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TITLE: Can Managerial Roles and Skills Change? An Exploratory Study in the Context of Industry 4.0

AUTHORS: Özlem GÜLERYÜZ, Ethem DUYGULU

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Yönetsel Roller ve Beceriler Değişebilir mi? Endüstri 4.0 Bağlamında Keşifsel Bir Çalışma^a

Özlem Güleriyüz^b c, Ethem Duygulu^d

Özet

Bu araştırma, Mintzberg (1971;1973) tarafından tanımlanan yönetsel rollerin ve Katz'ın (1955) çalışmasında belirttiği yönetsel becerilerin, endüstri 4.0 kavramının tartışıldığı günümüzde değişip değişmediğini belirlemeyi amaçlamaktadır. Araştırma konusu derinlemesine görüşme tekniği kullanılarak kartopu örnekleme yöntemiyle nitel bir yaklaşımla sorgulanmış ve içerik analizi yapılarak değerlendirilmiştir. Sonuçta, Mintzberg (1971;1973) tarafından tanımlanan yönetsel rollerin bazılarının önemini yitirdiği ve bazılarının daha önemli hale geldiği bulunmuştur. Ayrıca liderlik, motive etme, inisiyatif alma, güvenilir olma, öz güven, öz yönetim, zamanı iyi yönetme, teknik uzmanlık, müşteri odaklı olma, kalite odaklılık, insan odaklılık, takım çalışması, esneklik, dijital uyum sağlama yeteneği, organize etme, risk alma, yaratıcılık, hayal gücü, deneyime açıklık, merak, empati kurabilme, problem çözme, stratejik düşünme yeteneği, ömür boyu öğrenme, araştırmacı olmak, karar verme, modelleme, programlama, dijital okur yazarlık, dijital vizyon, adanmışlık, kişilerarası iletişim, M2M iletişimi, kültürel farkındalık, IT teknoloji becerisi, büyük veri kullanımı, disiplinlerarası çalışma, network teknoloji, veri – network güvenliği, iş süreci yönetimi ve işbirliği becerileri önemli hale gelmiştir.

Anahtar Kelimeler

Endüstri 4.0
Yönetsel Roller
Yönetsel Beceriler
Değişim

Makale Hakkında

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Can Managerial Roles and Skills Change? An Exploratory Study in the Context of Industry 4.0

Abstract

This research aims to determine whether Mintzberg's (1971;1973) managerial roles and Katz's (1955) managerial skills have changed today when industry 4.0 has been discussed. The subject of research was questioned with a qualitative approach by using the snowball sampling method using the deep interview technique and evaluated through content analysis. It was found that some of the Mintzberg's roles have lost importance and some become more important. Also, leadership, motivation, taking initiative, reliability, self-confidence, self-management, good time management, technical expertise, customer, quality and human-orientedness, teamwork, flexibility, digital adaptation, organizing, risk-taking, creativity, imagination, openness to experience, curiosity, empathy, problem-solving, strategic thinking ability, lifelong learning, being a researcher, decision making, modeling, programming, digital literacy, digital vision, devotional, interpersonal communication, M2M communication, cultural awareness, IT technology skills, using big data, interdisciplinary work, network technology, data-network security, business process management and cooperation skills become more important with industry 4.0.

Keywords

Industry 4.0
Manageria Roles
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About Article

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^b İletişim Yazarı: ozlem_guleryuz@yahoo.com

^c Doktora Öğrencisi, Dokuz Eylül Üniversitesi, Sosyal Bilimler Enstitüsü, İşletme Bölümü, Buca, İzmir, Türkiye, ORCID: 0000-0003-2788-358X

^d Prof. Dr., Dokuz Eylül Üniversitesi, İİBF, İşletme ABD, Yönetim ve Organizasyon Bölümü, Buca, İzmir, Türkiye, ORCID: 0000-0001-5054-5795

Introduction

"What do managers do?"... the answer to this question has been investigated for years. It was Linton who introduced the concept of role to the literature as the dynamic aspect of status. The first and most effective research about roles is Mintzberg's (1971;1973) research. Ten managerial roles were mentioned in his researches. On the other hand, the concept of skill expressed as the ability to do something has reached today with the research of Katz (1955). According to Katz (1955), there are three basic managerial skills. From an managerial point of view, these concepts are quite important for managers and it seems that it will remain important in the future as well.

Over the past years, information and communication technologies have progressed at an incredible rate and continue to do so. With the digital change experienced at every stage of production, robots gradually began to enter our life. As the machines began to communicate with each other and with people, the changing process with the introduction of intelligent technologies and artificial intelligence led to a paradigm shift in every field.

In the past, three industrial revolutions occurred consecutively. During this time there has been a development from steam-powered systems to cyber-physical systems and the fourth industrial revolution is so close now. It is called as "industry 4.0" and is based on the communication of all machines with each other. Also, it provides access to all data in real time and productivity / flexibility at all process. So, it seems as a radical change. As a natural result of this wave of change, it is predicted that change in organizational structures and management styles will be inevitable. With Industry 4.0, it is also thought that the managerial skills and roles can change.

In this context, the aim of this research is to find out whether there is a change on managerial roles and skills in this chaging atmosphere with industry 4.0. If there is a change they will be redefined. Because it is an exploratory study, it is sought answers to those questions below as a main focus of this research:

- a. Did Mintzberg's (1971;1973) managerial roles and Katz's (1955) basic managerial skills change from past to present in the context of industry 4.0?
- b. If managerial roles and skills have changed or new roles and skills have emerged with industry 4.0, what are these?

Literature Review

It is not the first time scientists have discussed digitalization and how digital it is. But the renewed technology reshapes the manufacturing industry (Reischauer, 2018: 27). For example, in Ortaş's study (as cited in Özsoylu, 2017: 42), with the first industrial revolution that began in England in the second half of the 1700s, machines were replaced by the hand and body power used before the industrial revolution. Production increased and has been cheaper with steam machines. Now industry 4.0 is mentioned and all researches show that it will affect the managerial field as well as the manufacturing industry. Because of that, in recent years, discussions on industry 4.0 have intensified in both academia and society. For example, Lee, Bagheri and Kao (2015), in their academic research, suggested a 5-stage model in the context of industry 4.0. Sommer (2015) have examined SMEs' readiness for industry 4.0 and awareness of it. Finally, it was found that only 49% of the interviewed companies have integrated

digitalization to their corporate strategy. Nevertheless, companies from all sectors around the world adopt "Industry 4.0". Ślusarczyk (2018), made a research about that issue and according to this research, only 20% of participants said that industry 4.0 was not important and has not affected their activities so far. Consequently, it can be said that the majority of companies see industry 4.0 as an opportunity, not a threat. Because, speed and impact of change in recent years increased. The society which was dominated by capital, turned into a society dominated by knowledge rapidly. The most important feature of today's economic system has been the ability to obtain value by using information. Therefore, knowledge has become the main force of providing competitive advantage to enterprises (Türkmen and Yılmaz, 2019: 1). So industry 4.0 is seen as a right way in this age of knowledge, change and speed.

When the literature was reviewed, regarding Industry 4.0 the following definition is developed for this research: "Bringing human machine interaction to the next level, thanks to advanced interfaces consisting of internet of things, intelligent and dark factories, 3D printers, autonomous robots, big data, cloud system, augmented reality, artificial intelligence, cyber physical systems and simulation, using real-time, flexible and autonomous technology, enabling to work with machines connected with each other over the internet with the help of cyber physical systems, it is a technology-oriented philosophy that reduces costs and leads to efficient, error-free, flexible and fast production and a digital transformation process that will be achieved by applying this philosophy" (Moeuf et al., 2018; EBSO, 2017; Dengiz, 2017; Schneider, 2018; Banger, 2017).

On the other hand, when the managerial roles are examined, according to Rüzgar and Kurt (2013: 37), some studies (Mc Carthy, 2000; Jung and Sosik, 2006; Phornprapha and Seebungkerd, 2007; Ramezani et al., 2011) has been done about it. But there is not much work done in the managerial area related to industry 4.0. One of them is about technology and managerial roles and it belongs to Arun, Türkay, Fen, Babacan and Ateş (2014). Arun et.al. (2014) studied the "managerial roles" shaped by "new technology". As a result of this research conducted using the roles taxonomy of Mintzberg, it was observed that new technologies affect more the roles related to information management and also technology was found to be the least effective in interpersonal roles compared with the others.

Also, according to Pehlivanoğlu's study (2018; 56), when managerial skills are examined, it can be said that some researches (Katz, 1955; McClland, 1973; Mintzberg, 1971, 1973; Hogan and Warrenfeltz, 2003; Drucker, 2009) was conducted about it. Even the studies on industry 4.0 and competencies are limited because the subject is quite new. About that, based on the literature, Prifti, Knigge, Kienegger and Krcmar (2017: 53) achieved a total of 64 competencies. These are the most mentioned competencies in the literature in the context of industry 4.0.

It would be appropriate to state the mentioned managerial roles of Mintzberg (1971;1973) are shown in table 1 and basic managerial skills of Katz (1955) in table 2. Mintzberg carried out a study in 1973, as well. Our main questions that was included by this research based on the original work of him in 1971 and developed one in 1973.

Table 1: Mintzberg's Ten Managerial Roles

Decisional Roles	Informational Roles	Interpersonal Roles
Negotiator	Nerve Center	Figurehead
Entrepreneur	Disseminator	Leader
Resource Allocator	Spokesman	Liaison
Disturbance Handler	-----	-----

Source(s): Referring to Mintzberg (1971;1973) edited by authors of research

Table 2: Katz's Basic Managerial Skills

Basic Managerial Skills		
Technical Skills	Human relations Skills	Conceptual Skills

Source(s): Referring to Katz (1955) edited by authors of the research

Methodology

When the literature in Turkey was reviewed, it was found that this is the first research that has been made on managerial roles and skills which is at the forefront with industry 4.0. The main questions including the main focus of this research are: Have Mintzberg's (1971;1973) managerial roles and Katz's (1955) basic managerial skills changed in the changing environment of industry 4.0? If so, what are the new managerial roles, skills and competencies? To be able to do this, a descriptive/exploratory study based on snowball sampling was conducted by using qualitative research method (Mallat, 2007: 418). Primary and secondary data and semi-structured questionnaire was used to collect the research data.

Some limitations existed while getting data. For example: companies were secretive about providing information and industry 4.0 is in the early stages of its process. Depending on the definition that was made for this research, the companies were determined that includes the similar features in definition (for example: internet of things, intelligent and dark factories, 3D printers, autonomous robots, big data, cloud system, augmented reality, artificial intelligence, cyber physical systems and simulation). To be able to creating the sample, web sites of the firms were scanned and nine companies were found in Turkey. Also, in 2017, Tekin (2018: 253), identified 155 news, containing "Industry 4.0 applications" statements in national and international press. Nine of the companies mentioned in these news were determined as the most mentioned company. Similar results were obtained with Tekin's research when we performed the same scanning in 2020. Six companies were reached with the snowball sampling method. So, six large manufacturing companies (% 66,6) were selected as sample.

All of the participants are senior managers in the companies they work for and their experience varies between 2 and 24 years in current company. The number of employees reporting to participants varies between 6 and 13. Five participants are male and only one is female. Information about the participant profiles are shown in table 3. Participants were asked 11 open-ended questions. The first part of questionnaire was prepared by adapting from the questionnaire of Özkurt's (2016) thesis. The questions are presented under 5 different themes. In addition, closed-ended questions were posed. The second part of questionnaire was adopted to our research from Anderson, Murray and Olivarez's (2002) study.

Table 3: Participant's Profile Informations

Nicknames	Gender	Years of experiences in current company	Number of employees reporting to participants
A	Male	24 years	6
B	Male	6 years 6 months	8
C	Male	5 years	12
D	Male	7 years	12
E	Male	2 years	15
F	Female	7 years	13

Source(s): Edited by the authors of the research

Companies are located in Marmara and Aegean regions. The company profile information is shown in table 4. It can be seen on table 4 that all companies are large enterprises with more than 250 blue and white collar employees. Also, all companies implement high technology and industry 4.0 applications.

Table 4: Firm's Profile Information

Nicknames	Location of company	Number of whole workes in the company (White and blue collar)	Company size	Company field of activity
A	İzmir	>250	Large enterprise	Manufacturing industry
B	Manisa	>250	Large enterprise	Manufacturing industry
C	Bursa	>250	Large enterprise	Manufacturing industry
D	Sakarya	>250	Large enterprise	Manufacturing industry
E	Manisa	>250	Large enterprise	Manufacturing industry
F	Manisa	>250	Large enterprise	Manufacturing industry

Source(s): Edited by the authors of the research

The empirical dimension of the research is based on semi-structured, deeply interviews with senior executives working in large enterprises using industry 4.0 applications (Aydn and Özeren, 2019: 164). Firstly, the companies to be interviewed were contacted and information about the purpose and content of the research was told. At the beginning of the interview, each participant was asked voluntarily whether they allowed voice recording and positive responses were recorded. Only participant F did not accept the voice record. So participant F's

words were noted. The interview was conducted in two stages. The participant marked the closed-ended questions and descriptive questions in the questionnaire for about half an hour through the form presented. Then, open-ended questions were answered and voice recordings were taken. Voice recordings took between 15 and 30 minutes. All audio recordings and writings obtained from the interviews were deciphered and content analysis were made, then themes and codes were created. While determining the themes, expert opinion was sought, taking into account the classification in the literature. In coding, words included in the definition of industry 4.0 and containing industry 4.0 applications and emphasizing managerial roles and skills were counted and the front and back of the words were examined and their frequencies were found out. While coding, manual coding was carried out considering that automatic coding would not give correct results. As creating the codes, the code frequencies and the number and percentages of the participants who mentioned the code were determined manually. Then coding percentages were found. For example, 83.3% (5 persons) of the participants mentioned the leader role 7 times. It means those who talk about the leader role have mentioned this role at least once. One participant did not mention any of the determined codes. Then each word was clustered under the related theme. After that, all codes and themes was transferred to computer, then, it was returned to the related participant and approval was obtained from him/her for the accuracy of the decrypted statements. The interviews were conducted at the point chosen by the participants in the company. By the way, as a qualitative study, it is possible to see the validity and reliability process in table 5.

Table 5: Validity and Reliability Process

Qualitative Research Reliability and Validity Criteria	Criteria Process
Cogency	The data collected during long interviews are more reliable. In this sense, it took approximately one hour for each participant to answer all closed and open-ended questions. While analyzing the interview texts and creating categories, words, phrases and sentences were established to reflect the meaning of the categories. In order to avoid meaning shifts in the sentences stated by the participants, direct quotations were made and the mentioned sentences were created by using the records.
Transferability	The results of the research can be transferred to senior executives, management and organization literature, behavioral sciences, and industry 4.0 studies of companies wishing to move to industry 4.0
Consistency	In addition to deeply interviews, secondary data were used and as asking and recording questions

	with a similar approach, consistency was sought.
	Throughout the research process, individual and ideological bias, subjectivity, impressing the participants were carefully avoided at all stages such as research design, data collection and analysis and selection of participants.
Confirmability	

Source(s): Edited by the authors of the research

Findings

Considering the findings of the research, five basic themes were created according to the codes created from the answers obtained from the participants. The resulting themes and codes is shown in table 6. Information on how the codes are created is presented in the methodology section. These themes and codes are examined in detail as follows.

Table 6: Themes and Codes Used in Research

Themes	Codes
Changing managerial roles, skills and competencies	Leader role, figurehead role, entrepreneur role, curiosity, digital literacy, programming, Generation Z, dark factory, IoT, digitalization
Industry 4.0 awareness	Digital twins, strategy, virtual reality, vision, IoT, digitalization
Industry 4.0 gains	Organizational chart, resistance to change, Transparency, quality, flexibility, speed, cost, disadvantage
Industry 4.0 process	Adaptation, budget
New occupations	Big data, robot, new managers, information security

Source(s): Edited by the authors of the research

Changing Managerial Roles, Skills and Competencies

Various predictions that were made about the managerial roles of Mintzberg (1971;1973) is mentioned in this research. To be able to talk about the changing of managerial roles, skills and competencies, the first and main theme is “changing managerial roles, skills and competencies”.

Speaking about the managerial roles that will come to the fore, participant C said that the role of the leader will be very important with industry 4.0. He explained why:

“I think the role of the leader will be very bright in the coming period. Because as I said, with the new generation, with digitalization, everyone will actually be using something in a place,

but the person we call the leader should be showing that the new generation is not restricted to mail via facebook, not only verbally, but also by his way of living or the way he does business in that factory. There must be digital leaders. Perhaps a different concept such as 'digital leadership' may emerge. The person we call the digital leader - my personal idea - needs to have an idea of at least one coding language. He needs to know how to access data, and new trends... digitalization, because it's something that you can't stand where you stand today, if you do not research, don't follow, your data will be no longer available. You don't have to wait two or three years for that. At the end of six months, in fact, all trends, all systems may have changed. I think this is something we should observe in the role of digital leadership in the coming period (Participant C)"

Leader role is very important. In this research, it was revealed that the leader role will keep its importance with industry 4.0 applications. A leader is needed at every stage. Industry 4.0 is a new formation full of uncertainties. For this reason, successful leaders who will manage these uncertainties will get success. According to some opinions, although it is said that robots will replace humans with Industry 4.0, we cannot completely eliminate the human element. In fact, this was the common opinion of all participants. Shared leadership on the subject was also mentioned about industry 4.0. Participant D talked about this issue as follows:

"A manager always has to show his/her leadership role but maybe central leadership will be a little more distributed. People will start to lead their own processes more. I think this leadership will turn into a more sharing leadership, but it doesn't mean that it will disappear completely (Participant D)"

It can be said that leaders who cannot individually handle their responsibilities will give importance to teamwork in the near future. According to global research conducted by IBM with 1500 CEOs (Chief Executive Officer), more than half of CEOs do not believe that they can manage their duties and responsibilities on their own. This shows us that industry 4.0, due to its nature and increasing complexity, is unable to accommodate autocratic and individual leadership, thus making the transition to collective and collaborative leadership (Tüzmen, 2017). In this sense, the literature supports the idea of the participant D.

Participant E said the following:

"Leader role... is of course important. In other words, in order to be perform the practices within the company in a way, to be a visionary, there is a need of leader role (Participant E)"

Indicating that the role of the figurehead will lose its importance, participant C added:

"To what extent is there a need for a figurehead role in an environment with such connectivity, in an environment where data is transparent? It may be a 'virtual representation' or I think at the point we're at right now - not just for industry 4.0, but for digital transformation - if a product, a service, a solution can sell itself, if it's already successful, if it's already working, people get it. You don't need to do this marketing or representation. A working system is directly accepted. I think the figurehead role with digitalization will gradually lose its importance (Participant C)"

Participant D thinks that with Industry 4.0. entrepreneur role will come to the fore and he expressed the following:

"I think the role of entrepreneur will be very important. Because, in fact, with this digital transformation, with industry 4.0 we usually do things that has not been done before. We are

implementing many projects that we have not done before in our company. It has no past experience. Yesterday I was taking this phone from here and putting it here. I can't keep putting it the same way today and expect a different result. Sometimes you have to take risks, you have not to be afraid, you have to approach with self-confidence. I think this will be very important in the near future (Participant D)“

Just like an entrepreneur, finding the new opportunities, changing the existing status, making new attempts will gain importance in the age of industry 4.0. In this context, industry 4.0 will bring us new managers who take on entrepreneur roles.

Participant F stated that the disturbance handler role is also important for industry 4.0, because:

“The disturbance handler role is important. Because for the first experiences, we can face crises so much. There is a need of managers to handle the crisis well. (Participant F)“

Crises follow innovations. Industry 4.0 will bring changes with it. Until this new situation stabilizes, some crises will be encountered. Here industry 4.0 will need managers to help companies overcome their crises.

In addition to the data announced about managerial roles, industry 4.0 predictions about skills and competencies were also made. In this context, in Klemp's study and Middleton & Long's study (as cited in Carson and Gilmore, 2000; 364), competence in general is defined as “the basic characteristic of a person who causes effective and/or superior performance in a job” or: “a combination of knowledge, skills and qualifications referenced in the task environment.”

When closed-ended questions are evaluated, the leading managerial skills and competencies highlighted as “very important” by participants A, B, C, D, E and F are: leadership, motivation, take initiative, reliable, self-confidence, self management, good time management, technical expertise, customer, quality and human-oriented, team work, flexibility, digital adaptation, organizing, risk taking, creativity, imagination, openness to experience, curiosity, empathy, problem solving, strategic thinking ability, lifelong learning, being a researcher, decision making, modeling, programming, digital literacy, digital vision, devotional, interpersonal communication, M2M communication, cultural awareness, IT technology skills , using big data, interdisciplinary work, network technology, data-network security, business process management and cooperation. The managerial skills and competencies that all participants have identified as “very important” in common for industry 4.0 are: customer-oriented, human-oriented, curiosity and lifelong learning. Rarely, participants B and E indicated that with industry 4.0 there would be no control skills in the future. Participant C told that there would not be the skill of good time management in the future because there is no need to have. All participants told about managerial skills in industry 4.0 and participant F said:

“Digital adaptation, flexibility and lifelong learning skills will be critical. Because industry 4.0 brings change and this change is fast. Technology changes fast. Managers also need to adapt to this. In the past, managers or leaders were waiting for training. But now, the information is already there in the new generation. Therefore, the leaders who will access information and use it in their life will be successful (Participant F)“

The prominent roles for each participant with industry 4.0 are summarized in table 7.

Table 7: Featured Roles with Industry 4.0

Managerial roles participant A thinks that becomes very important with industry 4.0:	Managerial roles participant B thinks that becomes very important with industry 4.0:	Managerial roles participant C thinks that becomes very important with industry 4.0:	Managerial roles participant D thinks that becomes very important with industry 4.0:	Managerial roles participant E thinks that becomes very important with industry 4.0:	Managerial roles participant F thinks that becomes very important with industry 4.0:
Leader	Leader	Leader	Leader	Leader	Leader
Liaison	Disturbance handler	Liaison	Nerve center	Figurehead	Liaison
Disseminator	Resource allocator	Entrepreneur	Disseminator	Liaison	Disseminator
Entrepreneur	Negotiator	Resource allocator	Liaison	Nerve center	Spokesman
Disturbance handler	-----	Nerve center	Entrepreneur	Disseminator	Disturbance handler
-----	-----	Disseminator	Disturbance handler	Disturbance handler	Negotiator
-----	-----	-----	Resource allocator	-----	-----

Source(s): Edited by the authors of the research

Industry 4.0 Awareness

Awareness is about being aware of something and having an idea about it. This theme consists of digital twins, strategy, vision, internet of objects (IoT) and digitalization sub-codes.

It can be said that the individual awareness of all participants started early. For example, participant A said:

“I have certain knowledge about industry 4.0 since in particular 2014, because I have attended master class about the factory of the future, -leading the factory of the future- and there was a lot of principles discussed about industry 4.0, but more of pragmatistical approach, they are not academic but seen how can we activate this in the factory. That was the beginning of my understanding about how to manage and change the factory that I am leading now (Participant A)”

In general, if there is no awareness about industry 4.0, the roles and skills that have become important with industry 4.0 are also losing their meaning that's why this theme was created. For example, as stated by participant E in the previous theme, to be a visionary, there is a need of leader role. On the other hand to be a visionary and act the leader role, first of all, people must be awared of the main subject (industry 4.0).

If there is an awareness, it can be created a vision and strategy for industry 4.0 as well. So, it provides a predictive and prescriptive management instead of retrospective one. In this regard, the leader role and the role of leaders are so important.

Also, it is important to create a shared vision while experiencing changing with Industry 4.0. Bagner (2018: 97) while describing digital leadership skills in his book, he determined that one of them is the digital vision. Also digital vision was specified as a skill on our reserach's findings. So the literature and the research findings are on the same way about this issue.

The concept of digital twins, which participant A mentioned and highlighted, was first introduced to the public in 2010 with a roadmap declared by NASA. (Erturan and Ergin, 2018: 815). As a digital copy of real life, digital twins can be built in the companies.

On the other hand, IoT (Internet of Things) is a technology that enables the communication of physical objects with each other and enables remote control by means of embedded network connections (Gubbi et.al., 2013) and digitalization is the change in the way of business works with the help of digital technologies (Dengiz, 2017: 39) The concepts of digitalization and IoT are complementary. With IoT, digital adaptation, flexibility and lifelong learning skills will be critical. Because everything changes so fast in this athmosphere and these technologies has to be adopted in our business according to our needs as taking care of these skills.

Industry 4.0 Gains

When we consider what industry 4.0 brings to firms, productivity increases, competitive advantage, decrease in costs and production of higher quality products with fewer errors are reported in the literature (Banger, 2017: 12). We can add speed, flexibility and problem-solving skills. The gains indicated by the all participants are in this direction.

With industry 4.0, entrepreneur role becomes important in order to be successful and gain advantage from digital issues that entered our life. As stated at findings, risk should be taken, opportunities should be caught with the entrepreneur role and the mentioned gains should be obtained.

But, another subject is important while industry 4.0 applications are being implemented. This subject is resistance. Resistance can occur at the level of individuals, groups or organizations (Tunçer, 2013: 384). Since Industry 4.0 is a process of change, it is likely to face resistance. About this issue, the participant C said:

"Is there a significant disadvantage of Industry 4.0? We can not say disadvantage, but there's resistance. With the gains I have mentioned about Industry 4.0: the transparency comes with the disappearance of routine works and with this concern, they ask: "do we robotize? Are we going to the unmanned factory?" We are trying to turn it into an advantage with our own works (Participant C) "

With Industry 4.0, resistance to change is inevitable. This problem can be overcome with the help of information and education. It is important to create Industry 4.0 awareness. In addition, by providing relevant trainings, resistance to industry 4.0 can be overcome.

Industry 4.0 Process

The question asked to understand the industry 4.0 process is “How does the industry 4.0 process work in your company?”. Because, it is important to be aware of the process, to be able to act the roles and implement the right applications. The coded sub-themes are adaptation and budget.

Participant C makes a smooth transition to industry 4.0 by adapting it. Budget allocation is also important for the industry 4.0 process. Because this process is quite expensive. Participant C explained how the process works, highlighting the budget issue as follows:

“Employees with ideas first express their ideas in a digital environment, we check whether this idea is in line with the company strategy, the cost is calculated and the ideas are listed. Then, considering the available capacities, we realize the industry 4.0 ideas. The most critical issue in this process is seen as budget (Participant C)”

Planning should be done when using Industry 4.0 applications. Necessary things should be determined. A budgeting and planning should be made according to each company's own needs. Because a wrong step can cause big losses.

New Occupations

Under the theme “new occupations” the words big data, robot, new managers and information security are encoded. There are seven new business lines mentioned in the literature. Most of these seven business lines began operations abroad. However, these are industry 4.0-specific business lines. These new business lines are: Industrial Software Programmers, Information Systems and Internet of Things Solution Provider, Industrial Data Analysis Specialist, Robot Coordinator, Programmer and Repairer, Production Technology Specialist, Smart Cities Planners, Product Designer and Manufacturers (Sener and Elevli, 2017; 30-33) . About this issue participant A said:

“There are many new occupational groups that we didn't have before, but we started to work with during our transition to industry 4.0. For example; robot engineer, image processing engineer, mathematicians, statisticians, big data analysts are some of them. It is important to understand how this process works, and in the future many professions will be erased and new professions will emerge and organizations should be prepared for it. It is important to have a good understanding of what needs to be happen in this whole new world (Participant A)”

Because of new professions that appeared with industry 4.0, new skills and roles should be known and according to new skills and roles, new generation should be educated. If it is not cared, new generation will not ready for them.

Conclusion

The aspects of Industry 4.0 we live have been known, but there are still undiscovered and unknown aspects of it which we might call as “the dark side of the moon”. This wave of change will continue and the fourth industrial revolution is going to take place very soon. So it is aimed to contribute with new findings about it to the literature that's why this subject was worked.

Industry 4.0 is considered as a philosophy including change and transformation process in our research. As a result of this research, these answers were found out to main research questions: managerial roles defined by Mintzberg (1971;1973) were not added, but some of them lost their importance and some of them became more important with industry 4.0. But managerial skills and competencies that was created by Katz (1955) have changed. Leadership, motivation, take initiative, reliable, self-confidence, self management, good time management, technical expertise, customer, quality and human-oriented, team work, flexibility, digital adaptation, organizing, risk taking, creativity, imagination, openness to experience, curiosity, empathy, problem solving, strategic thinking ability, lifelong learning, being a researcher, decision making, modeling, programming, digital literacy, digital vision, devotional, interpersonal communication, M2M communication, cultural awareness, IT technology skills, using big data, interdisciplinary work, network technology, data-network security, business process management and cooperation skills become more important with industry 4.0. According to findings, control and good time management skills will not take place in the future. All participants have the common idea that customer-oriented, human-oriented, curiosity and lifelong learning skills will be very important.

When the managerial roles that become important with the introduction of Industry 4.0 are examined it is seen that the common thinking of all four participants is the leader role. Looking at the literature and the views taken during the interview, it is thought that the leadership of the future will be 'collective leadership' which means a shared leadership.

Also the entrepreneur role was chosen as very important. Because the managers have to seek new opportunities like an entrepreneur. Another important role is the disturbance handler role. Because if there is a change there are also crises. So we need to handle it. It is also told that the role we can call as strategist can be consider as a new role, but in fact leader role includes strategist role so we can not create a new role as a strategist.

On the other hand, all participants were introduced to the concept of industry 4.0 early. Even a strategy and vision were created by them. This means they are all aware of industry 4.0 and they prepare themselves for it.

Research, curiosity and analytical skills come to the fore with Industry 4.0.

In terms of profession, data scientist and UX designers will gain importance with industry 4.0. Because companies that hold big data but cannot manage it will suffer losses.

It can be said that it is important to make the necessary changes in order to survive in the new world that will be brought us by the fourth industrial revolution. Identifying the right needs is important for the proper implementation of these expensive systems. This change should not be avoided.

Finally, it should not be overlooked that the study is a qualitative and exploratory research, therefore, the findings are non-generalizable and new researches are needed. Two suggestions can be made for the new research mentioned. The first of these is that a new scale should be created and new roles and skills should be tested quantitatively in a large sample. The other one is that new qualitative studies should be carried out using similar scales.

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