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Evaluation of the Transition Process of Industry 4.0 in Automotive Supplier Industry

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Abstract

The fourth industrial revolution is defined as the processes of full automation and digitization. The automotive industry, which is one of the most experienced and applied technological developments, takes its competitiveness power from these transformations. Automotive supplier industry, which is an industry branch with the supplier of parts and piece provided to the automotive sector, is one of the fastest developing areas of technology. By automating the production processes of automation and smart processes, it is possible to increase the productivity in the enterprises and to produce products in accordance with international standards. Besides the positive effects of the fourth industrial revolution on enterprises, there are also high cost effects. Businesses are hesitant to integrate the industry 4.0 processes due to these effects. In this study, the difficulties experienced in adapting to the industry 4.0 processes of the enterprises in the automotive supplier industry are analysed. In this study, it is aimed at evaluating these challenges with surveys conducted in Turkey with the province in the Konya and statistical analysis of this questionnaire. The enterprises that take into account the results obtained from the analysis are allowed to shape their strategic objectives in order to overcome these difficulties.

Keywords: Industry 4.0, automotive supplier industry, enterprises behaviour, statistical analysis

1. Introduction

With the industrial revolutions, there have been radical changes in technology and production patterns. The introduction of automation processes, electronics and information technologies into the transformations in machine and manual labor is led to the fourth industrial revolution. This development, which is referred to as Industry 4.0, is led to the emergence of concepts such as the internet of objects, big data, artificial

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intelligence. The dynamic development process of Industry 4.0 is a result of the change of technology, excessive competition, the variability of customer demands, and the formation of too much data which is difficult to control (Bulut and Akcaci, 2017). The term Industry 4.0, referred to as the fourth industrial revolution, is the digitization of the entire value chain, particularly in the manufacturing industry. This digitalization in the industrial revolution brought with it a lot of data. Globalization has started to transform the countries in a harmonious manner with the technology. The necessity of analyzing big data and the process of globalization is led to the formation of an information society. From a sectoral perspective, the automotive sector is one of the sectors where the globalization effect is the most common. The place of human life in an important position and the continuous renewal of demand according to changing demands is made the automotive products a compulsory consumption product. Automotive industry is seen as an important step in development in terms of inputs used in production, inter- sectoral links and employment rate (Çoban, 2007). From this point of view, the automotive sector is one of the areas where competition is the most experienced in the world. It is one of the industries where the technology is used most, and the ways of production are constantly changing. In this sector, where the effects of Industry 4.0 are experienced most, the difficulties experienced by the enterprises in the transformation processes are increasing. In this study, it is aimed to analyze the difficulties encountered in the transformation process and the transformation process in the automotive sector. The aim of this study is to analyze the approaches of the enterprises towards the changes in economic and system performance in the Turkish automotive supplier industry. In this context, statistical evaluation is made in order to analyze the approaches of the enterprises in the automotive supplier industry in the province of Konya towards the industry 4.0 and to analyze their integration capabilities to their own systems. According to the researches, no statistical evaluation of the transition process of the enterprises to industry 4.0 is found in the literature. This study contributes to the literature because both the study is first in this context and important in terms of the sector. With this study, enterprises realize how the process of integration of industry 4.0 and their approaches towards these processes actually affect the adoption of processes. In this study, automotive supplier industry enterprises operating in Konya province are surveyed. In this survey, the perceptions of the enterprises are measured by the scale test. With this scale, whose reliability and validity are tested, the difficulties of the enterprises in the industry are evaluated.

Considering the impact of the technological developments with industrial revolutions on industrial productivity (Rüßmann et al., 2015), it is understood by the enterprises that it is inevitable to adapt to the innovations that will change the profile of the workforce. The introduction of the concept of Industry 4.0 into world literature has shifted the interest of researchers not only in the enterprises (Roblek et al., 2016). Different literature reviews have been made for defining the concept and scope of the Industry 4.0 framework (Rüßmann et al., 2015); (Roblek et al., 2016); (Lasi

et al., 2014); (Faller and Feldmüller, 2015); (Hozdić, 2015); (Zhou et al., 2015); (Brettel et al., 2014); (Stock and Seliger, 2016); (Qin et al., 2016); (Liao et al., 2017); (Liu and Xu, 2017); (Zhong et al., 2017); (Xu et al., 2018). Talking about developments in technology Lasi et al. (2014), are discussed the concept of industry 4.0 in terms of development aspects. They talked about the different applications in manufacturing systems and mentioned the multifaceted organizational effects of the framework that industry 4.0 implements in production processes. At the same time, the emergence of enterprises that adopt new special roles in the production processes with industry 4.0 can be given as an example of changes in service and production systems. These new business lines (Lasi et al., 2014); (Stock and Seliger, 2016), which have emerged in order to respond to different expectations and requests of customers, are also seen as the effects of the current globalization. Stock and Seliger (2016) are made a literature study that touches on the difficulties experienced in the industry and differentiated production processes in enterprises. The sustainability of these different production processes can be achieved by keeping up with the technological developments. These studies, which offer an overview of these opportunities brought by Industry 4.0, enable enterprises to shape their production processes. Qin et al. (2016) are examined the vision and concept of industry 4.0 in 4 dimensions. Studies (Liao et al., 2017); (Xu et al., 2018); (Liu and Xu, 2017); (Zhong et al., 2017); (Xu et al., 2018) are describe their definitions of the concept of industry 4.0 in the framework of Figure 1. When the concept of service is added to these dimensions, it can be said that all these production and service processes, as well as the environments where they are formed, are gathered around the customers.

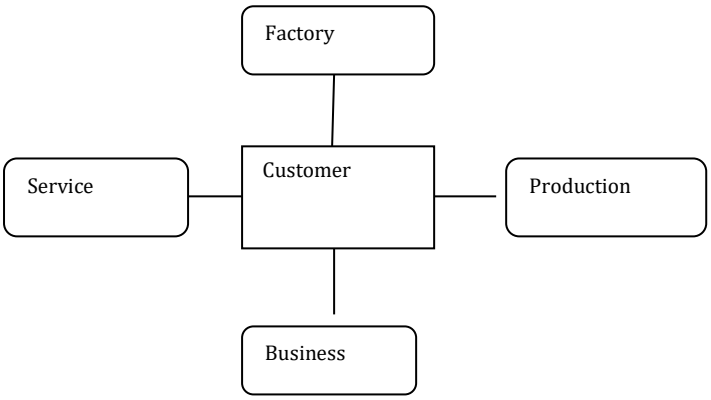

Figure 1. Vision and concept of Industry 4.0 (Qin et al., 2016)

This study consists of four parts. In the second part, the development of the concept of industry 4.0 in the automotive sector is mentioned. In the third part, factor analysis and relationship tests are conducted by mentioning the methods and methods used in the study. In the last part, the results of the study are presented, and suggestions are made.

2. Industry 4.0 and Automotive Supplier Industry

The fourth industrial revolution is initiated a period of full automation and digitization in production processes. The use of electronic and information technologies in production and services has had a significant impact on the economic indicators of enterprises. Internet of things and cyber physical systems are caused changes in the ways of production in enterprises. In small and medium-sized enterprises, the effects of these changes are mostly experienced. While these developments in technology still continue, the competition in the market increases in parallel with technological developments. Businesses are looking for new opportunities to change their strategies and guide them in this direction in order to keep up with this competition. The automotive industry, which has a significant share in the production branches, is among the most affected by these technological developments (Gabaçlı and Uzunöz, 2017).

The automotive industry is one of the complex industries where technological processes are applied most. At the same time, it is one of the most important sectors due to its connections with different sectors and employment power. With these industrial revolutions, there have been major transformations in the automotive industry. These enterprises, which meet the expectations of a large area and meet the expectations of personalized products, face a great difficulty in terms of technology. In the supplier industry, which is an important component of the automotive industry, the impact of technological developments is felt more and more. Although there are thousands of companies in the automotive supplier industry, there are very few companies that can produce acceptable production standards and compete in the international market. In order to keep up with the change processes in the world market and to maintain the level of competition, enterprises need to adapt quickly to the innovations brought by the industrial revolution. The desire to increase the investments in technology and automation is limited by reasons such as small production scales and high costs. However, despite these adverse conditions, these investments should continue. Automotive supplier industry firms have to invest in information and quality in addition to technology, due to their obligation to improve production quality. In these sectors which are the subject of the study, the power to keep up with the technological and other innovations brought by the industry 4.0 comes to the fore. There is the automotive supplier industry over 1,000 businesses operating in Turkey. There are 300-350 companies that are able to keep up with the technological developments and carry out a policy of product production at international standards (Tubitak, 2018) . Turkey's geographical position, advanced feature of being the only country that has established automotive industry, is developing technology to remove the necessity of integration once more to the fore. The production capacity of the automotive supplier industry is around $ 9 billion a year. Because of this feature automotive industry sector is an extremely important sector for Turkey (Tubitak, 2018). The integration of the innovations in the fourth industrial revolution in the world has a different necessity and importance in this sector. Increasing competitiveness by using the power of digitalization and information

technologies constitutes the basis of sustaining a healthy economy (Soylu, 2018). At this point, it is very important that enterprises can adapt to these technologies and transformations. But businesses face different challenges in the process of adapting to industry 4.0. In enterprises that see these challenges, there is a prejudice against industry 4.0 and they are reluctant to make decisions about shaping and transforming production processes. This study aims to evaluate the approaches of the enterprises against industry 4.0. In this context, this study, which contributes significantly to the enterprises, enables the analysis of the difficulties experienced and the development of strategies for these challenges.

3. Material and Method

As mentioned previously, in the studies on Industry 4.0 and the automotive supplier industry in the literature, there is no study on the reliability and validity of the scale and the statistical analysis of this scale. In scientific studies using scales which have been brought to literature for many different subjects and sectors, is possible to make a classification like "studies including developed original scales" (Özcan et al., 2014); (Eti İçli and Vural, 2010) (Group 1), studies including the application of a specific sampling of the original scales (Aksaraylı and Özgen, 2008); (Y ılmaz, 2007) (Group 2), and studies including the compilation of original scales (Keser, 2005); (İlter and Gökmen, 2009) (Group 3) (Avşar Özcan, 2014). In this context, in this study, it is an original scale to can be evaluated within the scope of Group 1, which is designed to determine the ability of the enterprises operating in the automotive supplier industry in Konya province to reveal their ability to keep up with these technologies and to determine the areas where they are most challenged in the transition to Industry 4.0.
Measurement is an important process carried out to evaluate individuals, events or objects in terms of characteristics (attitude, tendency, satisfaction, etc.) which are the subject of measurement, and to make analytical decisions based on the evaluation results obtained. The accuracy and appropriateness of the decisions are based on the results of the evaluation on which the decisions are based and on the compliance of the criteria used in the assessment. This suitability can only be achieved by standardizing the measuring tool. There are two main factors that are considered to be reliability and validity in order for the scale to be standardized and to gain the ability to produce appropriate information (Ercan and Kan, 2004).

Reliability is the determination between the independent measurements of the same thing. In other words, reliability is indicative of the degree to which a measuring instrument gives the same result in repeated measurements. The reliability is determined by a calculated internal consistency coefficient (r) and takes values ranging from 0.00 to 1.00. As the value approaches 1.00, the reliability level increases. The high reliability is dependent on the processes used in the measurement and the determination of the criteria used in detail (Özcan et al., 2014).

Validity means that a measurement tool really measures the properties it intends to measure. There are different types of validity such

as predictive validity, concurrent validity, content validity and construct validity (Özcan et al., 2014). The statistical tests related to the reliability and validity of the Industry 4.0 Perception Scale (Appendix-1) of the Konya Side Automotive Sub-industry developed within the scope of this study are presented in the following sections.

3.1. Measuring tool

In the study, Industry 4.0 Perception Questionnaire of the Automotive Sub-industry of Konya, which is a 5-point Likert- type scale (Strongly Disagree 1, Strongly Agree 5), is used. There are 445 companies serving in the automotive supplier industry in Konya. The 25-item scale is applied to the senior technical executives of 210 companies randomly selected from the said sector. Yazıcıoğlu and Erdoğan (2004) calculated the sample size as 217 in the 95% confidence interval in case the batch is 500, and the size of the sample selected within the scope of this study is sufficient (Yazıcıoğlu and Erdoğan, 2004); (Brettel et al., 2014). In the study, 23.8% of the enterprises examined are employees with 0-9, 55.6% with 10-49 employees, 19.2% with 50-249 employees and 0.7% of the employees are 250 and over.

Considering the turnover of these enterprises in 2017; is determined 12.6% of it is below 1 million TL, 55.6% in the range of 1-8 million TL, 30,5% in the range of 8-40 million TL and 0.7% of the annual sales amount of TL 40 million and above. The software used by the sample of the study and the Industry 4.0 technologies are presented in Table 1.

When the statistics of the software in Table 1 are examined, it is noteworthy that 5 enterprises (3.3%) do not use any software at present. Similarly, there is no enterprise using all of the software in Table 1. The number of enterprises with using software 10 or more is 8 (5,3%) . 29 enterprises with the highest frequency (19.2%) currently use at least 1 software. The total number of software used by 210 enterprises is 544 and the average is 3,6267. It is found that the relationship between the number of employees and the software used was statistically significant at $p < 0.05$ level. The relationship between the annual sales amount of the enterprises and the software used is statistically significant at $p < 0.05$ level.

Table 1. Software and Industry 4.0 technologies

Software	Industry 4.0 Technologies
CAD (computer aided design)	3D printers used to develop some product prototypes
CAM (computer aided manufacturing)	Cloud computing for data storage
ERP Software	Mobile devices used in direct and auxiliary production processes
CRM (Customer Service Software)	Communication between some machines (data exchange) technology
Design, Simulation and Analysis Software	Intelligent sensors used to collect data
Purchasing Software	Education etc. virtual reality or augmented reality applications used for processes
Accounting Software	Technologies that enable the customization of products according to customer requirements
Human Resources Software	Machines, sensors, service, sales services etc. technologies used to collect and analyse data related to business activities
Database Software	
Enterprise Mail Application	
Online Sales Software	
Data Analysis Software	
Inventory Tracking Software	

When the statistics of Industry 4.0 technologies in Table 1 are examined, it is determined that 14 enterprises (9.3%) currently do not use any Industry 4.0 technology. The number of enterprises using all of the Industry 4.0 technologies in Table 1 is 2 (1.3%). 39 enterprises with the highest frequency (25.8%) use at least 1 of the technologies listed in Table 1. The total number of Industry 4.0 technologies used by 210 enterprises is 365 and the average is 2,4333. The relationship between the number of people employed in enterprises and the Industry 4.0 technologies used is not statistically significant at $p < 0.05$ level. The relationship between annual sales amount of enterprises and Industry 4.0 technologies used was not statistically significant at $p < 0.05$ level. Therefore, the use of technology does not change according to the number of employees or annual sales amount.

3.2. Determination of scale items

In statistical analysis, Cronbach's alpha coefficient is used to determine the reliability of the measurement tool. A single value can be determined for each item, but an average value for all substances in the scale can also be calculated. If the coefficient is 0.7 and above, the reliability of the scale is considered good (Kı lıç, 2016). However, the proximity of this coefficient to 1.00 would increase the reliability of the measuring instrument.

As a result of the reliability analysis, Cronbach's alpha value of the scale consisting of 25 items was calculated as 0,733. Alpha, which decreases the value of the 4th, 11th, 14th, 23th, 24th, and 25th items are removed from the scale, the remaining 19 items of the scale Cronbach's alpha value is

calculated as 0,866. As a result of the second analysis, new substances are determined to have to be removed from the scale, alpha-lowering substances (items 10 and 12) were excluded from the scale. As a result of the reliability analysis, the Cronbach's alpha value of the scale consisting of 17 items was calculated as 0,890. If the item is deleted from the scale, the item in which the Alpha value will rise is not left. It was tested according to the Tukey Stackability Test whether the items in the scale were prepared to form a cumulative scale. The test statistic was calculated as p = 0,000 and H0 was rejected because it was p <0.05.

According to the Hotelling T2 test to determine whether the item averages are equal to each other, p = 0.000 <0.05 is considered to be 5% meaning that the item averages are different from each other. This result also means that substances are not equally understood or interpreted by different persons. Table 2 presents the substances used in the automotive supplier industry in the province of Konya in order to reveal their ability to keep up with Industry 4.0, to examine the stages of transition to these technologies and to determine the areas where the enterprises are most challenged in the transition to Industry 4.0.

Table 2 shows the minimum and maximum values, total, mean and standard deviation values of 17 items. The averages of item 7, item 8, item 16 and item 19 are 4,0067, 4,1867, 4,0200 and 4,2200, respectively.

Table 2. Scale items

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Item1	210	1,00	5,00	483,00	3,2200	1,11047
Item 2	210	1,00	5,00	598,00	3,9867	,94113
Item 3	210	1,00	5,00	479,00	3,1933	,98782
Item 5	210	1,00	5,00	597,00	3,9800	1,01974
Item 6	210	1,00	5,00	437,00	2,9133	1,15820
Item 7	210	1,00	5,00	601,00	4,0067	,92320
Item 8	210	1,00	5,00	628,00	4,1867	,90031
Item 9	210	1,00	5,00	466,00	3,1067	1,07533
Item 13	210	1,00	5,00	567,00	3,7800	,88893
Item 15	210	1,00	5,00	599,00	3,9933	,92320
Item 16	210	1,00	5,00	603,00	4,0200	,78124
Item 17	210	1,00	5,00	457,00	3,0467	,99890
Item 18	210	1,00	5,00	482,00	3,2133	1,05288
Item 19	210	1,00	5,00	633,00	4,2200	,91130
Item 20	210	1,00	5,00	595,00	3,9667	,99944
Item 21	210	1,00	5,00	444,00	2,9600	1,15206
Item 22	210	1,00	5,00	490,00	3,2667	1,13319
Valid N (listwise)	210					

The scale items in question are as follows:

- Our transition to Industry 4.0 technologies will increase the operational speed and flexibility of our business (item 7).
- Our senior management is willing to change to new technologies (item 8).

• Our senior management supports its employees in doing their jobs with more technological methods (item 16).

• Government support for Industry 4.0 technologies will be encouraging for our business (item 19).

Here, the acceptance and awareness of the management and the support of the government is remarkable in the benefit and implementation of the Industry 4.0 technologies.

3.3. Factor analysis

Factor analysis is the construct validity for determining the structure of the scale. The KMO test result is greater than 0.50 indicates the factor analysis feasibility. The KMO test statistic for the study was calculated as 0.862. This value indicates that the number of data is suitable for factor analysis.

Table 3. Factor structure of the scale

	I	II	III
Item 1	0,490		
Item 2	0,700		
Item 3		0,582	
Item 5	0,718		
Item 6			0,503
Item 7	0,712		
Item 8	0,669		
Item 9		0,493	
Item 13	0,502		
Item 15	0,704		
Item 16	0,709		
Item 17		0,578	
Item 18	0,519		
Item 19	0,744		
Item 20	0,764		
Item 21			0,510
Item 22			0,510
Self-Value	7,231	1,653	1,523
Variance (%)	37,90	12,66	8,88
Cronbach's alpha value	0,879	0,723	0,724

In order to investigate whether the original structure of the scale is valid for this sample, the data obtained from the study were subjected to factor analysis at the level of substances by using Principal Component Analysis (Varimax Rotation). There were 3 factors whose eigenvalues were above 1 and the factor loads were above 0.50. Factors in the items and factor loadings are shown in Table 3.

Factor I

• Vendors dealing with Industry 4.0 technologies are available in our business environment (Item 1).

• Transition to Industry 4.0 technologies will reduce the operational costs of our business (Item 2).
• In order to be able to hold the products and brands of our business in the market and compete with its competitors, it must pass to Industry 4.0 technologies (Item 5).
• Our transition to Industry 4.0 technologies will increase the operational speed and flexibility of our business (Item 7).
• Our senior management is willing to change to new technologies (Item 8).
• Our senior management allocates resources for the transition to new technologies (Item 13).
• Transition to Industry 4.0 technologies will increase the profitability of our business (Item 15).
• Our senior management supports its employees in doing their jobs with more technological methods (Item 16).
• Our senior management has knowledge of the Industry 4.0 technologies and benefits (Item 18).
• Government support for Industry 4.0 technologies will be encouraging for our business (Item 19).
• Switching to Industry 4.0 technologies will facilitate the customization of our products to customer demand (Item 20).

Factor II

• Promotional and promotional activities related to Industry 4.0 technologies are carried out by public and professional organizations of our province (Item 3).
• Companies that can receive training and consultancy on Industry 4.0 technologies are available in our business environment (Item 9).
• The companies that we can get technical support to enable us to use Industry 4.0 technologies actively are in our business environment (Item 17).

Factor III

• Some of our potential customers ask us to switch to Industry 4.0 technologies to do business with our business (Item 6).
• Some of our suppliers require us to switch to Industry 4.0 technologies to work more effectively with our business (Item 21).
• Our company believes that if it does not keep up with the Industry 4.0 technologies, it can lose its customers to its competitors (Item 22).

In Table 2, it is mentioned above that item 7, item 8, item 16 and item 19 have the highest average. It was determined that these substances were included in the first factor. Item 6 and item 21, which have the lowest mean in Table 2, are included in the third factor.

3.4. Relationship tests

For the remaining 17 items in the scale, the number of employees directed to the enterprises, the sales amount of 2017, the software used, and the technologies were tested separately. The relationship between 68 pairs was investigated in total and 10 relations which are statistically significant at 95% level are given in Table 4.

The incentive and promotional activities related to the Industry 4.0 technologies are carried out by the public and professional organizations of our province (item 3), and the relationship between the number of employees of the sector employees is statistically significant. The size of the enterprise by the number of employees revealed that the enterprises in question follow the developments related to the Industry 4.0 technologies and transfer the activities provided by the public and professional organizations to their personnel. Furthermore," the incentive and promotional activities related to the Industry 4.0 technologies are carried out by the public and professional organizations of our province (item 3)" the relationship between the annual sales amount of the enterprises of the sector employees who have the opinion is statistically significant. This means the size of the enterprises following the Industry 4.0 technologies as in the number of employees. In summary, enterprises with a high number of employees or high annual sales have a positive approach to Industry 4.0 technologies.

Table 4. Relationships between the items of the scale

	Working Personnel	Endorsement	Software	Technology
item 1	*	*	*	*
Item 2	*	*	*	*
Item 3	0,001	0,012	*	*
Item 5	*	*	*	*
Item 6	*	*	*	*
Item 7	*	*	*	*
Item 8	*	*	*	*
Item 9	*	*	*	*
Item 13	0,000	*	0,006	*
Item 15	0,000	*	*	*
Item 16	*	*	*	*
Item 17	0,002	0,015	*	*
Item 18	*	*	*	*
Item 19	*	*	*	*
Item 20	0,005	*	*	0,027
Item 21	*	*	*	*
Item 22	0,001	*	*	*

The calculated p value for the cells with the expression * is not shown to be greater than 0.05

The number of employees working in enterprises who have the opinion that “Our senior management allocates resources for the transition to new technologies (item 13)" has a high number of employees.

The high number of software used by the enterprises in which the employees of the sector who have the opinion of "Our senior management allocates resources for the transition to new technologies (item 13)" are already used, is found to be statistically significant. This can be interpreted as the transition of these enterprises to Industry 4.0 technologies.

The relationship between the number of employees and the number of employees in the sector where the employees of the sector who have the opinion of "Switching to Industry 4.0 Technologies will increase the

profitability of our business (item 15)" were found statistically significant. The contribution of the use of Industry 4.0 Technologies to the business is perceived as profitability in the result, i.e. the belief in the functionality of the technologies is equivalent to the financial gain. In short, employees perceive it not only as a follow-up of technology, but as a means of reaching the ultimate goal of all enterprises, the profitability point.

The relationship between the number of employees and the number of employees who have the opinion of "The companies that we can get technical support in order to use the technologies of Industry 4.0 are in our business environment (item 17)" in the sector was found to be statistically significant. The relationship between the sector employees and the annual sales amount of the companies with the same opinion was found statistically significant. Just as in item 3, the number of employees with a high number of employees or annual sales amounts show a positive approach to Industry 4.0 technologies.

The relationship between the number of employees and the Industry 4.0 technologies used in the enterprises where the sector employees with the opinion of "Switching to Industry 4.0 Technologies will make it easier for our products to be customized according to customer demand (item 20)" were found statistically significant. According to the number of employees operating in the sector, large enterprises are customer focused and at least convey this awareness to their employees. The enterprises that use the Industry 4.0 technologies in the current place give importance to customer satisfaction.

The relationship between the number of employees and the number of employees in the sector who have the opinion of "Our company believes that if it cannot keep up with the Industry 4.0 technologies, it can lose its customers to its competitors (item 22)" were found statistically significant. According to the number of employees operating in the sector, large enterprises consider the disadvantage of not using the Industry 4.0 technologies as a disadvantage and associates the lack of use of technology with the loss of customers.

As a result, four criteria were statistically significant at 95% for six items given in Table 4 Large enterprises according to the number of employees in the sector and in parallel with this, the enterprises with high annual sales amount follow the incentive and promotional activities carried out by the public and professional organizations of the Industry 4.0 technologies. At the same time, these enterprises allocate resources for the transition to new technologies in conscious technical support point, realize that they can easily customize their products according to customer demand and aim to increase profitability. Businesses believe that if they cannot keep up with Industry 4.0 technologies, they can lose their customers to their competitors.

4. Conclusions

In this study, the effects of the concept of industry 4.0 on automotive supplier companies, which are among the most important sectors in globalization, are examined. Statistical analyses of the surveys conducted by

the supplier companies are made. The rapid changes in the manufacturing processes with the fourth industrial revolution is brought about some necessities for the enterprises to hold on to the competitive market. It is among these necessities that enterprises adopt technological developments. High technology production environments come to the forefront in automotive sub-industry enterprises which are the most affected by technological developments. In addition to the innovations offered to enterprises, Industry 4.0 has brought with it coercive factors. Businesses try to adopt these transformations in order to be able to keep up with the competition, and also try to deal with some of the difficulties they have to endure as a result of this transformation. Sevinç et al. (2018) identified the challenges that enterprises face in the process of adopting industry 4.0. They are evaluated the factors they gathered under the main topics of organization, environmental, cost and innovation with multi-criteria decision-making methods. Cost criterion is shown as the most important factor in the difficulty of the enterprises in the transition to the industry. The fact that there are production processes based on technology in the automotive supplier industry and the high investment costs lead to the neglect of industry 4.0's returns.

In the literature, after the introduction of the concept of industry 4.0 in the world, researchers have done many studies to explain the concept and its scope. For example, the study of Grzybowska and Łupicka (2017) is one of the researches on the basis of industry 4.0. They have worked on monitoring the practical implications of the practices initiated by this industrial revolution and identifying potential new applications. Emphasizing the sustainability of Industry 4.0 applications (Grzybowska and Łupicka, 2017); (Manavalan and Jayakrishna, 2019), it is emphasized that businesses should be able to maintain their power in an increasingly complex and dynamic market. In this context, Theorin et al. (2017) are pointed out that enterprises should be more flexible in order to maintain their competitiveness and at the same time to meet the demands of customers. In order to be able to transform into production processes Uslu et al. (2019) are made recommendations to the strategies that enterprises can develop.

70% of motor vehicle production in the world is covered by automotive sector (Tubitak, 2018), emphasizes the importance of the sector in which the study is carried out. Turkey in this sector, which have the same ratio, the product has many of the industry by providing employment opportunities to reach customers. With the different applications coming with the fourth industrial revolution, integration difficulties have started to be experienced in this sector. When the literature is reviewed, there is no study except that Sevinç et al. (2018) 's study evaluates the results of the industry 4.0 processes in the enterprises. In this study, the automotive supplier industry sector, which is one of the most important sectors, has been discussed differently from Sevinç et al. (2018).The statistical evaluation of the surveys carried out in the province of Konya, which is active in this field, again highlights the feature of this study in the literature. Turkey, 1.5% share of the world is ranked 20th in the automotive supplier industry trade. Konya is the city with the highest development and sectoral

concentration in this sector, which has nearly 4 thousand producers. The fact that the sector has such an important position once again reveals the necessity of analyzing the difficulties in the industry 4.0 processes (Konya ABIGEM, 2017).

Weyer et al. (2016) mentions the importance of cyber physical production systems in the automotive sector. It draws attention to the support of automation processes in engineering and decision-making processes. Another study (Mič ieta et al., 2016), which draws attention to the importance of automation processes in the automotive sector in the automotive sector, mentions that the competitiveness of enterprises will increase with these smart systems. Karabegović (2016) emphasizes the necessity of modernization of industry 4.0 in production processes in the automotive sector.

This study differs from the studies in the literature as field of application and approach. It includes the assessment of the challenges of the enterprises operating in the automotive supplier industry in the process of adopting industry 4.0. When the obtained results are analyzed, significant relationships are found between the questions of the enterprises and the internal processes of the enterprises. The transition to Industry 4.0 correlates the beliefs of enterprises to increase their functionality with material and organizational factors. When these results are examined, it is understood that technological processes should be followed in order to reach the profitability point which is the ultimate goal of the enterprises. In further studies the researchers could proceed from this point, can expand the scope of this study for all Turkey. Based on the results of this survey, evaluation criteria can be determined from the scale items. These criteria can be evaluated on the basis of enterprises with different methods.

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Appendix

Appendix-1. Questionnaire Table for Experts (Important Factors for Transition to SMEs Industry 4.0 Technologies)

No	Questions Innovation/Organizational/Environmental/Cost	I strongly disagree	I don't agree	Undecided	I agree	Absolutely I agree
1	Innovations should be made in the industry 4.0 transition.					
2	In Industry 4.0 transition, technologies enable businesses to adapt to both business processes and commercial activities.					
3	The benefit from the innovation offered for Industry 4.0 is expected.					
4	In order to keep our products and brands in the market and to compete with their competitors, we must pass to Industry 4.0 technologies.					
5	The compatibility of the Industry 4.0 innovation is consistent with past experiences.					
6	It is difficult to understand the innovation offered in					

	Industry 4.0.
7	Some of our potential customers ask us to switch to Industry 4.0 technologies to do business with our business.
8	There is no information about the introduction of innovations related to Industry 4.0 by the relevant institutions.
9	Industry 4.0 applications are difficult to adapt to existing business processes and commercial activities.
10	Transition to Industry 4.0 Technologies will increase the operational speed and flexibility of our business.
11	The greater the relative advantage of technology, the greater the likelihood of adoption.
12	Our business management is willing to adopt new technologies and will accelerate the adoption of innovations.
13	We can get training and consultancy about Industry 4.0 technologies.
14	The size of the enterprise is related to the increase of the acceptance rate of innovation.
15	Information technology expertise for Industry 4.0 is very important.
16	Machine and technology infrastructure that we use in order to transition to Industry 4.0 technologies is required.
17	The transition to Industry 4.0 should be done to reach the level of competitiveness with other businesses in the same market.
18	External support should be received in Industry 4.0.
19	The transition to Industry 4.0 will have a positive effect on SMEs in strategic planning.
20	Industry 4.0 transition costs correspond to a significant amount for SMEs.
21	Maintenance and technical support in the Industry 4.0 transition is a requirement for SMEs. Maintenance and support costs will increase.
22	Training and support in the Industry 4.0 transition is a requirement for SMEs. Training and support costs will increase.