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GEBZE TECHNICAL UNIVERSITY
SOCIAL SCIENCES INSTITUTE

INDUSTRY 4.0: LAYOFF EFFECTS ON ORGANIZATIONAL CITIZENSHIP BEHAVIOR (OCB) OF EMPLOYEES WITH DISTINCT LOCUS OF CONTROL

AYKUT ERŞEN
MASTER THESIS
DEPARTMENT OF BUSINESS ADMINISTRATION

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ÖZET

Araştırmak, öğrenmek, geliştirmek ve ilerlemek arzuları insanoğlunun gelişimi için her zaman önemli rol oynamıştır. Bu arzuların endüstriyel gelişimdeki son adımları ise Dördüncü Sanayi Devrimi, diğer adıyla Endüstri 4.0 olarak ortaya çıkmış durumda. Gelişim algısı sadece "üretimde gelişim"le sınırlı kalmadı, insanlığın huzur ve mutluluğu için de ilerlemeler kaydetti. Bu çalışmalar rol üstü (ekstra-rol) davranışlar olarak adlandırılan ve performans yapılarından olan Örgütsel Vatandaşlık Davranışı (ÖVD) konusunu ortaya çıkardı. Ayrıca, karar verme mekanizmasını anlamaya yönelik araştırmalar da iç ve dış olmak üzere iki boyuttan oluşan Kontrol Odağı kavramını karşımıza çıkardı. Daha önceki sanayi devrimlerinden bildiğimiz kadarıyla üretimde makineleşme işten çıkarmalara neden oluyor ve Endüstri 4.0'ın getirdiği robotlaşmanın da iş kayıplarına sebep olacağı beklenmektedir. Bu tez çalışmasında, Endüsri 4.0'ın sebep olacağı işten çıkarılmaların farklı kontrol odağına sahip çalışanların ÖVD'lerine etkisi incelenmiştir. İç kontrol odağına sahip bireylerin ÖVD'lerinde pozitif etkilenme beklenirken dış kontrol odağına sahip olanlarda etkilenme beklenmemektedir. Örneklem 130 kişiden oluşmaktadır. Çalışmalar sonucunda içe ve dışa dönük kontrol odağına sahip çalışanların ÖVD'lerinde ve ÖVD alt boyutlarında anlamlı farklılaşma görülmüştür ve sunulan hipotezler desteklenmiştir. Tez çalışması; çalışmanın sınırlılıkları, gelecek çalışmalara yönelik öneriler ve tartışma bölümleri ile sonlandırılmıştır.

Anahtar Kelimeler: Endüstri 4.0, Örgütsel Vatandaşlık Davranışı, Kontrol Odağı, Dördüncü Sanayi Devrimi, İşten Çıkarılma

SUMMARY

The eager to research, learn, develop and to proceed has always been the key of the development of the human being and its latest attempt in terms of industrial development is called the Fourth Industrial Revolution, in other words Industry 4.0. The perception of development not only advanced in terms of production, but in well-being of humankind as well. These progresses brought up the topic of Organizational Citizenship Behavior (OCB), which is called extra-role behaviors as a performance construct. Moreover, the studies to understand the mechanism of decision making process introduced us the phenomenon of Locus of Control (LOC) which consists of two dimensions, internal and external. It is known from the previous industrial revolutions that the mechanization of the production causes layoffs, and it is expected that the I4.0's robotisation will create layoffs. In this study, it is aimed to analyze the layoff effects of I4.0 on OCB for employees with distinct LOC. Internals and externals are expected to get affected for their OCB, internals' differentiation is expected to be positive where externals' is expected to be negative. The sample group of 130 people were surveyed. In the results, the OCBs and its dimensions are significantly differentiated for both internals and externals and the hypotheses are supported. The study is concluded with research limitations, future research suggestions and the discussion.

Keywords: Industry 4.0, Organizational Citizenship Behavior, Locus of Control, Fourth Industrial Revolution, Layoffs

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It is to my beloved spouse Nurcan Erşen that I dedicate this thesis. It was always her belief in myself to keep this study going and her significant contributions during the surveying. I additionally dedicate this thesis to my beloved parents Senai and Selda Erşen who taught me to be stubborn to learn and succeed.

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LIST OF ABBREVIATIONS

Abbreviations		Explanations
AI	:	Artificial Intelligence
C2C	:	Computer to Computer
C2M	:	Computer to Machine
CPS	:	Cyber-Physical Systems
I4.0	:	Industry 4.0 (The Fourth Industrial Revolution)
IMF	:	International Monetary Fund
IoS	:	Internet of Services
IoT	:	Internet of Things
LOC	:	Locus of Control
M2M	:	Machine to Machine
OCB	:	Organizational Citizenship Behavior
RFID	:	Radio Frequency Identification

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1. INTRODUCTION

It has always been a concern to increase the productivity while decreasing costs since the first industrial revolution. The suggested and applied management theories by Henry Ford or Frederick Taylor were all endeavors to push this essential phenomenon further: increasing productivity. New tools, new ways to manufacture and work and new technologies were always studied and they all emerged in different forms throughout the history of Industrial Age. Although it was always the understanding of a single worker's ability to work more to increase the productivity, it is later understood that the management abilities and the manufacturing techniques are the elements to increase the productivity, which has been increasing of 3% for each annum since Taylorism (Drucker, 1999).

Still, at that period of time, the human factors were some quantitative variables in productivity equations. In other words, more human workers or more working hours were the definition of productivity. In contrast, attracting people into the system, having them commuted to their work not only with their body and parts but also with their mind and thoughts will contribute the effectiveness and the outcome numbers, but more importantly it will contribute the existence of the firm (Katz, 1964).

The importance of behaviors and work attitudes had become realized then and the extra-role behaviors were started to be discussed. It is later studied the positive correlation between the extra role behaviors and work motivation, work satisfaction, job commitment, etc. (Abdollahi et al., 2010; Borman and Motowidlo, 1997; Feather and Rauter, 2004; Organ, 1988; P. M. Podsakoff and MacKenzie, 1994; P. M. Podsakoff and Organ, 1990; Zeinabadi, 2010).

Besides extra-role behaviors, some other characteristic features were also defined such as locus of control, or control of reinforcement. It has been analyzed that people have pre-determined tendencies to make a decision or to interpret the events. These tendencies divided into two groups, internals and externals. Internals are more self-dependent individuals who perceive the causes can be changed by correct actions to change the outcome. On the other hand, externals believe that the sources of the causes are beyond of control and cannot be changed easily, and it is their fate what

they are experiencing even in their daily lives (Davis and Davis, 1972; James, 1957; Rotter, 1966).

As industrial age was passing, new approaches were studied and utilized as well as new technologies emerged. New technology also shaped the industrial revolutions which also mean the inventions that altered the route of industrial development. The Fourth Industrial Revolution has been announced by German Government in 2011 as a part of High Tech Strategy Plan of 2020. Autonomous systems were the pioneers of the third industrial revolutions and cyber-physical systems (CPS) are considered to be the essential drivers of Industry 4.0. The knowledge workers will work collaboratively with systems in a *smart* environment. The big data will be used provided by cloud systems, sub-systems will work autonomously, establish connection with each other and with humans effectively, and create a broad system which can run itself by using the network (internet) and radio frequency identification (RFID) signals (Bartodziej, 2015).

However, all these renovations will have its own side-effects. Changing organizational structure will lead to new job positions, but it will also destroy some job positions, too. Switching from a human based system to a semi-robotic system will definitely force the companies to make a decision to lay off some employees while switching some others' positions (Acemoglu, 1997; Sumer, 2018).

As a result, the research questions are defined for measuring the industry 4.0 layoff effects on OCBs of employees with distinct LOC. In order to study this phenomenon in this thesis, a literature review for the history of industrial revolutions and their relationship with layoffs will be investigated. Moreover, theoretical background of OCB and LOC will be provided under the same title. In the following chapter, methodology used for this study will be explained. Data collecting methods and used scales will be covered. Lastly, hypotheses will be defined in this section. Consequently findings will be provided and interpreted in the next chapter. The thesis will be completed with the discussion and conclusion chapter where the discussion of the results will be made, the limitations will be expressed and the future research suggestions will be framed. Finally, the thesis will be concluded.

2. LITERATURE REVIEW AND HYPOTHESES

2.1. Industrial Revolutions

In the last half of the nineteenth century a new form of capitalism appeared. The processes of production, distribution, transportation and communication in capitalistic economies had been carried on by enterprises managed by their owners and tiny amount of salaried managers who worked closely with the owners. The building and operating of the rail and telegraph systems called for the creation of a new type of business enterprise and this led the separation of ownership from management. The new forms of transportation and communication permitted the rise of modern mass marketing and modern mass production, and consequently led owners to recruit teams of salaried managers (Chandler, 1990, p.2).

2.1.1. The First Industrial Revolution

The first industrial revolution occurred in Great Britain spontaneously without the government assistance which has been the characteristic of most succeeding industrial revolutions (Deane, 1979, p.3). However, exact timing of the first industrial revolution is a matter of controversy. Arnold Toynbee, who delivered a course of lectures on this subject in University of Oxford in the year of 1880 took his starting point as 1760 (Toynbee, 2011, p.12). Later, new interpretations have emerged from the works of economic historians which were depending on the statistical evidence bearing upon the rate of economic growth. The movements of imports and exports curves of foreign trade conditioned the statistical interpretation of the industrial revolution (Deane, 1979, p.6). Then, the first industrial revolution is dated from 1783 to 1802 by Professor W.Rostow. This period defines the situation of sustained growth for the British economy (Rostow, 2014, p.11).

Last but not least, major changes in industrial techniques had taken place in Great Britain decades before. But the major impact of massive application of a new source of power and heat to the production was so profound to call this era as the first industrial revolution. Replacement of traditional power sources such as wind, water, man and beast with fossil fuel permitted these innovations (Chandler, 1980).

During these days, for the first time in history people gathered and worked together under the same roof and this is called factory. Furthermore, this new work organization initiated the division of labor and the specialization of functions and successively enabled mass production processes.

2.1.2. The Second Industrial Revolution

The technological revolutions preceded the first industrial revolution and the first industrial revolution itself had a little or no scientific base. The chemical industries having no chemistry, the iron industries having no metallurgy, power machinery without thermodynamics were created in this era. The scientific phenomenon behind these innovations were not known although the systems were working correctly. The second industrial revolution accelerated the mutual feedback between science and technology, and finally extended the rather limited and localized successes of the first industrial revolution to a much broader range of both activities and products. The second industrial revolution is usually dated between the years of 1870-1914. However, some of its characteristic events can be dated to the 1850s (Mokyr, 1998).

The period began in 1959 was a remarkable scientific progress in history. ”If one had to choose any fifteen-year period in history on the basis of the density of scientific breakthroughs that took place, it would be difficult to find one that exceeded 1859-1874” (Morwey et al., 1995, p.22). Darwin’s *Origin of Species (*1859), Pasteur’s germ theory (1860s), Kekule’s organic chemistry studies (1860s), Mendel’s studies on peas (1866), Mendeleyev’s periodic table (1871), Maxwell’s *Electricity and Magnetism* (1873) were some of the pioneer studies of this remarkable fifteen years. The transformation of industries with the second industrial revolution extended across the four decades after 1880. The triumph hidden behind this transformation was not only the speed and scale, but also the durable technical and institutional outcomes. During this period of time, entirely new and propulsive manufacturing sectors flourished. Electrical powered restructured the production, photographic technologies gave movies, radio signals and telephone connected people, synthetic chemicals brought the new fibers and plastic. As a result, industrial work changed. Center firms installed new

technologies that lessened the need for old-skilled workers, hundreds of novel job titles appeared (Scranton, 1997, p.8).

During the 1850s, American railroads became the pioneers in modern management. Handling of traffic, coordinating the functional activities on each division, the maintenance of motive power, equipment and roadbed and handling of and accounting for the thousands of daily financial transactions devised a line-and-staff system of administration. The new forms of transportation and communication not only brought about an organizational revolution in distribution, they also created an even greater revolution in production. With higher speed of consumer packaging technologies, these innovations gave rise to the mass production and distribution systems (Chandler, 1990, p.62). In the period 1889 to 1919, the annual growth of total factor productivity was almost six times higher than that which had occurred for most of the nineteenth century (McCraw, 1981, p. 3).

2.1.3. The Third Industrial Revolution

The Third Industrial Revolution takes place in history at the beginning of 20th century. The invention of transistors in 1947 which are devices composed of semiconductors made it clear that the Third Industrial Revolution is on the stage and therefore it is called the Digital Revolution. With the digital revolution, the application of internet technologies and electronic systems helped to reach the purposes of automation of the production which is dated back to 1970s by Lukac (2016).

Semiconductors, server computers and personal computers had been developed in parallel to each other and all started to use internet as a communication and network tool. In this period of history, software started to take place of actions that were being completed by humans. Additionally, companies' names started to be heard rather than countries' in global market. Supply chain management differentiated with the use of technology. Availability of raw materials to the companies made them more productive. Increasing production rate expanded the global market. Increasing use of internet technologies brought out new work models. Electronic marketing (e-marketing) emerged in this era. More, social media platforms formed and differentiated the understanding of conventional marketing as well (Diyadin and

Kocak, 2018). The stages of Industrial Revolutions and their outcomes are summarized in the Table 2.1 (Matovcikova, 2017).

Table 2.1: Industrial Revolutions

Stages of Industrial Revolution	Industry	Features	Consequences
First industrial revolution – England (1750-1850)	• James Watt's steam machine (1765) • Metallurgy • Textile • Engineering	• Abolition of slavery • Moving people to towns • Capital accumulation	• Urbanization • Rise of population • Higher standard of living • Social revolution
Second industrial revolution (1870 - 1914)	• Engineering • Telecommunication • Chemical industry • Maritime industry • Business management	• Cheap coal • Electrification • Mass production	• Railroads, iron and steel production • Wide usage of machinery • Paper and rubber production
Third industrial revolution (since around 1960)	• Transport • Computers • Metal machinery • Medicine • Genetic engineering	• Digital manufacturing • Clever software • Dexterous robots • Zero emission transport	• Mass customization • Production in low wage countries • Demand for skilled workers • Renewable energy
Fourth industrial revolution – Germany (since around 2011)	• All industries • All economies • All disciplines	• Digitalization • Internet • New technologies • Self-driving cars	• Digital enterprises • Artificial intelligence • Unemployment

2.1.4. The Fourth Industrial Revolution

The fourth industrial revolution, as in a more famous way Industry 4.0 was first announced as a governmental strategy of Germany in 2011. Previous industrial revolutions were systems that aim to create a work environment among people (C2C), however, the phenomenon of Industry 4.0 brought this understanding one step further to create the working environment between people and machines (C2M) and

furthermost between the machines themselves (M2M). Cyber-physical systems (CPS), internet of things (IoT), internet of services (IoS), big data, cloud systems, artificial intelligence (AI) are some of the concepts and technologies that have been proposed to be utilized (Dopico et al., 2019; J. Lee et al., 2014; Radziwon et al., 2014; Roblek et al., 2016).

Full automation of and high-level of communication between the *employees* (humans and robots or robotic systems) will be the core of Industry 4.0. Analyzing, interpreting and utilizing the data will be made by machines autonomously. The outputs will be shared via internet or other local network –Stojmenovic discussed in his study that internet is not mandatory for CPS (Stojmenovic, 2014), stored in cloud systems where all of the data will be available to all units and these all will activate the real-time decision-making process effectively. Additionally, artificial intelligence and machine learning concepts will help the machines to make more decisions by themselves. These concepts will create the smart environment between the humans and machines (C2C, C2M, M2M) which is called smart factory (Wang et al., 2016; Zuehlke, 2010).

2.2. Industry 4.0 and Its Components

The proverb of "One hand washes the other" means that only one hand can perform quite limited actions by itself, however more than one hand can become more effective in achieving more complex tasks. In the same manner, while the one machine or system can accomplish limited amount of tasks, a number of machines or systems may execute more complex duties and also be more cost-effective. The integration and interoperability of these sub-systems will create the synergy if managed accurately. Enterprise integration is the process of ensuring the interaction between enterprise entities necessary to achieve domain objectives. Enterprise interoperability is the ability for at least two systems to communicate with, interpret the acquired data from and direct each other. Interoperable enterprises exchange information and services (Chen et al., 2008).

Cyber-physical systems (CPS), internet of things (IoT), internet of services (IoS) and the smart factory are the four key elements of Industry 4.0. Machine to machine

(M2M) communication and smart products are sub-components of IoT and CPS (Roblek et al., 2016).

2.2.1. Cyber-Physical Systems (CPS)

Stojmenovic describes the M2M communication as a paradigm that lets the machines which are sensors, actuators, robots and smart meter readers to communicate with each other with no or little human effort. This paradigm also is the key for the technology of CPS which is a combination of, and coordination between the systems' sub-elements (Stojmenovic, 2014). Another definition of CPS is made by Lu as industrial automation systems which is the enabled connection between the physical operations and computing operations by networking used with integrated machines and tools (Lu, 2017).

CPS focuses on unifying the engineering fundamentals with knowledge across engineering disciplines. This purpose will allow to develop new CPS science and required technology (Shafiq et al., 2015). Embedded computers monitor and control the physical processes by utilizing the feed-back mechanisms and this level of control ability affects both of the virtual systems and the physical systems (E. A. Lee, 2008).

2.2.2. Internet of Things

The network that interconnects machines and sub-elements of the system with unique addresses via the internet or other telecommunication networks is called Internet of Things (IoT) (Stojmenovic, 2014). The IoT provides internet-based solutions and standards which helps to collect data from any device by the means of M2M communications. Additionally, combining cloud systems with IoT allows for real time computation as well as sharing the high value information anywhere connected to same network or internet. This real-time operation ability gives manufacturers unprecedented control and management effectiveness and therefore it gains more profits and less costs (Georgakopoulos et al., 2016). IoT will also create a new wave of high-tech revolutions which will decentralize production control and change the conventional manufacturing processes. Moreover, the production systems will expectedly become networked until everything is interlinked (Shafiq et al., 2015).

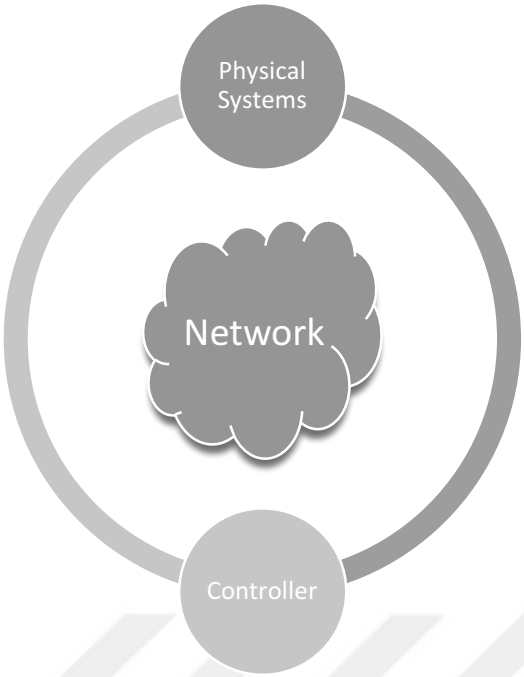

Figure 2.1: Network Controlled Systems

CPS can be applied to a wide range of areas. Some of these are:

Smart Grid Technologies: Aiming at facilitating intelligent monitoring and control of reliable, secure, and efficient delivery of electricity to consumers using digital communications.

Wireless Sensing, Monitoring, and Networking: To enable distributed monitoring systems of numerous smart sensors and actuators, mobile devices, RFIDs, (ground, aerial, and aquatic), robots, etc., which revolutionize a variety of application areas with unprecedented density, fidelity, and scalability of environment instrumentation.

Vehicular Cyber-Physical and Intelligent Transportation Systems: Integrating computing, communication, and storage capabilities with monitoring and control of vehicles to deal with the grand challenges of safe, green, and efficient transportation, e.g., distributed traffic control systems.

Smart Living Technologies: Smart city (e.g. increasing security, comfort and convenience, and green energy), intelligent park and space, healthcare systems, smart cameras, etc. (Stojmenovic, 2014).

2.2.3. Smart Things

The word of *smart* in some contexts refers to an independent device which is equipped with sensors, actuators, microprocessors and transceivers. Furthermore, multiplatform communication gives the ability to this smart device to share its intelligence in a cooperated network. The word of smart is frequently used as a synonym of *excessively automated* in technology (Raji, 1994). Manufacturing equipped with sensors, actuators and autonomous systems will create smart factories which are more intelligent, flexible and productive. These equipment will be able to improve processes through self-optimization and autonomous decision making (Roblek et al., 2016).

The term of *ubiquitous computing* is first explained by Weiser as it is a calm technology that will recede into the background of our lives by communicating each other via radio frequencies, internet or other networks (Weiser, 1991). Another term, *ubiquitous factory* (U-factory) is also used by scholars since the smart factory is not a consistent definition (Radziwon et al., 2014; Yoon et al., 2012). Yoon et al. explained this term as follows:

"A ubiquitous factory is a factory system in which autonomous and sustainable production takes place by gathering, exchanging and using information transparently anywhere anytime with networked interaction between man, machine, materials and systems, based on ubiquitous technology and manufacturing technology" (Yoon et al., 2012).

2.2.4. Big Data

Cyber-physical systems with smart analytics will change the course of production management and factory organization. Sensors will emit the signal of the data related to the heat, pressure, speed, etc. Creating, collecting, storing, processing and mining of this data are becoming another forms of handling the collected data and the combination all of these is called "Big Data" (J. Lee et al., 2014). Cloud computing and ubiquitous network allow for automation of the whole data using measures and therefore Big Data is becoming related to all of the steps in data production and management (Demchenko et al. 2013).

2.2.5. Artificial Intelligence (AI)

Initial attempts which tried to explain the manufacturing of Industry 4.0 systems mentioned the autonomous systems which are so called smart machines using cyber-physical systems (CPS) via the internet (IoT). However, Industry 4.0 environment will surely benefit from the integrated systems which can do all the analyses, calculations, interpretations and suggestions autonomously. Therefore, the science of Artificial Intelligence will perfectly suit the Industry 4.0 (Dopico et al., 2019).

Artificial intelligence (AI) is a science where computers work and react like human-beings. The machines with AI are intelligent and they can perform tasks with some subjects e.g. Deep Learning, Machine Learning and Computer Programming. Lee et al. defined the key elements of Industrial AI are characterized by 'ABCDE' in their study. These are Analytics Technology (A), Big Data Technology (B), Cloud or Cyber Technology (C), Domain Knowhow (D), Evidence (E). These elements are explained in detail in the cited study (J. Lee et al., 2018).

As mentioned earlier, the smart factories combined by hardware and software devices and where humans, machines and other resources work and communicate collaboratively will need more complex networks and programming. Artificial intelligence is the key to create the environment that can work autonomously by itself and collaboratively with humans and other machines while it keeps learning, reasoning and acting with the data gathered from industrial processes (Dopico et al., 2019).

2.3. Anticipated Organizational Changes with I4.0

The industrial revolutions always affected the labor and the employment in history. The effects of technological advancements on labor is explained by Bresnahan briefly:

"Computer business systems change white collar work. They change it by organizing, routinizing and regularizing tasks that people- and paper-based systems did more intuitively but more haphazardly. In the service sectors, and in the white collar activities of the goods sectors, they also change work by changing the nature of the firm's output. Computer-based production leads higher levels of service or even whole new (service) products. The labor-demand impact comes at the firm level, as computer business systems form the modern production process for many service

industries (and for the service functions of other industries.) As computers have grown cheaper, and especially as computer networking has improved, computer-based production has spread more and more widely through white-collar work" (Bresnahan, 1997).

The technologies can be used by companies and their employees at low marginal cost when they are invented first. Abundance of more skilled labor let the inventors put more effort to develop skill-complementary technologies because of the market being larger in that situation. In other words, technology should make the workers more skilled as it continues to develop and in return more skilled workers will make the technological developments more skill-complementary over time (Acemoglu, 1997). Autor et al. found that educational and occupational skills were rapidly upgraded in industries where the technological implementations were greatly made in 1980s (Autor et al., 1997). Therefore, skill-biased technological developments increase the need for skilled and educated workers and it evokes the jobs become more qualified (Goldin and Katz, 2007).

On the other hand, the demand for more skilled workers while the low-skilled jobs are increasing creates the job polarization, which occurs between high and low skilled workers and high and low wage occupations (Acemoglu, 1997; Autor and Dorn, 2009). Job polarization is almost inevitable when the technology develops rapidly. The wage inequality and consequently the unemployment of low-skilled workers are other outcomes of this rapid changing. According to the studies of Autor et al., the skill upgrading due to the complementary technological changes has been greater in industries where the computerization is more utilized (Autor et al., 1997).

According to the analysis made by Givord and Maurin (2004) between the years of 1982 and 2002, the job insecurity has increased and the computerization in industries escalated the rate of unemployment over time in France. In addition, the increase in the unemployment rate is significantly more in industries which have the greater portions of research and development workers and high-tech users. It is also concluded in the study that the technological changes add to the rate of job insecurity (Givord and Maurin, 2004).

High unemployment possibility and persistence has always created a fear of technological revolution since the first industrial revolution. Economists and policy

makers have always been concerned about this risk (Schlötzer, 2015). Unemployment is an economic problem which affects both, the economy and the unemployed person himself or herself. An unemployed person not only do not contribute to gross domestic product creation, but also puts more weight on state budget spending due to the payments of unemployment benefits. Additionally, unemployment leads to severe cuts in living standards. Unemployed people do not join social activities and it leads to social isolation and brings more problems with itself (Gallie et al., 2010).

The effects of the computerization on developing countries will be more crucial than the developed countries. Technology will equip the routine task occupations and it will lead a mass unemployment. The studies made in Turkey by Sumer show that Turkey is one of those developing countries which will experience the negative effects of new industrial revolution. Remodeling of the understanding of education and industrial transition in order to minimize the losses and increase the benefits from this revolutionary wave is crucial at this point. Besides, promoting jobs that needs human creativity and skills will absorb the negative impact of I4.0 on industry (Sumer, 2018).

According to the estimates of McKinsey Global Institute made in 2013, it is suggested that well-prepared algorithms can take place of 140 million full-time knowledge workers on globe. This will not occur at once of course, and many of the occupations are still far from being affected from this computerization. However, rapid development of technology and its challenge with human labor is increasing day after day (Frey and Osborne, 2013).

Industry 4.0 will enable the creation of value by higher level of productivity and new business models, however this industrial revolution may make an impact on employment (Roblek et al., 2016). The transformation of processes and the positions in firms have already been started in some. The managers are required to have gained knowledge to enable the digital thinking in order to achieve this transition smoothly. The ones who are not able to read and analyze the data will be less competitive in this challenging environment. Moreover, the employees will need to make the decisions autonomously (Roblek et al., 2016). It will be a challenge for managerial positions to conduct this transition since some of the less-demanding positions will disappear during the transformation of organizations' structures (Kane et al., 2015).

2.4. Organizational Citizenship Behavior (OCB)

Nowadays, organizations have to find new ways to grow in response to increasingly challenging situations day after day. Successful organizations need employees who will improve the functioning of the organization by doing more than their role requirements. In 1977, Organizational Citizenship Behavior was suggested as a performance construct by Organ (Organ, 1977) and later he suggested that, although satisfaction may not have a strong effect on standard conceptualizations of performance, it might be related to non-specified behaviors which he termed as organizational citizenship behavior. Additionally, the employees demonstrating this kind of behaviors called "good citizens" (Organ, 1988a). However, the first steps of introducing the phenomenon of OCB were taken in 1938 by Barnard, who expressed that in order to reach the organizational goals, the one should contribute by making more efforts than his or her role required (Barnard, 1938, p.23).

In 1964, Katz introduced three essential behavioral requirements for a well-functioning company. According to this phenomenon, "people must be induced to enter and remain within the system, they must carry out their role assignments in a dependable fashion, and there must be innovative and spontaneous activity in achieving organizational objectives which go beyond the role specifications.". In his remarkable study, Katz continuingly explained the significance of innovative and spontaneous behavior as they are the key attitudes for an employee should have to take position under unforeseen conditions. The companies should leave some room for some variabilities to emerge in order to develop and apply decent spontaneous acts for the sake of the organizational survival and effectiveness. In his words, "An organization which depends solely upon its blueprints of prescribed behavior is a very fragile social system." (Katz, 1964).

Organ et al. (1988b, p.13) defined organizational citizenship behavior as:

"Individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and in the aggregate promotes the efficient and effective functioning of the organization . By discretionary, we mean that the specific behavior in a specific context is not an absolute requirement of the job description (that is, the literal or clearly specifiable terms of the person's employment contract with the

organization). Rather, the behavior involves some degree of personal choice, such that the person will not be punished if he or she chooses not to engage in the behavior."

And he went on as:

"Our definition of OCB requires that it is not directly or explicitly recognized by the formal reward system of the employing organization. Consider the case of a department store salesperson. That person must demonstrate some minimal standards of job knowledge, competence, and effort to meet the contractual obligations of the job. Of course, some level of sales is also expected. Some of the staff will exert a level of effort just sufficient to meet that goal. Others will exert effort to attain sales well beyond that goal, and doing so would generally be regarded as discretionary, because a lower level of sales would be sufficient to meet minimal job requirements. However, to the extent that sales beyond the standard level contractually qualifies for higher pay, we would not regard this particular dimension of discretionary performance as OCB—although we probably would regard it as meritorious, even virtuous. On the other hand, a sales clerk who clearly went beyond the call of duty to assist a customer after the successful closure of a transaction would meet the definition of OCB."

From all of these studies, some characteristic features of OCB can be obtained. Firstly, OCB is discretionary. In other words, it is referred to some workplace behaviors acquired voluntarily which are beyond the basic job/role requirements. "They are often described as behaviors that go beyond the call of duty." (Suresh and Venkatammal, 2010). No job requirement or none of the supervisors can induce the employee to acquire that. Secondly, exhibition of OCB does not necessitate any rewards. This cannot be induced by contract, or any formal regulations. However, supervisors may recommend those employees exhibiting OCBs for promotion. Researchers have proposed specific dimensions of organizational citizenship behavior. The most famous of these are altruism, courtesy, sportsmanship, conscientiousness, civic virtue (Organ, 1988a). Additionally, obedience, loyalty, advocacy participation, social participation, functional participation (Graham and Dienesch, 1994), as well as organization-focused and interpersonal-focused organizational citizenship behaviors are some other dimensions defined in the literature (Williams and Anderson, 1991). Individually, these behaviors may all be trivial to exhibit, but collectively they may significantly enhance the performance of an organization (Borman and Motowidlo, 1997).

2.4.1. Altruism

Altruism has the theme of helping co-workers to solve or avoid work-related problems as well as courtesy, peacekeeping, and cheerleading. It consists of those voluntary actions to help another person with a work-related problem (P. M. Podsakoff and MacKenzie, 1994). For example, an experienced employee who shows a newly hired employee how to perform the job more effectively is an exhibition of altruism. This attitude may not only help the supervisor's department and the organization itself become more efficient but in addition, it may permit a supervisor to devote himself or herself to more important functions (Mackenzie, 1991). Additionally, voluntarily helping less skilled employees, assisting overloaded or absent co-workers are another examples of exhibiting altruism (Organ, 1988b).

2.4.2. Courtesy

Courtesy consists of actions that help prevent work-related problems with others or such actions as briefly making contacts with those parties whose works would be affected by one's decisions or commitments (P. M. Podsakoff and MacKenzie, 1994). Not creating problems for others reduces intergroup conflicts and diminishes the need to spend time on conflict management activities (Borman and Motowidlo, 1997). As an example of courtesy actions, a worker is exhibiting courtesy if he is checking in with co-workers about a troubling personal issue that could impact their performance.

Managerial productivity may increase when employees avoid creating problems for co-workers which will prevent a pattern of crisis management (Borman and Motowidlo, 1997).

2.4.3. Sportsmanship

Sportsmanship is a willingness to tolerate less than ideal circumstances without complaining, holding grudges, railing against real or imagined slights and making something out of nothing and keeping his or her calm during this kind of challenging situations (Organ, 1988c).

An employee, who exhibits sportsmanship by not complaining to their manager about every little aspect of the job they dislike, permit the manager to conserve his or her energy and direct the attention to those aspects of the job which are more important (Mackenzie, 1991). In addition, "when employees exhibit sportsmanship by demonstrating a willingness to take on new responsibilities or learn new skills, it may enhance an organization's ability to adapt to changes in its environment." (Borman and Motowidlo, 1997).

Protecting the organization's benefits every time, working for the advantages of the organization without supervisors, making use of the time well without wasting it by complaining, not being inclined to see the micro problems as great ones, focusing on the positive aspects rather than the negative sides are some of the behaviors of sportsmanship (Elçi and Alpkan, 2006).

2.4.4. Conscientiousness

Conscientiousness is a discretionary behavior that employees practice well beyond the minimum requirements of their role (Organ, 1988c). Coming in early or staying late to finish important tasks, going above and beyond the call of duty in performing one's work responsibilities, (Borman and Motowidlo, 1997), paying attention to not exceed the break times, attending the meetings properly and orderly, strictly sticking to timeline, never demanding additional or longer break times, applying the organizational rules even when nobody is present, trying his or her best to obey the rules and procedures (Elçi and Alpkan, 2006) are some of the behaviors of conscientiousness.

2.4.5. Civic Virtue

Civic virtue reflects behaviors in which an employee responsibly engages to show his or her concern for the life of the company and employee initiative in recommending how the firm can improve operations (Netemeyer et al., 1997). When employees voluntarily attend and actively participate in the organization's gatherings, it may enhance the organization's responsiveness by aiding the dissemination of valuable information. Additionally, the coordination of activities among group

members and between work groups may also be enhanced (Borman and Motowidlo, 1997).

Attending meetings and/or functions that are not required but help the company, keeping up with the changes in the organization, taking the steps to recommend how the company's operations and procedures can be improved and/or developed (P. M. Podsakoff and MacKenzie, 1994), trying one's best to follow and adapt the organizational changes and leading others to accept these changes are some of the behaviors of civic virtue (Elçi and Alpkan, 2006).

2.5. Locus of Control

The word *loci* means place or location in Latin and the plural form is locus. In accordance with social learning theory, there have been several researches conducted to explain the mechanisms behind the decision making process. It is shown that individuals demonstrate different characteristics when it comes to a degree to employ attributed reinforcements to their own actions. As Rotter (1966) noted in his study "A generalized attitude, belief, or expectancy regarding the nature of the causal relationship between one's own behavior and its consequences might affect a variety of behavioral choices in a broad band of life situations." and he adds that this behavior-reinforcement sequence is first formed in infancy. In his study, Rotter explained empirical definition of reinforcement which is independent of assumptions about physiological drive reduction. Conditions which let the the one employ approach behavior, this is called positive reinforcements, while conditions let to an avoidant behavior are called negative reinforcements. The reactions to some events define the behavioral attributes of people's belief system of control. According to Rotter (1966), if a reinforcement is perceived by a subject as the result of luck, chance, fate or the unidentifiable forces surrounding him or her, this belief system is labeled as external control of reinforcement. If the subject perceives that the results of his or her own actions are related to his or her own behavior, actions, decisions, or their permanent characteristics, this belief system is called internal control of reinforcement. In other words, people with external control of reinforcement tend to see the environment and external rewards are uncontrollable, whereas for those with internal control of reinforcement believe that the outcomes of events are responsive to their personal

actions which are somehow controllable. This personality concept is later called Locus of Control (LOC) (Rotter, 1966).

The individuals who have internal LOC are more likely to believe that they have the major role to play in affecting the outcomes of events which influence their lives. The attitudes to be displayed are under control of an individual with internal LOC and they also believe in themselves to have the power to direct the course of their lives in any way they desire by having the positive ego concept (Gulveren, 2008). Internals also are those who see themselves as the masters of their external environments. As of being the master of environments, they believe that they can control the fate and often perceive a strong connection between their decisions and outcomes. Thus, they are confident, alert and directive in attempting to rule the external environments (Musa et al., 2017).

The individuals who have external LOC are more likely to believe that their role in events do not influence the outcomes. The perceptions of externals are based on impersonal causes. They believe that they do not hold the power to control these causes and therefore the causes of outcomes are unpredictable and uncontrollable. Chance, fate, fortune or luck are some of the sources of the external causes. The externals also do not see any cause and effect relationship between behavior and outcome. The consequences of behavior are randomly formed by external forces which mentioned as they do not have any control on (Connolly, 1980). The externals are less likely to change their behaviors following a positive or a negative outcome than the internals. Internals tend to believe that the reinforcements may be altered by correct behaviors where externals do not (Marks, 1998).

Internals place emphasis on their skills and endeavors on a task, they focus on the success which is believed to be related to their own behaviors. On the other hand, externals place emphasis on the present circumstances and the difficulty of a task and they often focus on the failure which is believed to be related to outer powers. (Yeşilyaprak, 1988). Internals are more creative, self-confident, social and independent in comparison to externals who are more vulnerable to anxiety and neuroticism (Küçükkaragöz, 1998). Externals show a little effort to make their socio-economic conditions better and they often employ external forces as a defense mechanism (Modise and Rambe, 2017).

The following table summarizes the general diversities between the internal and external locus of controls based on distinct variables (Demirkan, 2006, p.36).

Table 2.2: Diversities Between Internals and Externals

Variables	Internal Locus of Control	External Locus of Control
Abilities	Chooses activities in which they can display their abilities.	Prefers activities in which they can show the role of chance in their lives.
Responsibilities	Feels that they are responsible for their own decisions, and perceive that their fate is not affected by factors out of their control, but by their own decisions.	Leaves the responsibility to the external sources which are chance, fate, or somebody's pre-made decisions.
Change	Feels responsible when the experience or desire a change.	Prefers to stay passive and reluctant to change.
Environment	Holds more power to use the information they have and affect the environment.	Cannot control their environment. They are generally the affected party of the environment.
Stress	Has better stress management.	Cannot cope with stress well. They have less inner-control.
Job satisfaction	Has more job satisfaction. They can dedicate themselves to their jobs and show better results for their own businesses.	Has negative correlation with job satisfaction.
Work motivation	Generally believes that their efforts will provide the desired results, thus they are more confident.	They are more award-oriented in terms of work motivation.

Relatively internal-oriented students are more likely to demonstrate higher success rates in the terms of grades, develop better stress coping mechanisms and pursue successful study strategies. Likewise, relatively external-oriented students are more likely to demonstrate lower grades, engage in less successful or unsuccessful study strategies, not to employ efficient course-induced stress coping mechanisms and blame others for their poor performance (Grimes et al., 2004).

2.6. Locus of Control and OCB

The environmental support and the social environment help the employees to take place in activities which will be valuable to improve his or her self-improvement.

In contrast, unfulfilled needs of environmental supports prevent him or her to reach the desired self-development. Therefore, environmental needs and support can have an impact on one's behavior. Moreover, some personality characteristics also take place in effecting the one's behavior, as well. Locus of control is one of these roles which is a dispositional attribution (O'Brien, 2004). As mentioned before, Organizational Citizenship Bahavior (OCB) is not task-related. OCB is a voluntarily acquired behavior which cannot be punished or rewarded directly. However, organizational citizenship behaviors are beneficial in the workplace (Organ, 1988a).

Locus of control, as a personality characteristic, may regulate participation of an individual employee requires. Funderberg and Levy studied the effects of locus of control on appraisal system attitudes and they found that the employees with internal locus of control tends to be more encouraging toward 360-degree appraisal systems which is explained as a system or process in which employees receive confidential, anonymous feedback from the people who work around them. It is covered in the study that individuals with external locus of control are more vulnerable to be evaluated by external sources, since they believe they have no power or control over the things they are doing or facing but external factors do. On the other hand, the individuals with internal locus of control feel that they have more control on their own actions and decisions, thus they are more welcoming to external feedbacks. Hence, employees with internal locus of control tend to show higher level of *altruism* as an organizational citizenship behavior (Funderburg and Levy, 1997).

The relationship between locus of control and other dimensions of organizational citizenship behavior will likely to be parallel with each other. Higher locus of control means more internal locus of control and lower locus of control is more external locus of control in literature. It is expected from the definitons and studies mentioned earlier in this study, higher locus of control will let higher degree of organizational citizenship behavior and lower locus of control will result in weak organizational citizenship behavior. O'Brien studied this phenomenon in her master's thesis. She tested the correlation between the locus of control and voluntary behaviors (OCB and counter-productive work behavior (CWB)). In her study, the correlation between locus of control and organizational citizenship behavior is found to be positive ($r=.40$, $p<.001$) and the correlation between LOC and CWB is found to be negative ($r=-.24$, $p<.01$) as expected (O'Brien, 2004).

2.7. OCB Changes with Mass Layoffs

Organ and Konovsky chose the long-term hospital workers who does not have the fear of being unemployed when they studied the cognitive and effective determinants of OCB (Organ and Konovsky, 1989). Followingly, Podsakoff and Organ (1990) examined the employees of The Ministry of Communications who were again long-term employees (P. M. Podsakoff and Organ, 1990).

But, how will be the OCB of employees who are mass-layoff survivors or have the higher prospect of being laid off? Datta et al. suggested that the mass layoff might be seen as a warning for survivors which means that the company will no longer be able to keep the psychological contract intact. Thus, this feeling of being at risk of unemployment would likely to make the survivors to put less endeavor into the work and to be non-productive as previously (Datta et al., 2010). However, some other studies suggested that the provided support to survivors and the behavior acquired by the company after a huge downsizing and/or a mass layoff may affect the outcome of these situations in the terms of survivors' behaviors (Brockner et al., 2004; Dulac et al., 2008). Bohle et al. studied this phenomenon in their research and came up with the result of that the level of psychological contract breach decides the effects of the support on survivors'. In other words, after-mass-layoff-support does not affect the survivors under higher psychological contract breach circumstances, but it has positive effects on low contract breach (Bohle et al., 2016).

There is another question emerges from the potential-mass-layoff upon an industrial revolution. Who does get laid off first? Researchers have defined three topics that affect the decisions for employees to get laid off. Firstly; occupation, location, job level (seniority) are some of the factors that affect the layoff decisions. Secondly, some demographic factors such as age, race, gender are taken into account while making the decisions. Thirdly, and most importantly according to this study, the capability of an employee to contribute to the value of the company. Personal training, specific knowledge of the firm, performance are some other factors that the employee contributes to firm's value with. Moreover, extra-role contributions are more likely to affect the performance of an employee and his or her place in the firm (Zatzick et al., 2015)

The companies facing layoffs are trying to make the *best* decisions to keep the good workers (Wagenaar et al., 2014). Beyond the situation of getting laid off, managers are seeing the employees with more job commitment more likely to have promotions (Shore et al., 1995). Higher level of job commitment also leads to higher OCB and vice versa (Suresh and Venkatammal, 2010; Zeinabadi, 2010). Zatzick et al. studied the likelihood of being laid off in their research and came up with the results that higher levels of performance accompanied with affective organizational commitment decreases the layoff chances of an employee (Zatzick et al., 2015).

In this study, it is suggested that employees with internal locus of control tend to be more adaptive to changing environment and consequently they tend to be differentiate positively their OCB in order to survive the layoffs. Therefore, it can be proposed as:

H1. *The OCB of employees with internal locus of control will be differentiated by Industry 4.0 layoffs.*

In contrast, the employees with external loci will be less likely to improve themselves to adapt and survive the changing environment and layoffs, and they are expected to show differentiation in a negative manner. This can be proposed as:

H2. *The OCB of employees with external locus of control will be differentiated by Industry 4.0 layoffs.*

Furthermore, the effect of mass layoffs by I4.0 on the dimensions of OCB can be analyzed for distinct LOC groups. Therefore, following sub-hypotheses can be proposed:

H1a. *The OCB dimension of Altruism of employees with internal locus of control will be differentiated by Industry 4.0 layoffs.*

H1b. *The OCB dimension of Courtesy of employees with internal locus of control will be differentiated by Industry 4.0 layoffs.*

H1c. *The OCB dimension of Sportsmanship of employees with internal locus of control will be differentiated by Industry 4.0 layoffs.*

H1d. *The OCB dimension of Conscientiousness of employees with internal locus of control will be differentiated by Industry 4.0 layoffs.*

H1e. *The OCB dimension of Civic Virtue of employees with internal locus of control will be differentiated by Industry 4.0 layoffs.*

H2a. *The OCB dimension of Altruism of employees with external locus of control will be differentiated by Industry 4.0 layoffs.*

H2b. *The OCB dimension of Courtesy of employees with external locus of control will be differentiated by Industry 4.0 layoffs.*

H2c. *The OCB dimension of Sportsmanship of employees with external locus of control will be differentiated by Industry 4.0 layoffs.*

H2d. *The OCB dimension of Conscientiousness of employees with external locus of control will be differentiated by Industry 4.0 layoffs.*

H2e. *The OCB dimension of Civic Virtue of employees with external locus of control will be differentiated by Industry 4.0 layoffs.*

3. METHODOLOGY

In this section of the study; data collection methods, the concerns which affected the structure of the research, measurements and the information on analyses of data are explained.

3.1. Data Collection Method

Turkey, the home country of the author of this study is a developing country where the one can easily find the impressions of the second industrial revolution. However, the effects of the third industrial revolution are prevalent among bigger firms. Moreover, there are several companies investing on R&D studies to implement Industry 4.0 concepts and elements. Thus, the firms selected to be analyzed are the ones capable to integrate technological developments in near future. The followings are the companies that the questionnaires were applied to: Autoliv Cankor Automotive Safety Systems (Kocaeli), Tekso Technical Refrigeration Systems (Kocaeli), Global Boxing and Labeling (İzmir).

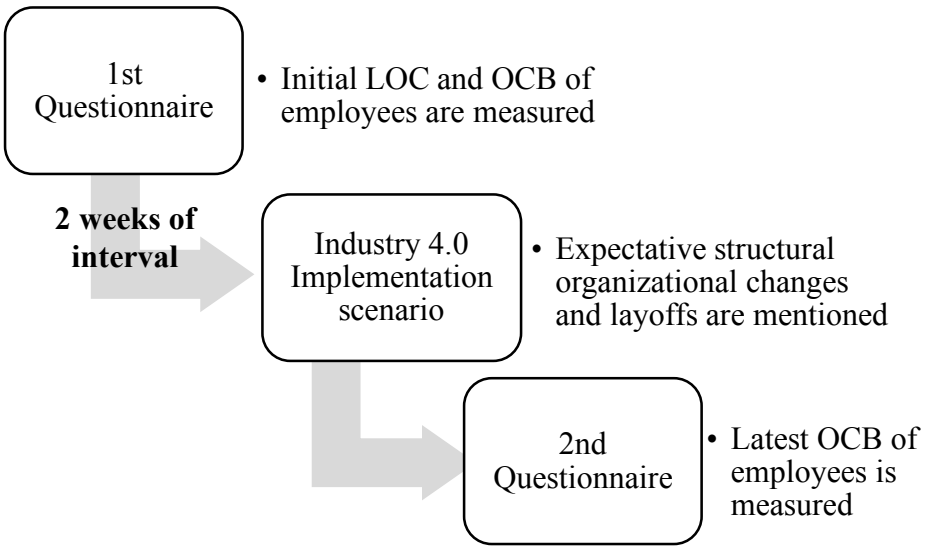

Figure 3.1: Application Steps of the Study

The studies based on observations on the same subjects for a determined duration of time are called longitudinal studies, and these are designated to evaluate the changes

for a research topic through time (Kodlin and Thompson, 1958). The study made on this research is a longitudinal study with two steps of application. At first application, the Locus of Control of the employees are measured and their Organizational Citizenship Behaviors are analyzed. The questionnaires were applied to the groups with 2 weeks interval. After 2 weeks of interval, a second application is made with a scenario which tells the subject that the company where he or she works is starting to Industry 4.0 implementation process which may cause some job position switches and layoffs. After the scenario, OCB questionnaire is applied again to analyze the latest OCB.

The scenario about the proposed Industry 4.0 implementations on the respondent's company is based on the vignette research method. Vignettes are usually stories or snapshots of future positions of the respondent in a projected situation (West, 1982). The respondents are generally asked for a projected situation by expressing what would do the character in the vignette, how would they react, etc. The idea of putting questions in this form is to let the respondent to imagine a third person, make a decision for him/her and entail the story with his/her (respondent's) moral understandings (Finch, 1987).

Although vignettes are generally used in question forms in researches, the scenario about the expected layoffs by Industry 4.0 implementation processes was read to respondents in order not to change the OCB scale questions. Moreover, the duration between two applications of questionnaires was kept shorter than most of longitudinal studies since it was aimed to have the respondents in the same manner of understanding of events in both applications. Lastly, the orders of the questions in 2nd OCB survey were randomly changed in order to prevent any pre-determined answers by respondents.

This longitudinal study revealed the problem of linking the two completed questionnaires of the same person without asking any identifier questions. The general method of linking the data through research waves of a longitudinal study is having the respondent create self-generation codes. However, using the self-generated codes may create a confusion during the linking process because of the correctness of the code created by the respondent in different applications (Schnell et al., 2010). Thus, 5 non-identifier questions such as the names of grandmothers, father's month of birth

were asked in both questionnaires and two clusters of the data collected were linked through matching the answers to these questions.

The design of the study is created by the anticipated outcomes of Industry 4.0 implementations. One of these outcomes is mass layoffs due to structural organizational changes in companies (Schlötzer, 2015).

3.2. Measurements

In this study data was collected through hardcopy questionnaires. Two applications of surveys were made. The first application consisted of profile questions such as gender, age, organization tenure, job position; non-identifier questions (i.e. names of grandmothers, birth month of father, birth place of mother, birth month of youngest sibling); Podsakoff's OCB scale (M. Podsakoff et al., 1990) and Spector's LOC scale (Spector, 1988). The Turkish translation of LOC scale was adopted from Bastounis et al.'s study (Bastounis et al., 2004). The second application of survey consisted of the same profile questions and non-identifier questions, a scenario explains the layoffs created by structural organizational changes by I4.0 implementation processes, and the same OCB scale where the questions' orders are randomly changed. Respondents are asked to reply the OCB scale after reading the scenario and to consider themselves in the position that the scenario defined. The respondents replied the 2nd OCB scale according to a vignette which tells them the following:

"The term of Industry 4.0 means the use of robots and machines in industry. Number of companies abroad are currently working on implementing Industry 4.0. According to researches made during these processes revealed that the organizations experience some structural changes. These structural changes cause some human job positions to be replaced with robots, and new positions to emerge. Some works of employees were began to be performed by machines (robots) and consequently some of those employees were laid off. In the same manner, some works could not be performed by machines and remaining of the mentioned employees were transferred to those job positions, moreover new employees were hired to perform these works.

In a nutshell, you or your friend may lose the job or experience a job position change in the company.

This survey aims to scientifically measure your point of view in case of this kind of organizational changes. Please respond the following questions by considering your company working on Industry 4.0 implementation processes and by considering how your manner and behavior would get affected. In other words, do not reply according to your current situation, do reply by taking into consideration the possible changes to be happened in your company."

5-point Likert type scales were used to measure both LOC and OCB scales. In both scales *1* stands for *Strongly Disagree* and *5* stands for *Strongly Agree*. In following tables OCB 1 stands for the initial OCB scores and OCB 2 stands for the OCB scores after layoff effects of I4.0.

The validity and reliability tests of the measures are studied before analyzing the data, so that the Cronbach's alpha internal consistency coefficients are investigated. The Cronbach's alpha value for the pre-test of the OCB scale's total score is found as 0.955 and it is found as 0.964 for the post-test.

Table 3.1: The Cronbach's Alpha Internal Consistency Coefficients for Pre-test and Post-test Analyses of OCB Scale and LOC Scale

	Pre-test α	**Post-test α**
OCB	.955	.964
Conscientiousness	.782	.797
Sportsmanship	.824	.893
Civic Virtue	.856	.899
Courtesy	.778	.825
Altruism	.889	.942
LOC	.956	

The internal consistency coefficient values for the dimensions of OCB are found between 0.782 and 0.889 for pre-test applications and between 0.797 and 0.942 for post-test applications as shown in Table 3.1. Lastly, the internal consistency coefficient value is found as .956 for LOC scale. These values show that the scales are valid and reliable (Fornell and Larcker 1981; Hair et al., 2010). The KMO test and the Barlett's test are used to measure the adequacy of the collected data. The outcome of the KMO test is .865 for LOC scale and .781 for OCB scale, so the conformity is confirmed to perform the factor analysis. The results of Barlett's tests showed statistical significance (p=0.000<0.05) for both of the scales. These tests show that the variables are correlated with each other, thus principal factor method can be used. Varimax rotation is used as the factor extraction method and the rotational component matrix for LOC scale is shown in the Table 3.2.

Table 3.2: Factor Structure for LOC

Item	Internal	External
LOC_2	.849	
LOC_3	.822	
LOC_7	.736	
LOC_1	.736	
LOC_14	.731	
LOC_11	.699	
LOC_5		.899
LOC_6		.857
LOC_12		.840
LOC_16		.739
LOC_10		.736
LOC_8		.655
LOC_9		.653
LOC_13		.615
KMO	.865	
Approx.Chi Sq.	1771.421	

The rotational component matrix for OCB dimensions is given in Table 3.3.

Table 3.3: Factor Structure for OCB Dimensions

Item	Conscien-tiousness	Sports-manship	Civic Virtue	Courtesy	Altruism
CONS_2	.880				
CONS_3	.845				
CONS_4	.844				
CONS_1	.814				
CONS_5	.700				
SPOR_5		.889			
SPOR_1		.880			
SPOR_3		.840			
SPOR_2		.792			
SPOR_4		.759			
CIVIC_2			.940		
CIVIC_3			.896		
CIVIC_4			.815		
CIVIC_1			.688		
COUR_4				.946	
COUR_2				.835	
COUR_5				.724	
COUR_1				.626	
COUR_3				.511	
ALTR_1					.935
ALTR_4					.901
ALTR_3					.899
ALTR_2					.883
ALTR_5					.846
KMO	.656	.761	.763	.607	.742
Approx. Chi Sq.	577.509	912.814	873.232	764.938	1453.058

3.3. Analysis of the Data

The initial number of respondents were 167. During the linking process of two steps of the surveys by matching the non-identifier questions, 37 of them found un-matching due to missing or inaccurate information. Although the remaining surveys were missing some portion of replies to non-identifier questions, 130 of the surveys were linked successfully by matching at least 2 answers of non-identifier questions. All of the collected and linked surveys are copied to online survey software one by one and a report is created and downloaded. 5 questions of OCB scale are reverse (R) questions and they are converted into the opposite values (M. Podsakoff et al., 1990). Additionally, the questions related the 5 dimensions of OCB are grouped together for each dimension.

LOC scale consists of internal and external questions, and the answers of internal questions converted into the opposite values. Converting the LOC scale answers made the survey an external locus of control questionnaire, in other words, higher the score was more external and vice versa.

The descriptive statistics of the variables of this study are shown in Table 3.4. The number of (1) placed after the variable means the measuring before Industry 4.0 implementations, and the number of (2) means the measuring after Industry 4.0 implementations. The means of the variables are between 3.08 and 4.24, Skewness values are between -1.27 and 0.76, Kurtosis values are between -1.20 and 0.43. These data show that variables meet the normality assumptions, thus parametric tests are used. Therefore, in order to measure the changes in OCB scores of participants before and after I4.0 implementations according to their LOC, Two-Way ANOVA for Mixed Measures is used. This software measures the changes in time between unrelated measurements and dependent variables. Independent Samples T Test is used for OCB comparison of employees according to their genders and job types. One-Way ANOVA analysis is used to compare OCB scores for ages, educations and organizational tenures. Independent Samples T Test compares the dependent variables with respect to independent variables comprised of two independent groups, while One-Way ANOVA compares dependent variables with respect to independent variables

comprised of more than two groups (Buyukozturk, 2012). For the analysis of the data SPSS 22 software bundle is used and the level of significance is defined as 0.05.

Table 3.4: Descriptive Statistics of Variables of the Study

	n	Mean	SD	Skewness	Kurtosis
OCB 1	130	3.56	.67	.49	-.90
OCB 2	130	4.09	.75	-.80	-.92
Conscientiousness 1	130	3.73	.68	.55	-.86
Conscientiousness 2	130	4.14	.63	-.70	-.21
Sportsmanship 1	130	3.08	.85	.14	-.48
Sportsmanship 2	130	3.99	.98	-.60	-.80
Civic Virtue 1	130	3.38	.88	.56	-.92
Civic Virtue 2	130	3.89	.98	-.79	-.82
Courtesy 1	130	3.88	.52	.76	-.44
Courtesy 2	130	4.24	.64	-.62	-1.20
Altruism 1	130	3.66	.77	.07	-1.01
Altruism 2	130	4.12	.98	-1.27	.43

In order to analyze the participants' locus of control, the LOC scores are clustered by using the median value. The median value of the total score is found as 37. The findings related the dimensions of LOC are shown in Table 3.5. LOC score mean for internals are found as 27.05±3.31 and for externals it is 53.91±11.15.

Table 3.5: Internals and Externals According to LOC Scores

	LOC group	n	Mean	SD
LOC	Internal	65	27.05	3.31
	External	65	53.91	11.15

The half of the group (n=65) is measured as internals, while other half is measured as externals.

4. FINDINGS AND RESULTS

The statistics of the data are provided in this section. Description of the sample, findings and their analyses are covered.

4.1. Descriptive Statistics of the Sample

The descriptive characteristics of the 130 respondents are provided in Table 4.1.

Table 4.1: Demographic Characteristics of the Respondents

Characteristics	Category	Frequency	%
Age	20-25	7	5.4
	26-30	45	34.6
	31-40	70	53.8
	Over 40	8	6.2
Gender	Female	63	48.4
	Male	67	51.6
Education	High School	57	43.8
	Bachelor's Degree	52	40
	Master's Degree	18	13.9
	Ph.D. and above	3	2.3
Type of Work	White Collar	68	53.5
	Blue Collar	59	46.5
Organizational Tenure	Less than a year	9	6.9
	1-5 years	40	30.8
	5-10 years	76	58.5
	Over 10 years	5	3.8

As shown, 48.4% of the participants were female. 5.4% of whole group were in 20-25 age range, 34.6% were in 26-30 age range, 53.8% were in 31-40 age range and the remaining 6.2% of the participants were over 40 years old. 43.8% of these 130 participants were holding high school diploma and the rest of the group were holding Bachelor's degree or above. 40% of the participants were holding Bachelor's degree,13.9% were holding Master's degree and the remaining 2.3% of whole group was holding Ph.D. degree or above. In terms of the type of work of the participants, 68 were white collar and 59 were blue collar workers, which constituted 53.5% and 46.5% of the group respectively. Majority of the participants had an organizational tenure between 5-10 years which makes 58.5% of the group; while 30.8% had 1-5 years, 6.9% had less than a year and the remaining 3.8% had organizational tenure over 10 years.

Total number of applicants participated in this study is 130 consisting of 63 female and 67 male. OCB changes for different genders are shown in Table 4.2. Analyses show that OCB 1 (t=-2.968, p<.01) and OCB 2 (t=-2.955, p<.01) scores are demonstrating significant differentiation in favor of males.

Table 4.2: OCB Differentiations of the Genders

	Gender	**n**	**Mean**	**SD**	**t**	**p**
OCB 1	Female	63	3.38	.58	-2.968	.00*
	Male	67	3.72	.71		
OCB 2	Female	63	3.89	.83	-2.955	.00*
	Male	67	4.27	.63		

* p<.01

OCB differentiations with Industry 4.0 layoff effects for age groups are given in Table 4.3. The results show significant differentiations between OCB 1 (F=14.349, p<.01) and OCB 2 (F=5.938, p<.01). To understand the source group of the differentiation, Tukey multiple comparison, a post-hoc test is made. The results of this test show that the "20-25 years old" and "over 41 years old" age groups have higher OCB 1 scores mean values than the other age groups. Additionally, "26-30 years old"

and “over 41 years old” age groups have higher OCB 2 scores mean values than the other age groups.

Table 4.3: OCB Differentiations of the Age Groups

	Age (years old)	n	Mean	SD	F	p	Tukey
OCB 1	20-25	7	4.20	.37	14.349	.00*	1, 4 > 2, 3
	26-30	45	3.44	.68			
	31-40	70	3.43	.56			
	Over 41	8	4.69	.21			
OCB 2	20-25	7	4.31	.38	5.938	.00*	2, 4 > 3
	26-30	45	4.30	.67			
	31-40	70	3.85	.78			
	Over 41	8	4.67	.28			

* p<.01

OCB differentiations with layoff effects for “education level” groups are given in Table 4.4. The results show significant differentiations between OCB 1 (F=4.563, p<.05) and OCB 2 (F=13.534, p<.01). To understand the source group of the differentiation, Tukey multiple comparison, a post-hoc test is made. The results of this test show that the “Bachelor`s degree” education level group has higher OCB 1 and OCB 2 scores mean values than the other education level groups.

Table 4.4: OCB Differentiations of the Education Level Groups

	Education Level	n	Mean	SD	F	p	Tukey
OCB 1	High School	57	3.40	.71	4.563	.01*	2 > 1, 3
	Bachelor’s D.	52	3.78	.50			
	Master’s D.	18	3.29	.81			
	Ph.D. D. and Over	3	3.97	.44			

	Education Level	n	Mean	SD	F	p	Tukey
OCB 2	High School	57	4.09	.77	13.534	.00**	2 > 1, 3
	Bachelor's D.	52	4.38	.39			
	Master's D.	18	3.23	.84			
	Ph.D. D. and Over	3	3.79	.92			

* p<.05, ** p<.05

OCB differentiations with layoff effects for "organizational tenure" groups are given in Table 4.5. The results show significant differentiations between OCB 1 (F=7.289, p<.01) and OCB 2 (F=9.665, p<.01). To understand the source group of the differentiation, Tukey multiple comparison, a post-hoc test is made. The results of this test show that the "less than 1 year" organizational tenure group has higher OCB 1 scores mean values than the other "1-10 years" organizational tenure groups. Additionally, "1-5 years" organizational tenure groups have higher OCB 2 scores mean values than the "5-10 years" organizational tenure groups.

Table 4.5: OCB Differentiations of the Organizational Tenure Groups

	Organizational Tenure (years)	n	Mean	SD	F	p	Tukey
OCB 1	Less than 1	9	4.37	.45	7.289	.00*	1 > 2, 3
	1-5	40	3.45	.71			
	5-10	76	3.47	.59			
	Over 10	5	4.14	.57			
OCB 2	Less than 1	9	4.27	.48	9.665	.00*	2 > 3
	1-5	40	4.54	.43			
	5-10	76	3.82	.81			
	Over 10	5	4.01	.52			

* p<.01

4.2. Hypotheses Testing

Before starting the testing of the hypotheses, the correlation coefficients of the measurements are studied as a preliminary step. The correlation coefficients of the pre-tests' scores are provided in Table 4.6. The results of the correlation analysis show that the mean of the LOC is 40.48 and the means of the dimensions of OCB-1 vary between 3.08 and 3.88. The correlation analysis shows significant correlation between LOC scores and the dimensions of OCB-1 ($p<.01$), and it shows insignificant correlation with OCB-1 scores ($p>.05$).

Table 4.6: Inter-correlation Matrix of LOC and OCB-1

	Mean	STD	1	2	3	4	5	6
1. LOC	40.48	15.78	-					
2. OCB-1	3.56	.67	-.04	-				
3. Cons-1	3.73	.69	.09	.94**	-			
4. Sport-1	3.08	.85	-.12	.85**	.68**	-		
5. Civic-1	3.38	.89	-.13	.94**	.89**	.72**	-	
6. Court-1	3.88	.53	-.05	.92**	.87**	.70**	.87**	-
7. Altr-1	3.67	.78	.03	.93**	.86**	.71**	.83**	.83**

*p<.05, **p<.01

The correlation coefficients of the post-tests' scores are provided in Table 4.7. The results of the correlation analysis show that the mean of the LOC is 40.48 and the means of the dimensions of OCB-2 vary between 3.90 and 4.25. The correlation analysis shows significant negative correlation between LOC scores and the OCB-2 scores ($p<.01$), and it shows significant positive correlation with the dimensions of OCB-2 scores ($p<.01$).

Table 4.7: Inter-correlation Matrix of LOC and OCB-2

	Mean	STD	1	2	3	4	5	6
1. LOC	40.48	15.78	-					
2. OCB-2	4.09	.76	-.86**	-				
3. Cons-2	4.14	.63	-.66**	.85**	-			
4. Sport-2	3.99	.99	-.81**	.87**	.61**	-		
5. Civic-2	3.90	.99	-.82**	.91**	.79**	.69**	-	
6. Court-2	4.25	.64	-.74**	.92**	.82**	.71**	.80**	-
7. Altr-2	4.12	.99	-.77**	.94**	.73**	.78**	.82**	.86**

*p<.05, **p<.01

The main concern of this thesis was to analyze the OCB differentiation with Industry 4.0 layoff effects for the employees with distinct LOC. Therefore, the first two hypotheses were defined as:

H1. *The OCB of employees with internal locus of control will be differentiated by Industry 4.0 layoffs.*

H2. *The OCB of employees with external locus of control will be differentiated by Industry 4.0 layoffs.*

The layoff effects of Industry 4.0 on OCBs of LOC groups are demonstrated in Figure 4.1. As the graphics in the given figure shows that general score of OCB is increased for internals and decreased for externals.

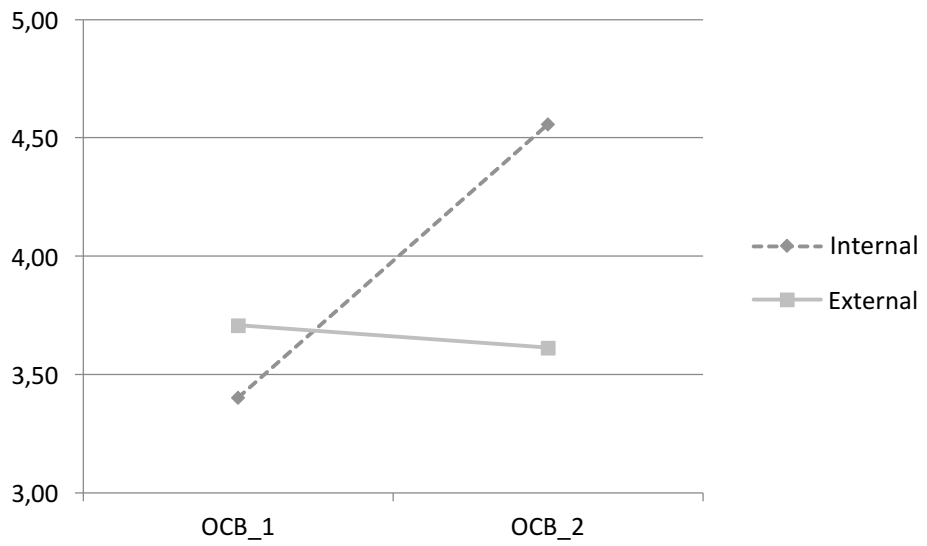

Figure 4.1: OCB Differentiations for LOC Dimensions

The variant analysis data findings of OCB differentiations for LOC dimension groups are provided in Table 4.8. The result of the analysis shows significant differentiations for OCB before and after I4.0 implementations ($F_{(1,128)}$ =121.681, p<.01, partial η^2=.49) and also for OCB Differentiation x LOC interaction effect ($F_{(1,128)}$ =169.447, p<.01, partial η^2=.57). In other words, OCB differentiations of before/after I4.0 implementations are significant for all the participants, moreover the differentiations are also significant when LOC dimensions of the participants are taken into account. Thus, it is understood that internals are differentiated and improved with I4.0 layoff effects in terms of OCB which shows that **H1** is supported and externals are differentiated which supported **H2** as well. The differentiation for internals is positive, while it is negative for externals.

Table 4.8: OCB Differentiations for LOC Dimensions

	Sum of Squares	DF	Mean Square	F	p	Partial Eta Squared
OCB Differentiation	18.289	1	18.289	121.681	.00*	.49
OCB D. x LOC	25.469	1	25.469	169.447	.00*	.57
Error	19.239	128	.150			

* p<.01

Consequently, the layoff effects on OCB dimensions for LOC groups are studied. Firstly, the Altruism dimension of OCB was taken into account. The Altruism differentiations for LOC groups are shown in Figure 4.2. As the graphics in the given figure shows that Altruism is increased for internals and decreased for externals.

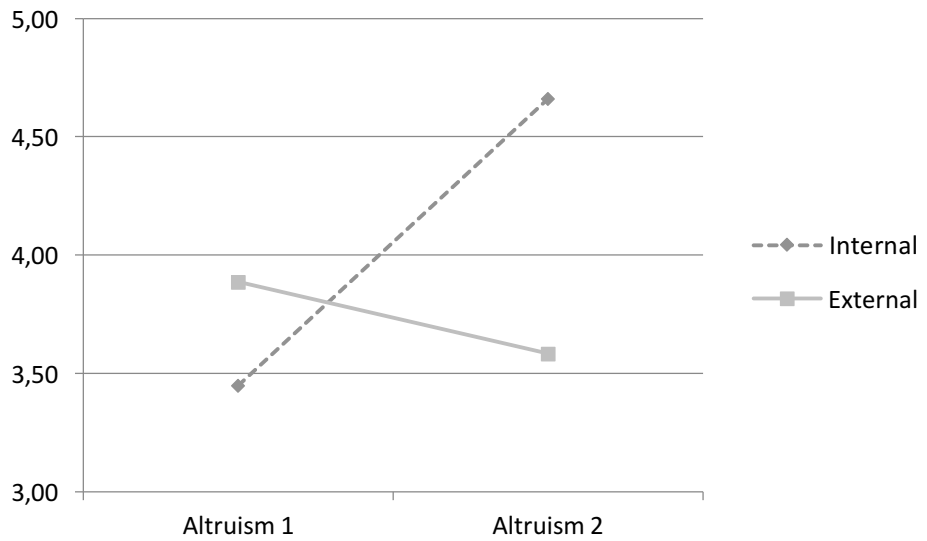

Figure 4.2: Altruism Differentiations for LOC Dimensions

The variant analysis data findings of Altruism differentiations for LOC dimension groups are also provided in Table 4.9. The result of the analysis shows significant differentiations for Altruism before and after I4.0 implementations ($F_{(1,128)}$ =55.018, p <.01, partial η^2 = .30) and also for Altruism Differentiation x LOC interaction effect ($F_{(1,128)}$ =152.003, p<.01, partial η^2 = .54). In other words, Altruism differentiations of before/after I4.0 implementations are significant for all the participants, moreover the differentiations are also significant when LOC dimensions of the participants are taken into account. Thus, it is understood that internals are differentiated with I4.0 layoff effects in terms of Altruism which shows that **H1a** is supported and externals are differentiated which also supports **H2a.** The differentiation for internals is positive, while it is negative for externals.

Table 4.9: The Variant Analysis Findings of Altruism Differentiations Before/After Industry 4.0 Implementations for Employees with Distinct LOC

	Sum of Squares	DF	Mean Square	F	p	Partial Eta Squared
Altruism Differentiation	13.479	1	13.479	55.018	.00*	.30
Altruism D. x LOC	37.241	1	37.241	152.003	.00*	.54
Error	31.360	128	.245			

* p<.01

Another dimension of OCB, Courtesy differentiations for LOC groups are shown in Figure 4.3. As the graphics in the given figure shows that Courtesy is increased for internals and decreased for externals.

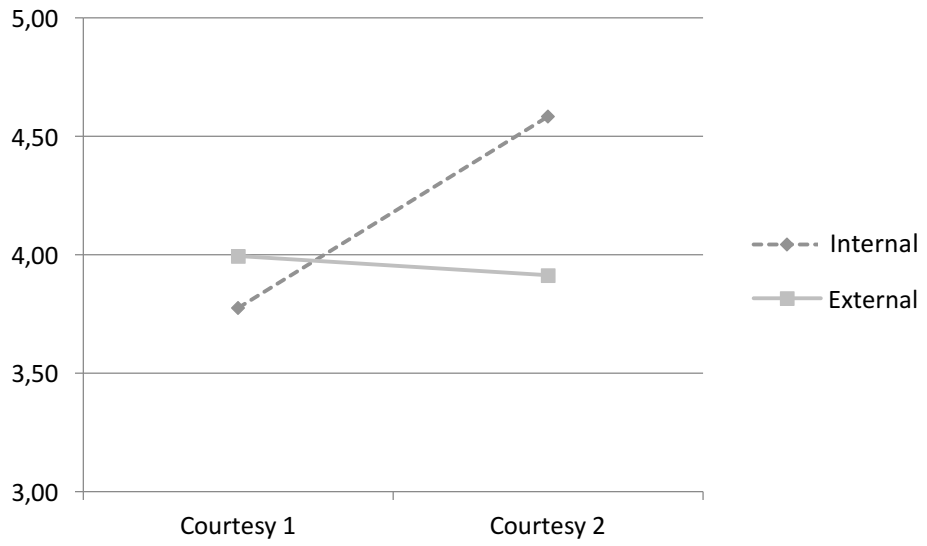

Figure 4.3: Courtesy Differentiations for LOC Dimensions

The variant analysis data findings of Courtesy differentiations for LOC dimension groups are also provided in Table 4.10. The result of the analysis shows significant differentiations for Courtesy before and after I4.0 implementations ($F_{(1,128)}$ =69.091, p <.01, partial η^2 = .35) and also for Courtesy Differentiation x LOC interaction effect ($F_{(1,128)}$ =102.736, p<.01, partial η^2 = .45). In other words, Courtesy differentiations of before/after I4.0 implementations are significant for all the participants, moreover the differentiations are also significant when LOC dimensions of the participants are taken into account. Thus, it is understood that internals are

differentiated with I4.0 layoff effects in terms of Courtesy which shows that **H1b** is supported and externals are differentiated which also supports **H2b.** The differentiation for internals is positive, while it is negative for externals.

Table 4.10: The Variant Analysis Findings of Courtesy Differentiations Before/After Industry 4.0 Implementations for Employees with Distinct LOC

	Sum of Squares	DF	Mean Square	F	p	Partial Eta Squared
Courtesy Differentiation	8.641	1	8.641	69.091	.00*	.35
Courtesy D. x LOC	12.849	1	12.849	102.736	.00*	.45
Error	16.009	128	.125			

* p<.01

The third dimension of OCB, Sportsmanship differentiations for LOC groups are shown in Figure 4.4. As the graphics in the given figure shows that Sportsmanship is increased for both internals and externals. The increment for internals are higher than externals.

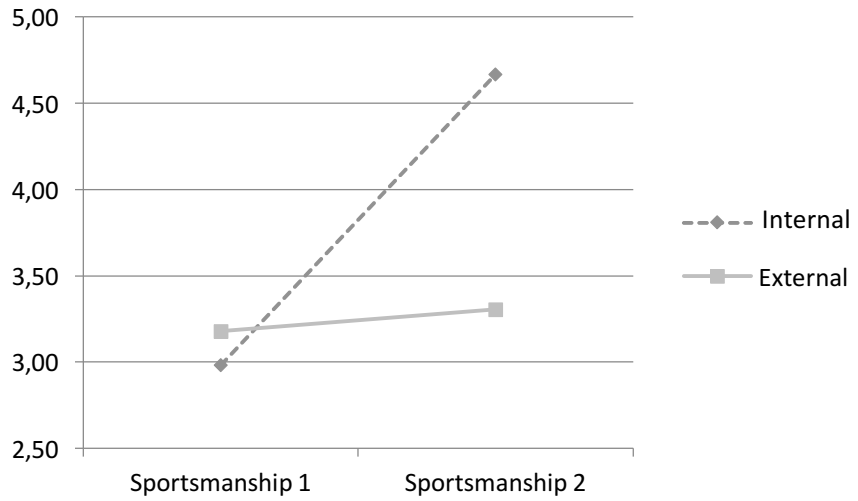

Figure 4.4: Sportsmanship Differentiations for LOC Dimensions

The variant analysis data findings of Sportsmanship differentiations for LOC dimension groups are also provided in Table 4.11. The result of the analysis shows significant differentiations for Sportsmanship before and after I4.0 implementations ($F_{(1,128)}$ =181.204, p <.01, partial η^2 = .59) and also for Sportsmanship Differentiation

x LOC interaction effect ($F_{(1,128)}$ =134.262, p<.01, partial η^2 = .51). In other words, Sportsmanship differentiations of before/after I4.0 implementations are significant for all the participants, moreover the differentiations are also significant when LOC dimensions of the participants are taken into account. Thus, it is understood that internals are differentiated with I4.0 layoff effects in terms of Sportsmanship which shows that **H1c** is supported and externals are differentiated which also supports **H2c.** The differentiation for internals and externals is positive.

Table 4.11: The Variant Analysis Findings of Sportsmanship Differentiations Before/After Industry 4.0 Implementations for Employees with Distinct LOC

	Sum of Squares	**DF**	**Mean Square**	**F**	**p**	**Partial Eta Squared**
Sportsmanship Differentiation	53.372	1	53.372	181.204	.00*	.59
Sportsmanship D. x LOC	39.546	1	39.546	134.262	.00*	.51
Error	37.702	128	.295			

* p<.01

The fourth dimension of OCB, Conscientiousness differentiations for LOC groups are shown in Figure 4.5. As the graphics in the given figure shows that Conscientiousness is increased for internals and decreased for externals.

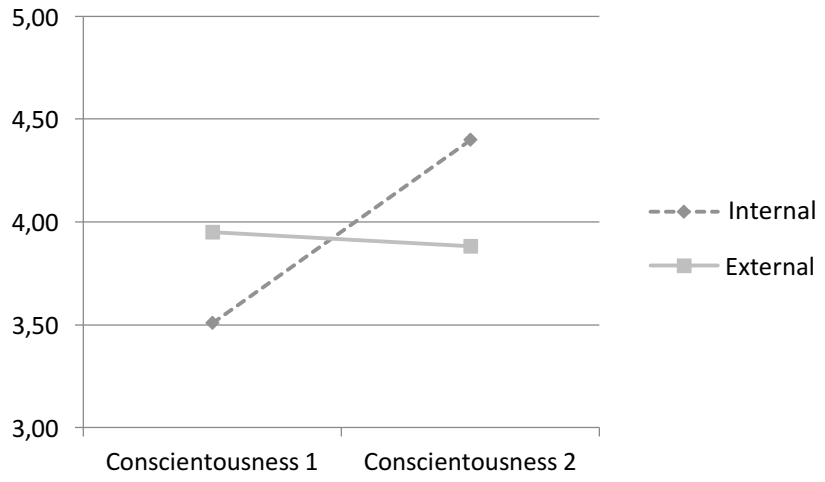

Figure 4.5: Conscientiousness Differentiations for LOC Dimensions

The variant analysis data findings of Conscientiousness differentiations for LOC dimension groups are also provided in Table 4.12. The result of the analysis shows

significant differentiations for Conscientiousness before and after I4.0 implementations ($F_{(1,128)}$ =73.839, p <. 01, partial η^2 = .37) and also for Conscientiousness Differentiation x LOC interaction effect ($F_{(1,128)}$ =100.180, p<.01, partial η^2 = .44). In other words, Conscientiousness differentiations of before/after I4.0 implementations are significant for all the participants, moreover the differentiations are also significant when LOC dimensions of the participants are taken into account. Thus, it is understood that internals are differentiated with I4.0 layoff effects in terms of Conscientiousness which shows that **H1d** is supported and externals are differentiated which supports **H2d.** The differentiation for internals is positive, while it is negative for externals.

Table 4.12: The Variant Analysis Findings of Conscientiousness Differentiations Before/After Industry 4.0 Implementations for Employees with Distinct LOC

	Sum of Squares	DF	Mean Square	F	p	Partial Eta Squared
Conscientiousness Differentiation	8.641	1	8.641	69.091	.00*	.35
Conscientiousness D. x LOC	12.849	1	12.849	102.736	.00*	.45
Error	16.009	128	.125			

* p<.01

The last dimension of OCB, Civic Virtue differentiations for LOC groups are shown in Figure 4.6. As the graphics in the given figure shows that Civic Virtue is increased for internals and decreased for externals.

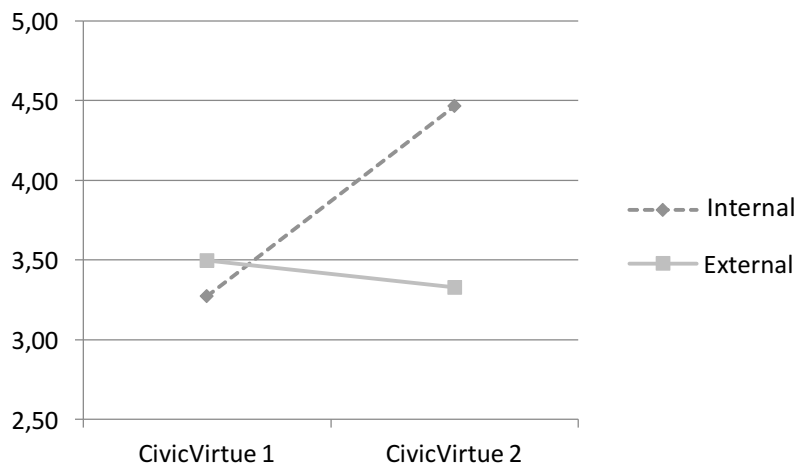

Figure 4.6: Civic Virtue Differentiations for LOC Dimensions

The variant analysis data findings of Civic Virtue differentiations for LOC dimension groups are also provided in Table 4.13. The result of the analysis shows significant differentiations for Civic Virtue before and after I4.0 implementations ($F_{(1,128)}$ =85.403, p <. 01, partial η^2 = .40) and also for Civic Virtue Differentiation x LOC interaction effect ($F_{(1,128)}$ =151.256, p<.01, partial η^2= .54). In other words, Civic Virtue differentiations of before/after I4.0 implementations are significant for all the participants, moreover the differentiations are also significant when LOC dimensions of the participants are taken into account. Thus, it is understood that internals are differentiated with I4.0 layoff effects in terms of Civic Virtue which shows that **H1e** is supported and externals are differentiated which also supports **H2e.** The differentiation for internals is positive, while it is negative for externals.

Table 4.13: The Variant Analysis Findings of Civic Virtue Differentiations Before/After Industry 4.0 Implementations for Employees with Distinct LOC

	Sum of Squares	**DF**	**Mean Square**	**F**	**p**	**Partial Eta Squared**
Civic Virtue Differentiation	8.641	1	8.641	69.091	.00*	.35
Civic Virtue D. x LOC	12.849	1	12.849	102.736	.00*	.45
Error	16.009	128	.125			

* p<.01

Lastly, the differentiations of OCB itself and its dimensions with respect to job types are provided in Table 4.14. The analyses show that Altruism 1 (t=2.756, p<.05), Sportsmanship 2 (t=-2.472, p<.05), Conscientiousness 1 (t=3.607, p<.01) and Civic Virtue 1 (t=3.049, p<.01) have significant differentiations, while other dimensions do not have significant differentiations (p>.05). When the significant differentiations are studied, it is seen that mean value of white-collar job type group is higher for Altruism 1, Conscientousness 1, Civic Virtue 1 (the number of *1* stands for "before Industry 4.0 implementations"), while the mean value of blue-collar job type group is higher for Sportsmanship 2 (the number of *2* stands for "after Industry 4.0 implementations") than the others.

Table 4.14: OCB Dimensions Differentiations of Job Types

	Job Type	n	Mean	SD	t	p
Altruism 1	White-collar	68	3.83	.66	2.756	.01*
	Blue-collar	59	3.45	.86		
Altruism 2	White-collar	68	4.04	1.12	-1.114	.26
	Blue-collar	59	4.24	.77		
Courtesy 1	White-collar	68	3.90	.47	.624	.53
	Blue-collar	59	3.84	.58		
Courtesy 2	White-collar	68	4.28	.56	.542	.58
	Blue-collar	59	4.22	.71		
Sportsmanship 1	White-collar	68	2.97	.93	-1.361	.17
	Blue-collar	59	3.17	.74		
Sportsmanship 2	White-collar	68	3.79	1.02	-2.472	.02*
	Blue-collar	59	4.22	.90		
Conscientiousness 1	White-collar	68	3.92	.58	3.607	.00*
	Blue-collar	59	3.50	.73		
Conscientiousness 2	White-collar	68	4.20	.49	1.118	.26
	Blue-collar	59	4.08	.71		
Civic Virtue 1	White-collar	68	3.58	.87	3.049	.00*
	Blue-collar	59	3.11	.86		
Civic Virtue 2	White-collar	68	4.02	.93	1.691	.09
	Blue-collar	59	3.72	1.04		

* $p<.01$

5. DISCUSSION AND CONCLUSION

5.1. Discussion

Industrial revolutions have always affected the path of the world history. They caused rivalry among countries, altered the course of the events, glorified some countries while some were being exploited. However, the humankind has always developed, and brought the knowledge one step further at every opportunity. It is for sure that Industry 4.0 will contribute this knowledge more, it has already started. Yet, more gain at some fields cause some losses at others. The fourth industrial revolution will bring the production rate and quality up, but it will also increase the unemployment rate for some other places, as well (Bonekamp and Sure, 2015; Frey and Osborne, 2013; Givord and Maurin, 2004; Roblek et al., 2016; Sommer, 2015; Sumer, 2018; Wang et al., 2016).

It is studied in some researches that developing countries are more prone to side effects of this kind of industrial revolutions. Production generally shifts to where the costs are lower, and for the fourth industrial revolution, costs are going to be lower for countries who completed this process fully, which means fully-automation of production in a smart environment will replace the cost of human workers. Those, who achieved the fourth industrial revolution successfully will reduce their needs for employees. This will increase the unemployment rate for sure, but most of the western countries (who are lacking younger population and workers) are going to end inviting foreign workers to meet their increasing worker requirements. Thus, developing countries or under-developed countries will have their citizens back who are foreign workers in other countries in one hand and these people will join the army of jobless. Moreover, these not-developed countries will also lose the foreign countries' production sites on their lands in the other hand. Consequently, the unemployment rate will be affected from both situations. Turkey is one of those developing countries which will experience the negative effects rather than earning the good points from I4.0 (Bonekamp and Sure, 2015; Sumer, 2018).

The effects of organizational changes or layoffs on people's behaviors are also examined in numerous studies (Brockner et al., 2004; Zatzick et al., 2015). Although

the layoffs are generally caused by bad economic conditions or downsizing of companies, it may be caused by organizational structure changes as well (Datta et al., 2010). Therefore, the atmosphere will be a little different from the usual mass-layoffs, those who are best to adapt the new industrial revolution will stay (Roblek et al., 2016). The employees with internal LOC are more likely to change their behaviors and the findings showed that they are more likely to adapt the changing environment by improving their OCBs. All of the hypotheses in this manner for internals are verified. Yet, although externals were assumed to show no changes on their behaviors since they believe that they have little effect on the outcomes of the events, they showed significant differentiations. They improved their Sportsmanship dimension of OCB significantly but not as highly as internals, and they decreased the scores for the other remaining OCB dimensions. The differentiations for externals were not as great as for internals.

The externals generally perceive that they have less job opportunities than internals, which affects their job commitment. They are hesitant to develop continuance commitment to their firms (Coleman et al., 1999). It is studied that the job commitment has positive correlation with OCB (Suresh and Venkatammal, 2010; Zeinabadi, 2010). The fact that the externals showed decrements for their OCBs with a layoff may be affected from their decreasing job commitment in an environment of mass-layoffs.

5.2. Limitations and Future Research Suggestions

This study is not without limitations. One potential limitation to conduct this research properly is the sample group. The firms selected in this study were the ones which have capabilities to advance to Industry 4.0. Therefore, a scenario was needed to be used to measure the results in terms of the topic of the study. The results mostly supported the proposed hypotheses. However, the same study made with firms which are currently working on these implementations and experiencing the proposed effects of the fourth industrial revolution will have more realistic results.

Another limitation was not being able to involve other aspects that might affect the OCB. The hypotheses related to externals are not generally supported by the findings. Therefore, the scope of the study can be widen by involving the job commitment researches on the same sample group.

The next step of this study can be constructed in a more sophisticated way which can be divided into sub-categories of types of industry, the history of the firm in terms of industrial revolutions and the classes of countries defined by IMF; developed, developing and under-developed countries.

5.3. Implications for Decision Makers

The revolutions may bring bad outcomes with the good ones. Changing the production type, administration instruments, organizational structures and the atmosphere in terms of the relationship of *workers* (human and non-human) is a big step (Flynn et al., 2017). Mass-layoffs are studied and explained as one of these bad outcomes of this industrial revolution. Management should take into consideration this and the other probable side effects of the I4.0. Moreover, the effects of mass-layoffs on well-being of the population and the indirect effects to both the country economy and the companies should be analyzed comprehensively (Gallie et al., 2010). If the decision made to continue to realizing the fourth industrial revolution, the probable changes to be experienced should be explained explicitly to the employees. And it will be best for the country economy and the well-being of the population to consider the future of the worker profile in the future after such a revolution. The new opportunities should be created, support after laying off should be carried out, as well.

5.4. Conclusion

This research is believed to contribute the science by covering extant literature related the Industry 4.0 and its effects, organizational citizenship behavior, locus of control and the relationship between these. Moreover, analyses made to support the proposed hypotheses brought the contribution many steps further. Managers and decision-makers should consider the latter-mood of the laid-off employees after layoff effects and take the proper cautions in order to implement the revolution with the least

harm. It is for sure that the fourth industrial revolution will change most aspects of our daily lives in a positive way, however many precautions are needed to be considered and implied by both governments and firms to reduce the side effects.

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BIOGRAPHY

Aykut Erşen was born in Ankara in 1989. He graduated in 2011 as a Mechanical Engineer and got his Engineering Master's Degree from Mechanical Engineering Dept. of Rice University, TX, USA in 2016. He has been running his own company for 2 years. He started his Master of Business Administration program in Gebze Technical University in 2017. He is married and he knows English besides the native language of Turkish.

APPENDICES

Appendix A: Locus of Control Scale

The expressions given below are generally your thoughts for your job. Please rate the expressions not only for your current job, but also for the previous ones as well. Choose the answer that suits you best.

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. A job is what you make of it.	( )	( )	( )	( )	( )
2. On most jobs, people can pretty much accomplish whatever they set out to accomplish.	( )	( )	( )	( )	( )
3. If you know what you want out of a job, you can find a job that gives it to you.	( )	( )	( )	( )	( )
4. If employees are unhappy with a decision made by their boss, they should do something about it.	( )	( )	( )	( )	( )
5. Getting the job you want is mostly a matter of luck.	( )	( )	( )	( )	( )
6. Making money is primarily a matter of good fortune.	( )	( )	( )	( )	( )
7. Most people are capable of doing their jobs well if they make the effort.	( )	( )	( )	( )	( )
8. In order to get a really good job, you need to have family members or friends in high places.	( )	( )	( )	( )	( )
9. Promotions are usually a matter of good fortune.	( )	( )	( )	( )	( )
10. When it comes to landing a really good job, who you know is more important than what you know.	( )	( )	( )	( )	( )
11. Promotions are given to employees who perform well on the job.	( )	( )	( )	( )	( )
12. To make a lot of money you have to know the right people.	( )	( )	( )	( )	( )
13. It takes a lot of luck to be an outstanding employee on most jobs.	( )	( )	( )	( )	( )

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
14. People who perform their jobs well generally get rewarded.	( )	( )	( )	( )	( )
15. Most employees have more influence on their supervisors than they think they do.	( )	( )	( )	( )	( )
16. The main difference between people who make a lot of money and people who make a little money is luck.	( )	( )	( )	( )	( )

Appendix B: Organizational Citizenship Behavior Scale

The expressions given below are generally your thoughts for your job. Please rate the expressions not only for your current job, but also for the previous ones as well. Choose the answer that suits you best.

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. I help others who have heavy workloads.	( )	( )	( )	( )	( )
2. I am the classic "squeaky wheel" that always needs greasing.	( )	( )	( )	( )	( )
3. I believe in giving an honest day's work for an honest day's pay.	( )	( )	( )	( )	( )
4. I consume a lot of time complaining about trivial matters.	( )	( )	( )	( )	( )
5. I try to avoid creating problems for co-workers.	( )	( )	( )	( )	( )
6. I keep abreast of changes in the organization.	( )	( )	( )	( )	( )
7. I tend to make "mountains out of molehills".	( )	( )	( )	( )	( )
8. I consider the impact of my actions on coworker	( )	( )	( )	( )	( )
9. I attend meetings that are not mandatory, but are considered important.	( )	( )	( )	( )	( )
10. I am always ready to lend a helping hand to those around me.	( )	( )	( )	( )	( )
11. I attend functions that are not required, but help the company image.	( )	( )	( )	( )	( )
12. I read and keep up with organization announcements, memos, and so on.	( )	( )	( )	( )	( )
13. I help others who have been absent.	( )	( )	( )	( )	( )
14. I do not abuse the rights of others.	( )	( )	( )	( )	( )

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
15. I willingly help others who have work related problems.	( )	( )	( )	( )	( )
16. I always focus on what's wrong, rather than the positive side.	( )	( )	( )	( )	( )
17. I take steps to try to prevent problems with other workers.	( )	( )	( )	( )	( )
18. My attendance at work is above the norm.	( )	( )	( )	( )	( )
19. I always find fault with what the organization is doing.	( )	( )	( )	( )	( )
20. I am mindful of how my behavior affects other people's jobs.	( )	( )	( )	( )	( )
21. I do not take extra breaks.	( )	( )	( )	( )	( )
22. I obey company rules and regulations even when no one is watching.	( )	( )	( )	( )	( )
23. I help orient new people even though it is not required.	( )	( )	( )	( )	( )
24. I am one of the most conscientious employees.	( )	( )	( )	( )	( )

Appendix C: Industry 4.0 Implementation Scenario Based on Probable Layoffs or Job Position Changes

PLEASE READ FIRST!

The term Industry 4.0 means using machines such as robots in industry. Many of the firms abroad are currently working on the implementation processes of Industry 4.0. The studies made during these processes showed that firms experience some organizational and structural changes. Some jobs are disappeared, some are being performed by robots and some new jobs are emerged. In other words, some employees are laid off because of their jobs are performed by machines, and new workers are hired for the jobs that machines are unable to perform. In summary, you or your colleagues may lose their jobs or be employed in other positions in the firm.

This study aims to scientifically measure your thoughts **if a situation like mentioned above occurs.**

Please reply the questions below **considering that** your firm is working on Industry 4.0 implementations. Do not reply according to your current situation, assume that you are going to experience the changes occurred in your company during these processes.

Appendix D: Kontrol Odağı Ölçeği

Aşağıda genel olarak işinizle ilgili düşüncelerinize yer veren ifadeler bulunmaktadır. Bu ifadeleri yalnızca şu anki işinizle ilgili olarak değil genel olarak değerlendirerek, bu ifadelere ne derece katıldığınızı belirtiniz (Tamamen karşıyım / Biraz karşıyım / Kararsızım / Biraz katılıyorum / Tamamen katılıyorum).

	Tamamen karşıyım	**Biraz karşıyım**	**Karar-sızım**	**Biraz katılıyo-rum**	**Tamamen katılıyo-rum**
1. Yeterince uğraşırsam işim bir şeye benzer.	( )	( )	( )	( )	( )
2. İşimde başarmak istediğim şeyleri başarabilirim.	( )	( )	( )	( )	( )
3. Eğer bir işten ne beklediğimi biliyorsam buna uygun bir iş bulabilirim.	( )	( )	( )	( )	( )
4. Eğer patronumun verdiği karardan rahatsız oluyorsam bir şeyler yaparım.	( )	( )	( )	( )	( )
5. Kısmetimde varsa istediğim gibi bir iş bulabilirim.	( )	( )	( )	( )	( )
6. Kısmetimde varsa iyi para kazanabilirim.	( )	( )	( )	( )	( )
7. Yeterince gayret gösterirsem işimi iyi seviyede yapabilirim.	( )	( )	( )	( )	( )
8. Gerçekten iyi bir iş bulabilmem için torpile ihtiyacım var.	( )	( )	( )	( )	( )
9. Kısmetimde varsa terfi alırım.	( )	( )	( )	( )	( )
10. İyi bir işe girebilmem için ne bildiğimden daha çok kimi tanıdığım önemlidir.	( )	( )	( )	( )	( )
11. İşimde iyi çalışırsam terfi alabilirim.	( )	( )	( )	( )	( )
12. Çok para kazanmak için doğru insanları tanımam gerekir.	( )	( )	( )	( )	( )
13. Kısmetimde varsa işimde çok iyi yerlere gelebilirim.	( )	( )	( )	( )	( )
14. İşimi çok iyi yaparsam ödüllendirilirim.	( )	( )	( )	( )	( )
15. Amirlerimi etkileyebilirim.	( )	( )	( )	( )	( )
16. Para kazanan ve kazanmayan insanlar arasındaki temel fark kısmettir.	( )	( )	( )	( )	( )

Appendix E: Örgütsel Vatandaşlık Davranışı Ölçeği

Aşağıda genel olarak işinizle ilgili düşüncelerinize yer veren ifadeler bulunmaktadır. Bu ifadeleri yalnızca şu anki işinizle ilgili olarak değil genel olarak değerlendirerek, bu ifadelere ne derece katıldığınızı belirtiniz (Tamamen karşıyım / Biraz karşıyım / Kararsızım / Biraz katılıyorum / Tamamen katılıyorum).

	Tamamen karşıyım	**Biraz karşıyım**	**Karar-sızım**	**Biraz katılıyo-rum**	**Tamamen katılıyo-rum**
1. İş yükü ağır olan arkadaşlarıma yardım ederim.	( )	( )	( )	( )	( )
2. Söylenmediğim sürece birşey değişmeyeceğinden, sürekli söylenirim, yakınırım.	( )	( )	( )	( )	( )
3. Maaşımı hak etmem gerektiğine inanırım.	( )	( )	( )	( )	( )
4. Ufak tefek şeyler hakkında çok fazla yakınırım.	( )	( )	( )	( )	( )
5. İş arkadaşlarıma sorun yaratmamaya çalışırım.	( )	( )	( )	( )	( )
6. İş yerimdeki değişiklikleri takip ederim.	( )	( )	( )	( )	( )
7. Ufak şeyleri abartmaya yatkınımdır.	( )	( )	( )	( )	( )
8. Hareketlerimin diğer çalışanları nasıl etkilediğini de değerlendiririm.	( )	( )	( )	( )	( )
9. Zorunlu olmasa da, önemli olduğunu düşündüğüm toplantılara katılırım.	( )	( )	( )	( )	( )
10. İş arkadaşlarıma yardım eli uzatmaya hep hazırımdır.	( )	( )	( )	( )	( )
11. Zorunlu olmasa da, şirketin imajını iyileştirecek faaliyetlere katılırım.	( )	( )	( )	( )	( )
12. Şirketle ilgili duyuruları, mesajları ve diğer bilgileri okur ve takip ederim.	( )	( )	( )	( )	( )
13. İşe gelememiş arkadaşlarıma yardımcı olurum.	( )	( )	( )	( )	( )
14. İş arkadaşlarımın haklarını kötüye kullanmam.	( )	( )	( )	( )	( )
15. İşle ilgili sorun yaşayan arkadaşlarıma seve seve yardım ederim.	( )	( )	( )	( )	( )
16. İyi tarafını görmektense, yanlış olan şeyler üzerine odaklanırım.	( )	( )	( )	( )	( )

	Tamamen karşıyım	**Biraz karşıyım**	**Karar-sızım**	**Biraz katılıyo-rum**	**Tamamen katılıyo-rum**
17. Diğer çalışanlarla ortaya çıkabilecek sorunları engellemek için çabalarım.	( )	( )	( )	( )	( )
18. Ortalamanın üstünde işe devamlılığım vardır.	( )	( )	( )	( )	( )
19. Şirketin yaptıklarıyla ilgili daima bir kusur bulurum.	( )	( )	( )	( )	( )
20. Davranışlarımın diğer arkadaşlarımın işini nasıl etkilediğini göz önünde bulundururum.	( )	( )	( )	( )	( )
21. Fazladan mola almam/ara vermem.	( )	( )	( )	( )	( )
22. Kimse beni denetlemese de şirketin kural ve yönetmeliklerine uyarım.	( )	( )	( )	( )	( )
23. Zorunlu olmasa da, işe yeni başlayanların uyum sağlamalarına yardımcı olurum.	( )	( )	( )	( )	( )
24. İş yerindeki en vicdanlı insanlardan biriyimdir.	( )	( )	( )	( )	( )

Appendix F: Endüstri 4.0'a Geçiş Uygulamaları Esnasında Oluşabilecek İşten Çıkarılmalarla İlgili Senaryo

LÜTFEN ÖNCELİKLE METNİ OKUYUNUZ!

Endüstri 4.0 kavramı sanayide robotlar gibi makinelerin kullanılması anlamını taşır. Yurtdışında bir çok şirkette Endüstri 4.0'a geçiş çalışmaları devam etmektedir. Bu çalışmalar sürecinde yapılan incelemelerde şirketlerin yapısında bazı değişiklikler yaşandığı belirlenmiştir. Bu değişiklikler sonucunda bazı iş kollarının ortadan kalkarak bu işlerin robotlara yaptırıldığı ortaya çıkmış olup yeni iş kollarının oluştuğu da gözlenmiştir. Yani bazı çalışanların işleri makineler tarafından yapılmaya başlandığı için bu çalışanlar işlerinden çıkarılmışlardır. Aynı şekilde makinelerin yapamadığı diğer işler için de çalışanlar bu alanlarda görevlendirilmiş ya da yeni işe alımlar yapılmıştır. Kısaca siz ya da en yakın iş arkadaşınız işini kaybedebilir veya şirket içinde başka bir yerde görevlendirilebilirsiniz.

Bu anket çalışması bilimsel amaçlı olarak, eğer böyle bir durum olsaydı ne yapacağınıza ilişkin görüşlerinizi değerlendirmek amacıyla yapılmaktadır.

Aşağıdaki soruları, şirketinizin Endüstri 4.0'a geçiş çalışmaları yapacağını varsayarak bu çalışmalar sürecinde çalışma tutum ve davranışlarınızın nasıl değişebileceğini düşünerek cevaplayınız. Yani şu anki durumunuza göre değil, ileride işyerinizde meydana gelebilecek değişiklikleri göz önünde bulundurarak cevaplayınız.

Appendix G: Introduction Page, Demographic Questions and Non-identifier Questions

Dear participant,

This questionnaire is a part of my Master's Education in Gebze Technical University under supervision of Prof.Dr. Hakan KİTAPÇI. The study aims to analyze the layoff effects of Industry 4.0 on Organizational Citizenship Behavior of employees.

This survey **DOES NOT** ask about your identification or any identifier questions. There are only non-identifier personal questions asked below to link the two surveys you are going to reply in different times. The results are going to be analyzed for scientific reasons, not for your or my personal causes.

Please read carefully and do not leave any blank replies. Your contribution is valuable. I thank you for your time and participation. Please do not hesitate to ask any related questions to me at ersenaykut@gmail.com.

Demographic Personal Information

Age: ( ) 20-25 ( ) 26-30 ( ) 31-40 ( ) Over 41 years old
Gender: ( ) Female ( ) Male
Education Level (High School, Bachelor's, Master's, etc.) **:**
Current Job Position:
How long has it been since you are working in this firm?
( ) Less than 1 year ( ) 1- 5 years ( ) 5- 10 years ( ) Above 10 years

Name of the Mother of your Mother (Example: Mary) **(*) :**
Name of the Mother of your Father (Example: Mary) **(*) :**
The Birth Month of your (Example: January) **(*) :**
The Birth Place of your Mother (Example: Istanbul) **(*) :**
The Birth Month of your Youngest Sibling (Example: January) **(*) :**

(*) These questions are asked to link this survey to the other survey of yours. These questions cannot expose your identification.

Appendix H: Giriş Sayfası, Demografik Sorular ve Katılımcı Belirleyici Sorular

Sayın ilgili,

Size sunulan bu anket formu Gebze Teknik Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı bünyesinde Prof. Dr. Hakan KİTAPÇI denetiminde yürüttüğüm yüksek lisans tez çalışması kapsamında hazırlanmıştır. Araştırma, işyerlerinde Endüstri 4.0'a geçiş kapsamında tecrübe edilecek organizasyon değişikliğinin çalışanların örgütsel vatandaşlık davranışına etkilerini incelemektedir.

Ankette **isminiz ya da belirleyici kişisel bilgileriniz istenmemektedir**. Sadece bundan sonra cevaplayacağınız anketlerle eşlenmesi için kimlik bilgilerinizle ilgisi olmayan birkaç soru sorulacaktır. Vereceğiniz cevaplar, yalnızca bilimsel amaçlarla kullanılacak ve diğer katılımcıların cevaplarıyla birleştirilerek genel bir değerlendirmeye tabi tutulacak, **kişisel bir değerlendirme yapılmayacaktır.**

Lütfen her soruyu dikkatle okuyarak cevaplayınız ve cevapsız soru bırakmamaya özen gösteriniz. Katkınız çok değerlidir. Zaman ayırıp anketi doldurduğunuz için şimdiden teşekkür ederim. Sorularınız olursa şahsıma ersenaykut@gmail.com adresinden ulaşabilirsiniz.

Demografik Kişisel Bilgiler

Yaşınız : ( ) 20-25 ( ) 26-30 ( ) 31-40 ( ) 41 ve üzeri
Cinsiyetiniz : ( ) Kadın ( ) Erkek
En son elde ettiğiniz diploma (Lise, Lisans, Y.Lisans, vs.) **:**
Göreviniz:
Ne kadar zamandır bu işyerinde çalışıyorsunuz?
( ) 1 yıldan az ( ) 1- 5 yıl ( ) 5- 10 yıl ( ) 10 yıl ve üzeri

Annenizin annesinin Adı (Örnek: Fatma) **(*) :**
Babanızın annesinin Adı (Örnek: Fatma) **(*) :**
Babanızın Doğduğu Ay (Örnek: Ocak) **(*) :**
Annenizin Doğum Yeri (Örnek: Ankara) **(*) :**
En Küçük Kardeşinizin Doğduğu Ay (Örnek: Ocak) **(*) :**

(*) Bu sorular, şu anda cevapladığınız anketi bir önceki anketle eşleştirmek için sorulmuştur. Kimlik bilgilerinizi açığa vuracak sorular değillerdir.