do not have significant effect on employment.

Aly (2020) analyzed, by using Feasible Generalized Least Squares method, the relationship between digital transformation and economic development, labour productivity and employment in selected developing countries among which there is Turkey. In the analysis, Digital Evolution Index was used as the indicator of digital transformation. In the consequence of the study, a significant positive relationship was determined to be between digital transformation and economic development, labour productivity and employment. Nevertheless, digital transformation was found to contribute to employment in developing countries.

Poliquin (2020) examined the effect of the firms' using broadband technology over employment and wages in Brasil in 2000-2019. In the study, it was noticed that the use of broadband had positive effect on employment at the firm level. Accordingly, it was determined that an increase of about 5.4% in employment and about 2.3% in wages took place together with the spread of broadband. In this study it was concluded that the wages increased at most for the employees who performed non-routine cognitive tasks in consistent with the skill-biased technological change approach.

Wijayanti and Turgel (2021) examined the impact of digitalisation on labour market in 2002-2017 in Indonesia, using panel regression analysis. In the conducted study, it was concluded that digitalisation could change the structure of labour market and reduce the employment rate. The obtained findings showed that the 1% increase that happened in the variable used as the indicator of digitalisation caused a decrease by 0.59% in the rate of employment. In the model formed in the study, mean years of schooling as the indicator of human capital was used as the explanatory variable. Depending on the obtained findings, it was revealed that there is a statistically significant and positive relationship between the increase in the mean years of schooling and employment rate; the increase in the mean years of schooling as the indicator of human capital was more effective in increasing the rate of employment than digital technology. Nevertheless, attention was drawn to the necessity of investments to be made about the development of human capital against several problems to be able to occur in the process of digitalisation such as unemployment, poverty.

The quantitative effect of robot technology on employment was examined by Aydın (2021) using the data of forty-seven countries during 2004-2016 period and dynamic panel data techniques. The results obtained from the study showed that there is a significant and negative relationship between the increase in robot use and employment.

Avom et al. (2021) examined the effect of information and communication technologies on employment in 2000-2017 in member countries of West African Economic and Monetary Union, using panel data analysis method. In the study, it was concluded that information and communication technologies disappeared, on the one hand, 0.03% of the jobs requiring low and medium level of skills and, on the other hand, emerged 0.05% of the high-skilled jobs. It was found out that information and communication technologies contributed to the emergence of qualified jobs. The obtained findings generally showed that information and communication technologies had positive effect on the creation of employment. Accordingly, emphasis was made on the role of education to benefit from the advantages the mentioned technologies provided.

Eder et al. (2022) examined the qualitative and quantitative effect of the spread of digital technologies on employment in Austria. At the end of the study, they reached the finding that because of digitalisation, the jobs disappearing in the next 10 years will probably be more than the appearing

jobs and the total employment will decrease by 0.80-4.81% compared to current employment. They stressed that the occupational and sectoral structure of employment will change as a result of the replacement of human labour by machines and the changing requirement of skills. The obtained findings showed that while digitalisation made positive effect on the increase of employment in high-skilled occupations, it had negative effect on employment in medium-skilled occupations. Also, it was emphasized that digitalisation would cause changed in sectoral distribution of employment and employment would pass on from the first and second sectors to third sector.

Hongmei et al. (2022), in their study, analyzed the effect of technological development represented by artificial intelligence on employment skill structure in China using the panel data of the years 2003-2017. According to the results of the analysis, it was determined that the developments in the field of artificial intelligence is considerably effective on the transformation of employment skill structure. The findings obtained in the study showed that the effects of mentioned developments differ in labour force classified in three categories as low, medium and high-skilled; their effect on the employment of low-skilled labour force has been negative, but their effect on the employment of medium and high-skilled labour force have been positive.

Considering the related literature, there are also studies in which the results were obtained related to digitalisation's decreasing the employment although there are studies in general which concluded that digitalisation had positive effect on employment. Nevertheless, in most of the studies in literature in general it can be stated that findings have been obtained related to the fact that the demand for skilled labour force increase in the process of digitalisation.

3. EMPIRICAL STUDY

In this section, the results of the study, in which we investigated the effects of digitalisation on total employment level and occupational groups classified according to different skill level, will be discussed. Within this context, primarily the method, data set and formed models used in the study were explained and then the findings obtained in the study were revealed and evaluated.

3.1. Method

In this study, the effects of digitalisation on total employment and occupational groups classified by skill levels in industrial and service sectors in Turkey have been investigated using panel data analysis method. Cross-sectional dependency was primarily tested in the analysis. Among the tests developed for testing cross-sectional dependency, there are Breusch-Pagan (1980) CD_{LM1} test, Pesaran (2004) CD_{LM2} test, and Pesaran (2004) CD_{LM} test.

The CD_{LM1} test developed by Breusch and Pagan (1980) to test cross-sectional dependency is calculated as follows;

$$CD_{LM1} = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{p}_{ij}^2 \sim X^2_{N.\frac{N-1}{2}} \qquad (1)$$

In the equation, $\hat{\rho}$, shows the example estimation of the dual correlation of the remains. Depending on the assumption that LM test does not have a cross-sectional dependency of Ho hyphothesis, when $T \to \infty$, N(N – 1)/2 can be applied in the event that it has chi-square distribution at the degree of freedom.

The CD_{LM2} test developed by Pesaran (2004) is calculated as follows;

$$CD_{LM2} = \sqrt{\frac{1}{N(N-1)}}\left[\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T\hat{p}_{ij}^2 - 1\right)\right] \sim N(0,1) \qquad (2)$$

The CD_{LM} test developed by Pesaran (2004) is calculated as follows;

$$CD_{LM} = \sqrt{\frac{2T}{N(N-1)}}\left[\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{p}_{ij}\right] \sim N(0,1) \qquad (3)$$

The existence of cross-sectional dependence is controlled with Breusch-Pagan (1980) $CDLM1$ test when time dimension is bigger than cross-section dimension (T>N); with Pesaran (2004) $CDLM2$ test when time dimension equals to cross-section dimension (T=N); with Pesaran (2004) $CDLM$ test when time dimension is smaller than cross-section dimension (T<N) (Yıldırım et al., 2013: 86).

In the study, after the cross-sectional dependency analysis, it was examined whether the slope coefficients are homogeneous or heterogeneous, with Hsiao (1986) test. Hsiao (1986) test works under three different hypothesis assumptions as H1, H2, and H3. According to these assumptions, zero hypothesis for H1 states that coefficients are homogeneous, while the alternative hypothesis for H1 states that coefficients are heterogeneous. Although H2 hypothesis is the same as H1 hypothesis and defends homogeneity, it states that its alternative is heterogeneous. H3 hypothesis, being different from the other hypothesis, depends on the assumption that its alternative is partially heterogeneous (Turgut and Uçan, 2019: 10).

Nevertheless, although it is necessary to fulfill the condition of stability in the series in macro panels with long cross-section (N) and long time series (T) dimensions in the panel data analysis depending on the data set structure, it is not necessary to fulfill the condition of stability in micro panels with long cross-section (N) and short time series (T) dimensions. In other words, in micro panels with short time series (T) dimension, it is not necessary to perform unit root test (Baltagi, 2021: 1-337; Hurlin and Mignon, 2007: 2; Yüksel, 2020: 639; Yıldız and Demireli, 2019: 422-423). Thus, the assumption of the stability of variables was disregarded in the analysis because the data set used in this study was a micro panel data set considering both the cross-section dimension (N=10) and time series dimension (T=10).

In order to determine the proper model to be able to be used in panel data analysis, Chow Test, Breusch-Pagan (1980) Lagrange Multiplier Test and Hausman (1978) Test were applied, and it was decided which one of Pooled Ordinary Least Squares model, fixed effects model, and random effects model would be used for prediction according to the results of the mentioned tests.

Panel data models should have basic assumptions. The deviations from basic assumptions are the problems of heteroscedasticity, autocorrelation and cross-sectional dependency. Making predictions by disregarding these problems prevent the efficiency because it will cause parameter variances therefore standard errors to be deviated. Therefore, the presences of the deviations from these assumptions should primarily be tested and then predictions should be made with proper methods in the event of their presences (Güriş et al., 2017: 185; Yerdelen Tatoğlu, 2020: 227-229). In this study, Levene (1960), Brown and Forsythe (1974) tests were used to test the presence of heteroscedasticity in predicted models. The presence of autocorrelation in predicted models was examined with Durbin Watson (DW) test. Another problem causing deviations from assumptions, the presence of cross-sectional dependency was tested with Pesaran CD_{LM2} test in this study.

The variance covariance matrix of the error term is no longer a unit matrix in the event that deviations from assumptions are encountered in the predicted model. Therefore, standard errors should be corrected (resistant standard errors should be used) or predictions should be made with proper methods in the presence of at least one of the heteroscedasticity, autocorrelation or cross-sectional dependency in the model (Yerdelen Tatoğlu, 2020: 229-303). In this study, the presence of heteroscedasticity, autocorrelation and cross-sectional dependency was tested in predicted models and these problems were seen to be existent. Thus, in this study, "Panel Corrected Standard Errors (PCSE)"

method proposed by Beck and Katz (1995) in the presence of these problems was used (Beck and Katz, 1995: 634-646; Zolfaghari et al., 2020: 1157).

Lastly, it is necessary to test whether or not the error terms are distributed normally (Yerdelen Tatoğlu, 2020: 261). In this study, in order to test to normal distribution assumption, Jarque-Bera test proposed by Jarque and Bera (1987) was used. The zero hypothesis of the test is 'the error terms are distributed normally', concluding that the error terms are distributed normally if the zero hypothesis cannot be refused.

3.2. Data Set

In this study, it was aimed to estimate the severity of parameters showing the effects of digitalisation on total employment and occupational groups classified according to skill levels within the context of industrial and service sectors in Turkey. A large number of indicators representing digitalisation can be used in the studies about the process of digitalisation. But, it is not possible to properly and neatly achieve a substantial part of the data related to these indicators. Digitalisation shows itself primarily with the increase of computer and internet use. Therefore, in literature (Andrews et al., 2018; Nicoletti et al., 2020; EC, 2021; Lepore et al., 2021; Myovella et al., 2020; Banga and Willem te Velde, 2018; Bellakhal and Mouelhi, 2020; Castro Vergara and Marquina Feldman, 2018; Tolkachev et al., 2020; EC, 2020; OECD, 2019b; OECD, 2014; Katz et al., 2013; Milosevic et al., 2018; Lanyi et al., 2021; Camara and Tuesta, 2017; Taymaz, 2018; Anderton et al., 2020; Chobanova and Kocarev, 2019) the access to broadband connection and web site ownership comes to the forefront among various indicators in terms of representing digitalisation. In this study, broadband connection and web site ownership as the indicator of digitalisation have been preferred and used considering the orderliness and accessibility of data.

Considering literature, education and occupation are generally used as proxy variables representing the skill level in empirical studies. Occupation can provide more information about the skill level required for employees to have (Colecchia and Papaconstantinou, 1996: 8; Hertveldt and Michel: 2013: 401). Besides, there is a current literature information regarding that the prediction power of occupational categories are more in measuring the skill level in the studies related to labour market (Marin and Vona, 2019: 5).

Depending on the involved literature, International Standard Classification of Occupations (ISCO) (ILO, 2012; ILO, 2016) was used developed by International Labour Organization (ILO) in examining the effect of digitalisation on occupational groups in this study. ISCO classifies jobs into different categories using skills levels and skills specialization as the main criteria. It assigns one of 4 skills levels to each of the major ISCO occupational groups: level 1 for elementary occupations (ISCO 9), level 2 for medium-skilled occupations (ISCO 4-8), level 3 to medium high skilled occupations (ISCO 1 and 3) and level 4 to high-skilled occupations (ISCO 1 and 2). For reasons of simplicity, occupational groups are often aggregated further into three skills levels (ISCO 1-3 for high-skilled, ISCO 4-8 for medium-skilled and ISCO 9 for low-skilled) (Sekmokas et al., 2020: 11; Vandeplas and Thum-Thysen, 2019: 14). Within this context, occupational groups have been examined by being categorized in three groups as high, medium and low-skilled according to the skill levels. High-skilled occupations are composed of managers, professionals, technicians and associate professionals; medium-skilled occupations are composed of clerical support workers, service and sales workers**,** skilled agricultural, forestry and fishery workers, craft and related trades workers**,** plant and machine operators, and assemblers; low-skilled occupations are composed of elementary occupations.

In the study the period of 2010-2019 has been examined and the data of this period has been used. The data of the indicators representing digitalisation were obtained from Survey on Information and Communication Technology (ICT) Usage in Enterprises conducted by Turkish Statistical Institute (TURKSTAT). With Survey on Information and Communication Technology (ICT) Usage in Enterprises, according to Statistical Classification of Economic Activities in the European Community (Nace Rev.2), data are collected regarding the following sectors; (i) Manufacturing, (ii) Electricity, gas and steam, water supply, sewerage and waste management, (iii) Construction, (iv) Wholesale and retail trade; the repair of motor vehicles and motorcycles, (v) Transportation and storage, (vi) Accommodation and food service activities, (vii) Information and communication, (viii) Real estate activities, (ix) Professional, scientific and support activities, (x) Administrative and support activities (TURKSTAT, (2020)). In this regard, while this study contains all other sub-sectors apart from Mining and Quarrying sub-sector related to the industrial sector, it contains all sub-sectors apart from Nace Rev.2 64-66 and Nace Rev.2 84-99 in services sector in parallel to the data that can be obtained from Survey on Information and Communication Technology (ICT) Usage in Enterprises.

In the study, the employment data were obtained from Household Labour Force Survey Micro Data Set[2] carried out by TURKSTAT. In LFS, 522.171 people participated in 2010; 511.076 people in 2011; 510.807 in 2012; 502.426 in 2013; 393.822 in 2014; 389.035 in 2015; 380.709 in 2016; 378.691 in 2017; 374.172 in 2018 and 366.551 people participated in 2019. In order to reach predictions and to reach conclusions at Turkey level from the information in Household Labour Force Survey Micro Data Set, data sets were weighed using weighting coefficient defined by TURKSTAT. The analysis of data sets used in the study were made with E-Views 12 package program.

3.3. Model

In the study four different econometric models have been formed in line with the dependent and independent variables used to predict the effect of digitalisation over total employment and occupational groups classified according to skill level within the context of sub-sectors of two main sectors as industry and service sectors in Turkey. With Model 1 the effect of digitalisation on total employment has been analyzed within the context of discussed sectors in Turkey. With Model 2, Model 3, and Model 4, the effect of digitalisation on occupational groups in terms of skill level has been resolved. The natural logarithms of dependent variables used in the study have been taken (the logarithms depending on e base). Within this frame, the equations representing the models giving the relationship among the variables are given below:

$$\text{Model 1: } \ln TI_{it} = \beta_o + \beta_1 X1_{it} + \beta_2 X2_{it} + u_{it}, \quad i=1,2,...,10 \quad t=1,2,...,10 \quad (4)$$

$$\text{Model 2: } \ln YV_{it} = \beta_o + \beta_1 X1_{it} + \beta_2 X2_{it} + u_{it}, \quad i=1,2,...,10 \quad t=1,2,...,10 \quad (5)$$

$$\text{Model 3: } \ln ORV_{it} = \beta_o + \beta_1 X1_{it} + \beta_2 X2_{it} + u_{it}, \quad i=1,2,...,10 \quad t=1,2,...,10 \quad (6)$$

$$\text{Model 4: } \ln DV_{it} = \beta_o + \beta_1 X1_{it} + \beta_2 X2_{it} + u_{it}, \quad i=1,2,...,10 \quad t=1,2,...,10 \quad (7)$$

In the first model formed in the study, "TI", "X1", "X2" respectively represents total employment which is the dependent variable, and the rate of enterprises with broadband connection to

[2] There have been some changes in the Household Labour Force Survey Micro Data Set used in the study during the 2010-2019 period. In the dataset, "Which job or occupation are you looking for?" while the answers to the question were created with reference to the ISCO 08 occupational classification since 2012, the answer to this question in the datasets of 2010 and 2011 was created with reference to the ISCO 88 occupational classification. But, considering that the time dimension of the data belonging to the variables used in the research should not decrease further, the relevant data for the years 2010-2019 were taken as basis. Therefore, it would be correct to evaluate the results obtained within the scope of the research without ignoring the mentioned limitation.

those with total internet connection and the rate of enterprises with web sites[3] to total enterprises, which are independent variables. In the other three models, while the dependent variables are employment in occupational groups requiring different skill levels, independent variables are composed of variables used in the first model. In the mentioned models, "YV", "ORV", "DV" represents employment high, medium and low-skilled occupations, respectively.

4. FINDINGS

The findings obtained at the end of the study are summarized through the tables given below. Primarily, the definitive statistics of all dependent and independent variables used in the study such as arithmetic mean, standard deviation, minimum and maximum values, total number of observations are presented in Table 1 as brief information.

Table 1: Definitive Statistics

Variables	lnTI	lnYV	lnORV	lnDV	X1	X2
Mean Value	13.71970	12.17782	13.06926	11.52971	93.09601	63.62960
Standard Deviation	1.095561	0.869734	1.404695	1.567480	4.901680	11.99714
Minimum Value	11.01161	10.47246	9.232004	7.521318	77.69923	43.74339
Maximum Value	15.47023	13.93526	15.12926	13.54263	99.99996	93.78910
Number of Observations	100	100	100	100	100	100

In Table 1 there are brief data such as arithmetic mean, standard deviation, minimum and maximum values, total number of observations. When the dependent variables are examined, the variable with the highest standard deviation is observed to be InDV representing employment in low-skilled occupations in industry and service sectors in Turkey, while the variable with the lowest standard deviation is observed to be InYV expressing employment in high-skilled occupations in the mentioned sectors. While the minimum and maximum values of X1 variable representing the share of enterprises with broadband connection in industry and service sectors in Turkey were 77.69% and 99.99%, the mean value occurred as 93.09%. While the minimum and maximum values of X2 variable representing the share of the enterprises having web sites in the mentioned sectors were 43.74% and 93.78%, the mean value occurred 63.62% level.

After the definitive statistics about the variables in the data set, it was investigated whether there is a cross-sectional dependency or not in variables. In order to test the cross-sectional dependency, three different tests were applied such as Breusch-Pagan (1980) CD_{LM1} test, Pesaran (2004) CD_{LM2} test and Pesaran (2004) CD_{LM} test. The results obtained from the tests made for determining the cross-sectional dependency are given in Table 2.

[3] In the Survey on Information and Communication Technology (ICT) Usage in Enterprises carried out by TURKSTAT although the enterprises using social media application were considered to be the enterprise with web site before 2019, the usage of web site and social media applications have been measured separately from 2019 onwards. Therefore, the social media applications are also contained in web site content in the data of enterprises with web site, used in the study.

Table 2: Cross-Sectional Dependency Test Results

	Tests	Variables					
Model 1		lnTI		X1		X2	
		Test Statistic	Probability Value	Test Statistic	Probability Value	Test Statistic	Probability Value
	CD_{LM1} (Breusch-Pagan 1980)	281.0495	0.0000	192.7987	0.0000	299.8147	0.0000
	CD_{LM2} (Pesaran 2004 CD_{LM})	24.8818	0.0000	15.57935	0.0000	26.85983	0.0000
	CD_{LM} (Pesaran 2004 CD)	16.45586	0.0000	13.27646	0.0000	17.00323	0.0000
Model 2		lnYV		X1		X2	
		Test Statistic	Probability Value	Test Statistic	Probability Value	Test Statistic	Probability Value
	CD_{LM1} (Breusch-Pagan 1980)	203.6642	0.0000	192.7987	0.0000	299.8147	0.0000
	CD_{LM2} (Pesaran 2004 CD_{LM})	16.72468	0.0000	15.57935	0.0000	26.85983	0.0000
	CD_{LM} (Pesaran 2004 CD)	8.521608	0.0000	13.27646	0.0000	17.00323	0.0000
Model 3		lnORV		X1		X2	
		Test Statistic	Probability Value	Test Statistic İstatistiği	Probability Value	Test Statistic	Probability Value
	CD_{LM1} (Breusch-Pagan 1980)	292.8379	0.0000	192.7987	0.0000	299.8147	0.0000
	CD_{LM2} (Pesaran 2004 CD_{LM})	26.12441	0.0000	15.57935	0.0000	26.85983	0.0000
	CD_{LM} (Pesaran 2004 CD)	11.43238	0.0000	13.27646	0.0000	17.00323	0.0000
Model 4		lnDV		X1		X2	
		Test Statistic	Probability Value	Test Statistic	Probability Value	Test Statistic	Probability Value
	CD_{LM1} (Breusch-Pagan 1980)	126.8572	0.0000	192.7987	0.0000	299.8147	0.0000
	CD_{LM2} (Pesaran 2004 CD_{LM})	8.628508	0.0000	15.57935	0.0000	26.85983	0.0000
	CD_{LM} (Pesaran 2004 CD)	2.286585	0.0000	13.27646	0.0000	17.00323	0.0000

In Table 2, the alternative hypothesis as "there is cross-sectional dependency" is tested in opposition to the zero hypothesis as "there isn't cross-sectional dependency" for three tests applied to test whether there is cross-sectional dependency or not in variables in the models. When the results in the Table are examined it is seen that the probability value calculated in all tests made for cross-sectional dependency is less than 0.01 value. In the study, CD_{LM2} test results were taken into consideration because time dimension (T) equals to cross-section dimension (N). Accordingly, the zero hypothesis as 'there isn't cross-sectional dependency' is denied. Therefore, it is concluded that there is cross-sectional dependency in variables.

Hsiao (1986) test was applied in order to test the homogeneity of slope coefficients after the cross-sectional dependency analysis. In Table 3, there are homogeneity analysis results conducted for each model.

Table 3: Homogeneity Test Results

	Hypothesis	F-Statistic	Probability Value
Model 1	H1	184.4477	7.84E-55
	H2	3.990342	1.47E-05
	H3	338.3854	2.83E-64
Model 2	H1	121.1488	1.37E-48
	H2	4.587366	1.87E-06
	H3	204.3349	5.19E-55
Model 3	H1	127.4907	2.41E-49
	H2	7.118042	7.72E-10
	H3	163.5574	5.44E-51
Model 4	H1	89.93849	3.28E-44
	H2	3.537729	7.36E-05
	H3	172.9599	5.37E-52

According to the results of Hsiao (1986) test in Table 3, zero hypothesis, in which the homogeneity was accepted in all three hypothesis as H1, H2, and H3, is denied at 1% significance level. Within the frame of these probability values, although the zero hypothesis is denied for H1 and H2, the alternative is accepted as heterogeneity. Partial heterogeneity, an alternative hypothesis for H3, is accepted and the coefficients are concluded to be heterogeneous.

While performing the model selection in panel data analysis, it was decided by performing Chow Test, Breusch-Pagan (1980) Lagrange Multiplier Test and Hausman (1978) Test to determine which of the Pooled Ordinary Least Squares model, fixed effects model or random effects model would be used for prediction. The results of the tests are shown in Table 4.

Table 4: The Results of the Panel Data Model Selection Analysis

	Test	Statistic	Probability Value
Model 1	Chow Test	338.385424	0.0000
	Breusch-Pagan Lagrange Multiplier Test	318.1758	0.0000
	Hausman Test	4.478337	0.1065
Model 2	Chow Test	204.334910	0.0000
	Breusch-Pagan Lagrange Multiplier Test	403.3660	0.0000
	Hausman Test	0.214173	0.8984
Model 3	Chow Test	163.557429	0.0000
	Breusch-Pagan Lagrange Multiplier Test	276.2833	0.0000
	Hausman Test	5.867933	0.0432
Model 4	Chow Test	172.959864	0.0000
	Breusch-Pagan Lagrange Multiplier Test	248.8844	0.0000
	Hausman Test	8.113362	0.0173

At the stage of selecting the proper model, Chow Test was applied to be able to make a selection between the Pooled Ordinary Least Squares model and fixed effects model. According to the results of the Chow Test in Table 4, the zero hypothesis which states that Pooled Ordinary Least Squares model was proper was rejected because the probability values of all models were less than the critical value 0.01, and fixed effects model was preferred.

Afterwards, Breusch-Pagan (1980) Lagrange Multiplier Test was applied to determine which one of the Pooled Ordinary Least Squares model and random effects model should be preferred. In accordance with the results of Breusch-Pagan (1980) Lagrange Multiplier Test in Table 4, the zero hypothesis which states that Pooled Ordinary Least Squares model was proper was rejected because the probability values of all models were less than the critical value 0.01, and random effects model was preferred.

Finally, Hausman (1978) Test was applied to be able to make a selection between fixed effects model and random effects model. The results of Hausman (1978) Test showed difference in the models. According to the Hausman (1978) Test results in Table 4, the zero hypothesis as 'random effects model is efficient' couldn't be rejected because the probability values of Model 1 and Model 2 were higher than the critical value 0.05. Therefore, in predicting the panel data model for the mentioned models, it was decided that random effects model was proper to use. According to the test results of Model 3 and 4, the zero hypothesis as 'random effects model is efficient' was rejected because the probability values are lower than the critical value 0.05. Thus, in the prediction of these models it was decided that fixed effects were proper to use.

It was tested whether there were the problems of heteroscedasticity, autocorrelation and cross-sectional dependency or not in the models predicted in the light of these findings, and the results are shown in Table 5.

Table 5: The Test of Deviations from Assumptions

	Heteroscedasticity		Autocorrelation		Cross-Sectional Dependency	
Model 1	Levene	5.186409* [0.0000]	DW	0.581	CD_{LM2}	4.303937* [0.0000]
	Brown-Forsythe	2.459637* [0.0149]				
Model 2	Levene	9.833758* [0.0000]	DW	0.405	CD_{LM2}	15.04099* [0.0000]
	Brown-Forsythe	2.988343* [0037]				
Model 3	Levene	9.395361* [0.0000]	DW	0.572	CD_{LM2}	7.961622* [0.0000]
	Brown-Forsythe	2.279433** [0.0237]				
Model 4	Levene	13.93557* [0.0000]	DW	2.162	CD_{LM2}	2.884210* [0.0039]
	Brown-Forsythe	2.769109* [0.0066]				

Notes: *, **, *** express the statistical significance at 1%, 5% and 10% significance levels, respectively. The values in brackets […] express the probability values.

Levene (1960), Brown and Forsythe (1974) tests were applied to test the assumption of heteroscedasticity in models predicted in the study. According to the results in Table 5, the zero hypothesis 'the variance of the units is equal' was denied because the probability values for both tests in all models were lower than 0.05, and it was concluded that there was heteroscedasticity in all models. Nevertheless, it is observed that DW statistical values about testing the presence of autocorrelation which is another assumption in the models predicted in Table 5 are 0.581 for Model 1; 0.405 for Model 2; 0.572 for Model 3; 2.162 for Model 4. For 100 numbers of observations (n=100) and 2 independent variables (k=2), dL (low) limit value is 1.634 and dU (up) limit value is 1.715 for DW statistic at 0.05 significance level. According to these values, because DW statistical values (0.581, 0.405, and 0 572, respectively) related to the predicted Model 1, 2, and 3 are lower than dL value (1.634) (0<d<dL), it was concluded that cited models had positive autocorrelation. Since DW statistical value related to Model 4 (2.162) falls into the field expressing the absence of autocorrelation (dU<d<4-dU), it was concluded that there wasn't autocorrelation in the model. Finally, CD_{LM2} test was applied in order to test the presence of cross-sectional dependency in the models. According to the test results in Table 5, the zero hypothesis 'there isn't cross-sectional dependency' was rejected because the calculated probability value was lower than the critical value 0.01, and it was concluded that there was a cross-sectional dependency problem in all models.

According to the results in Table 5, it was found that there was autocorrelation problem in each model except for Model 4 besides the heteroscedasticity and cross-sectional dependency in all models. The mentioned equations were predicted and the results of the predictions were given in the Table 6, using PCSE estimator giving efficient and consistent predictions with standard errors resistant to these effects ruining the feature needed to be carried by estimators.

Table 6: Analysis Results

Model 1	Dependent Variable: lnTI	
	Variables	Coefficients
	X1	0.008189* [2.634836]
	X2	0.005617* [6.401261]
	C	12.59996* [51.09482]
	R square: 0.996505 Adjusted R square: 0.996069 F-Statistic: 2281.245 (Prob: 0.000000) Jarque-Bera: 3.483944 (Prob: 0.175175)	
Model 2	Dependent Variable: lnYV	
	Variables	Coefficients
	X1	0.012121*** [1.884685]
	X2	0.007311** [2.439331]
	C	10.58420* [25.85702]
	R square: 0.147463 Adjusted R square:0.129885 F-Statistic: 8.389016 (Prob: 0.000436) Jarque-Bera: 4.308539 (Prob: 0.115988)	
Model 3	Dependent Variable: lnORV	
	Variables	Coefficients
	X1	0.000379 [0.084884]
	X2	0.013658* [6.577910]
	C	12.16487* [37.94663]
	R square: 0.991911 Adjusted R square: 0.990900 F-Statistic: 981.0070 (Prob: 0.000000) Jarque-Bera: 3.578789 (Prob: 0.167061)	
Model 4	Dependent Variable: lnDV	
	Variables	Coefficients
	X1	0.004661 [0.546674]
	X2	0.008620** [2.322104]
	C	10.54724* [16.19220]
	R square: 0.977922 Adjusted R square: 0.975162 F-Statistic: 354.3495 (Prob: 0.000000) Jarque-Bera: 1.854076 (Prob: 0.395724)	

Notes: *, **, *** express statistical significance at 1%, 5% and 10% significance levels, respectively. The values in brackets […] state t statistics.

Considering the prediction results of the models composed in the survey in Table 6, it is seen that according to the results of F statistics, all models were statistically significant at 1% level. According to the prediction results of Model 1 and Model 2, the coefficients of X1 and X2 variables are statistically significant. It was found that there was a statistically significant and positive relationship between 'the rate of enterprises with broadband connections', 'the rate of enterprises with web sites' and total

employment and employment in occupations requiring high level of skills. An increase of 1 point in the rate of enterprises with broadband connections and in the rate of the enterprises with web sites in industrial and service sectors in Turkey leads to an increase of 0.008189% and 0.005617% in total employment respectively; 0.012121% and 0.007311% in employment in occupational groups of high-skilled, respectively.

The prediction results of Model 3 and Model 4 shows that the coefficient of X2 variable was statistically significant. It was found that there was statistically significant and positive relationship between 'the rate of enterprises with web sites' and the employment in occupations requiring medium level of skills and the employment in occupations requiring low level of skills. An increase of 1 point in the rate of enterprises with web sites in the industrial and service sectors in Turkey leads to a increase of 0.013658% in employment in occupational groups requiring middle-level of skills in the cited sectors; an increase of 0.008620% in employment in occupational groups requiring low-level of skills. It was found that the increase in the rate of enterprises with broadband connections had statistically insignificant effect on employment in occupations of middle and low level of skills.

In conclusion, according to the Jarque-Bera (1987) test results related to testing whether the error terms of models in Table 6 are distributed normally or not, the zero hypothesis as 'error terms are distributed normally' cannot be rejected because probability value was higher than the critical value of 0.05. Accordingly, it is concluded that error terms of all models were distributed normally.

According to the findings achieved in the study, 'flexibility' was used to measure the susceptibility to change in digitalisation of employment. The flexibility coefficient was calculated according to the obtained parameters because parameters of logarithmic linear models used in the analysis didn't give direct flexibility. Within this context, the severity of the parameters showing the effects of digitalisation on total employment and occupational groups classified according to skill level in terms of industry and service sectors in Turkey in 2010-2019 period has been accounted using the involved formula, and its results have been given below.

Model	**Flexibility**	
$InY= \beta_o + \beta_1X1+ \beta_2X2$	$\beta_1\Sigma(X)$	$\beta_2\ \Sigma(X)$
$InTI= \beta_o + \beta_1X1+ \beta_2X2$	0.76236	0.52292
$InYV= \beta_o + \beta_1X1+ \beta_2X2$	1.12841	0.68062
$InORV= \beta_o + \beta_1X1+ \beta_2X2$		1.27150
$InDV = \beta_o + \beta_1X1+ \beta_2X2$		0.802488

According to the above-results, when Model 1 is taken as a basis, an increase of 1% in the rates of enterprises with broadband connections and the enterprises with web sites among total enterprises in industrial and service sectors in Turkey in 2010-2019 period caused an increase 0.76236% and 0.52292% in total employment, respectively. In accordance with this finding achieved within the varieties used as the indicators of digitalisation in this study, it can be said that the flexibility of total employment against digitalisation was lower than 1 considering the last decade. However, according to the results of Model 2, an increase of 1% in the rates of enterprises with broadband connections and enterprises with web sites among total enterprises created an increase of 1.12841% and 0.68062% in employment in occupations of high-skilled. According to the results of Model 3 and Model 4, an increase of 1% in the rate of enterprises with web sites in the cited period in the mentioned sectors caused an increase of 1.27150% and 0.802488%, respectively, in employment in the occupations of middle and low-skilled. According to these achieved data, the susceptibility that the employment in occupations requiring different skill levels showed against change that occurred in the ten-year period in variables representing the indicator of digitalisation shows difference.

CONCLUSION

In the period in which we live just like in the past, the potential of any kind of essential changes- which emerges in parallel to the change in technology- to create important effects on employment is discussed with the concept of digitalisation today. One of the most important fields affected by digitalisation is actually the labour markets. In fact, while in this period in which production processes and service provision have transformed, traditional jobs and standard forms of employment disappear, job losses are encountered in certain sectors and features of labour and the required skills become different. In this study, the effects of digitalisation process on labour markets have been examined in the context of especially sectoral employment and skills and occupations in the example of Turkey. The effects of digitalisation over total employment and different groups of occupations classified according to level of skills in industrial and service sectors in Turkey between the years 2010-2019 have been investigated using panel data analysis method.

With the research it has been concluded that digitalisation has positive effects on employment increase in general in the sub-sectors of two main sectors as industry and services in a period of decade in Turkey. This conclusion is compatible with the optimistic approach in literature suggesting that digitalisation will affects employment positively. Nevertheless, considering the spread of broadband connection used as the main indicator of digitalisation in the study, the mentioned effect has been observed to be caused by high-skilled occupations in the analysis made on sectoral basis. The obtained results show that the rate of increase created in the employment of high-skilled occupations with the spread of broadband connection access is higher than that of the total employment. Also, considering the broadband connection, the flexibility of total employment against digitalisation has been accounted as 0.76. According to the mentioned flexibility coefficient, an increase of 1% in digitalisation in a decade in the mentioned sectors has been found to cause an increase less than 1% in total employment.

Nevertheless, the findings of the study have shown within the frame of mentioned sectors that the effect of digitalisation on employment in occupations requiring high, medium and low level of skills are different. In fact, the spread of broadband connection used as the main indicator of digitalisation in the study has positive effects on employment increase in occupations requiring high level of skills, while it does not have a significant effect on employment in occupations requiring medium and low level of skills. Nevertheless, in the firms functioning in the mentioned sectors, the spread of web site ownership has been observed to have a positive effect on employment increase in occupations of medium and low level of skills.

In the study, the flexibility coefficient has been accounted to measure the sensitivity of employment in occupations requiring different levels of skills against change that has taken place in a decade in the indicator representing the digitalization. Accordingly, considering the broadband connection, the flexibility of employment in high-skilled occupations against digitalisation has been accounted as 1.12. The mentioned coefficient shows that employment in high-skilled occupations is highly sensitive to the increase at digitalisation level. Nevertheless, considering the web site ownership used as another indicator of digitalisation, the flexibility of employment in medium-skilled occupations against digitalisation has been accounted as 1.27. The cited flexibility coefficient can be interpreted as the indicator that employment in occupations requiring medium-level of skills is highly sensitive to the increase of the firms utilizing digital facilities in general. Within this context, it can be defended that more skilled labour demand and employment have increased in general together with the increase in digitalisation level in years in the firms functioning in the discussed sectors in Turkey. From this aspect, the obtained results are of the character that supports “the skill-biased technological change approach”, generally accepted in literature.

Therefore, in Turkey, in the demand for labour at sectoral level in parallel to the spread of digital technologies a change both in terms of quality and quantity can be predicted to be inevitable. Although digitalisation has positive effects on total employment in general in the analysis made with the variables used for 2010-2019 period within the frame of the sectors discussed in this study, it is possible for the need for human labour to get decreased and for a certain risk of unemployment in certain sectors to be encountered together with the application of more developed digital technologies in the coming years. Naturally, the labour force with different education and skill levels will differ in the level and manner of being affected in this period. Therefore, in parallel to the spread of digital technologies, it is possible for the demand to increase towards the labour force with higher education and skill level than the labour force not having enough education and skill level in labour market.

In parallel to digitalisation process, it is necessary to fulfill the policies and arrangements to enable employment to be preserved and increased in labour market. Within this frame, there is a need for vocational training policies in the center of which there is the gaining of digital skills towards the gaining skill required by new jobs created in economy to unskilled labour force that can encounter the threat of job losing in the sectors with the increase in digital technology use. These policies will both meet the skilled labour need compatible with the changing labour market's requirements and make possible the employability of labour force that will become more disadvantaged with the acceleration of digitalisation.

Nevertheless, all individuals should have equal opportunities in order to be able to adapt to changing labour market and skill requirement. Therefore, the social policies to provide opportunity equality should also be put forward. These policies will enable more people to benefit from new job opportunities expected to be created just as they can decrease the risks to be encountered in the event of potential job losses. At the same time, they will be able to prevent digitalisation from reinforcing the inequalities between the skilled labour force with skills needed to work with new technologies in the long run and the unskilled labour force not having developed these skills for different purposes. Thus, they will make serious contribution to taking place of social balance, equality and justice.

Ethical Statement

During the writing and publication of this study, the rules of Research and Publication Ethics were complied with, and no falsification was made in the data obtained for the study. Ethics committee approval is not required for the study.

Contribution Rate Statement

The article was produced from the first author's doctoral thesis. The second author is the PhD thesis advisor and contributed to the editing of the article.

Conflict Statement

This study has not led to any individual or institutional/organizational conflict of interest.

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