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THE CHANGING NATURE OF THE WORKFORCE: A QUALITATIVE EXPLORATION ACROSS SELECTED COUNTRIES[1]

Cumali KILIÇ
Asst. Prof., Mardin Artuklu University, Mardin, Türkiye, cumalikilic@artuklu.edu.tr
ORCID: 0000-0003-1564-1938

Gaye ATİLLA
Prof., Süleyman Demirel University, Isparta, Türkiye, gayeatilla@sdu.edu.tr
ORCID: 0000-0003-1421-917X

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ABSTRACT

The human factor assumes an increasingly pivotal role in the sustenance of organizational operations. Within this context, this research embarks on an exploration of the intricate interplay between evolving industrial dynamics and the forthcoming landscape of employment conditions and workforce configuration. To elucidate these dynamics, the study leveraged interviews conducted with middle and senior-level managers and human resources experts hailing from select countries meeting specific criteria. The research employed a semi-structured interview method as a qualitative research approach. The study's findings underscore a consensus among participants, signifying an impending transformation in employment and workforce structures, chiefly attributable to the pervasive influence of technology. Although divergent viewpoints emerged regarding the nature of future labor conditions, a prevailing sentiment among participants is the necessity for proactive preparations commencing today to enable adaptation to evolving circumstances and secure a competitive edge in future market dynamics.

Keywords: Industry 4.0, technological developments, workforce, employment, human resources management.

[1] This research is derived from Cumali Kılıç's doctoral thesis titled "The Relationship of Industry 4.0 with Labor and Employment: A Qualitative Analysis on Selected Countries".

INTRODUCTION

In this research, the paramount significance of human resources in the transformative landscape of Industry 4.0 serves as a pivotal focal point. Conducting semi-structured qualitative interviews with middle and senior-level managers and experts within human resources departments across organizations in selected countries forms the methodological backbone of this study. The criteria-driven selection of these countries adds depth and relevance to the exploration, ensuring a diverse and comprehensive perspective. Through these interviews, the study endeavors to delve into the nuanced thoughts of participants concerning the anticipated effects of the Industry 4.0 revolution on the future workforce and employment conditions. The choice of the semi-structured interview method, a widely acknowledged approach in the social sciences, underscores the commitment to capturing the richness and intricacies of participants' insights.

In reviewing the existing literature, a noticeable pattern emerges wherein most studies are confined to a single-country, city, or organizational sample. Furthermore, the predominant nature of these studies leans towards descriptive analyses or case studies within specific organizational samples, often favoring quantitative methods. Strikingly, there is a scarcity of qualitative studies in the literature, and notably absent is a study of this magnitude employing the semi-structured interview method. This study, therefore, distinguishes itself by its unique methodological approach and the substantial sample size chosen for research. Consequently, the research contributes significantly to the literature by exploring participants' perspectives on employment conditions and labor force structures expected to evolve with Industry 4.0 in a novel manner and within an unprecedented sample size.

The overarching objectives of this study are twofold: firstly, to enrich the existing literature and, secondly, to heighten awareness among countries, administrations, organizations, and individuals regarding the future contours of the workforce and employment structures. As the Industry 4.0 transformation unfolds, the uncertainties surrounding the eventual form of future labor force conditions captivate the curiosity of stakeholders. This study, in response, seeks to dispel some of these uncertainties by drawing inferences and facilitating stakeholders' adaptation to evolving production conditions. Consequently, the research not only furnishes stakeholders and interested parties with findings interwoven with existing literature but also offers insightful policy suggestions for navigating the dynamic landscape of the future labor market, profoundly influenced by the advent of Industry 4.0.

Structured into five sections, this research begins with an introductory overview, providing context and rationale for the study. The subsequent section offers a theoretical examination of the relevant theories and concepts, establishing a solid foundation for the subsequent analyses. Chapter three systematically outlines the methodology employed and presents the empirical results. The fourth chapter engages in a nuanced discussion, utilizing the findings to interpret and elucidate the study's outcomes. Lastly, the fifth section, encompassing the conclusion and recommendations, synthesizes the overarching findings and guides future considerations in the realm of the evolving workforce shaped by Industry 4.0.

The primary objective of this study is to assess organizations' awareness and perceptions of the transformation brought about by Industry 4.0. Within this goal, the investigation explores the intricate relationship between Industry 4.0 and the structure of labor as well as employment conditions. As the Industry 4.0 revolution is ongoing, researchers actively study the prospective workforce structure and potential alterations in employment conditions. The study aims to contribute valuable insights and recommendations, elucidating uncertainties and facilitating organizational adaptation to the evolving production landscape of the future. The findings are juxtaposed with existing literature, offering nuanced perspectives and actionable suggestions to inform policies. These proposed policies are designed to address anticipated changes in the labor market and employment conditions influenced by the transformative impact of Industry 4.0, enriching the academic discourse on this dynamic intersection of technology, labor, and organizational adaptation.

The following section will delve into the theoretical framework, providing a comprehensive exploration of key theories and concepts underpinning the study. This theoretical examination aims to contextualize and elucidate essential theories that form the foundation of the research, establishing a robust framework for subsequent analyses.

THEORETICAL BACKGROUND

In his influential work "The Economic Possibilities of Our Grandchildren," economist John Maynard Keynes warned of the threat of widespread technological unemployment. Keynes argued that the pace of discovering labor-saving methods surpasses the speed of finding new uses for labor, a question still relevant today. This perspective delves into the examination of technological impacts on the labor force dating back to 1931. The central query emerges: *"Will rapid technological progress lead to future unemployment issues?"* Scholars, echoing concerns addressed in this study, have extensively researched this question. Before delving into the methodology section, where the research approach is detailed, it is crucial to touch upon foundational concepts shaping the theoretical backdrop. The subsequent section explores the industrial transformations our world has undergone, elucidating their fundamental characteristics.

In framing our theoretical background, we explore a century-long scholarly tradition initiated by illuminators like John Maynard Keynes, focusing on the interplay between technological advancements and the labor force. This discussion draws upon key theoretical frameworks shaping our understanding of the potential impact of rapid technological progress on employment dynamics. Navigating these underpinnings, we offer a nuanced perspective on the intricate relationship between technology and the evolving nature of work. This analysis lays the groundwork for our empirical examination of the implications of Industry 4.0 on the workforce. Before delving into theoretical analysis, we provide a concise overview of prominent theories on this subject.

- **Technological Determinism:** Originated from Thorstein Veblen (1990) and rooted in the ideas of media theorist Marshall McLuhan (1994) and cultural critic Neil Postman (1993), Technological Determinism asserts that technological advancements catalyze profound societal changes. In the context of Industry 4.0, characterized by the integration of smart technologies, artificial intelligence (AI), and the Internet

of Things (IoT). The theory's insights illuminate how these technologies reshape the workforce. From automated processes to AI-driven decision-making, Industry 4.0 technologies redefine job roles, skill requirements, and the overall structure of employment.

- **Human Capital Theory:** Developed by economists Gary Becker (1994) and Theodore Schultz (1961), the theory underscores the pivotal role of education and skills in enhancing individual productivity and contributing to economic growth. In the Industry 4.0 era, marked by rapid technological advancements, theory gains prominence as the demand for skills in data analytics, programming, and problem-solving escalates. Investing in human capital becomes paramount to equip the workforce with the necessary skills to navigate the evolving technological landscape.

- **Skill-Biased Technological Change (SBTC):** SBTC, influenced by economist Robert M. Solow (1957) and later developed by scholars (Autor et al., 1998), explores how technological advancements disproportionately impact the demand for different skills. In the context of Industry 4.0, the theory's insights become particularly relevant as there is a discernible surge in demand for high-skilled workers proficient in technology-related fields, while routine and repetitive tasks face automation.

- **Job Polarization Theory:** Theory suggests that employment is becoming concentrated in high-skill and low-skill jobs, with a decline in middle-skill jobs (Autor & Houseman, 2010; Murnane & Levy, 1993). In the Industry 4.0 era, characterized by automation and digitalization, this theory gains significance as it helps explain the polarization trend observed in the workforce, where high-skilled tech-centric occupations thrive while routine middle-skill jobs face potential obsolescence.

- **Flexible Specialization Theory:** Discussed by urban theorists Richard Florida (1991) and David Harvey (1989), Flexible Specialization Theory focuses on how industries become more flexible in responding to market demands. In the Industry 4.0 scenario, characterized by customization and rapid adaptation, Florida and Harvey's theories help explain how technologies enable businesses to tailor products and services, fostering a more flexible and adaptive economic environment.

- **Boundaryless Career Theory:** Theory discussed by organizational psychologists Michael Arthur and Denise Rousseau (1996) and addresses the evolution of career paths and the breaking down of traditional organizational boundaries. In the Industry 4.0 era, marked by the rise of remote work, gig economy platforms, and collaborative digital environments, careers become increasingly boundless. Arthur and Rousseau's insights offer a lens to understand the changing nature of careers and employment relationships in a technologically connected world.

As we explore theories surrounding workforce changes amidst industrial and technological transformations, a cohesive narrative emerges, revealing the dynamic landscape shaped by Industry 4.0. At its core, these theories emphasize that technological advancements drive profound changes. In conclusion, these interplaying theories provide a nuanced understanding of the intricate dynamics shaping the workforce in the era of Industry 4.0.

The transformative impact of technology, human capital emphasis, skill differentials, workforce polarization, flexible adaptation, and the boundaryless nature of careers form a narrative illuminating the multifaceted aspects of the evolving world of work. These theories collectively guide our comprehension of the complex interdependencies between technology and the workforce in this era of unprecedented change. Following an exploration of various theories, the next imperative is to delve into a comprehensive understanding of the Industry 4.0 revolution. This subsequent discussion aims to illuminate its core components, objectives, and how it aligns with diverse perspectives and theories previously examined regarding its impact on the workforce. This integrated approach seeks to enhance clarity and offer a holistic perspective on the revolutionary paradigm of Industry 4.0 in the context of its implications for the labor market.

Industry 4.0 envisions a collaborative framework for seamless integration of all production-related units. This involves creating an integrated production and value chain, utilizing advanced digital technologies, and establishing a "Smart Production" infrastructure within the system architecture. This infrastructure includes identifying production hardware with codes or internet addresses, processing data with user-defined algorithms, and designing autonomous production processes with rule-based scenarios (Eldem, 2017: 11; Mrugalska & Wyrwicka, 2017: 467-468; Wagner et al., 2017: 125). The primary goal is to transition from mass production to individualized production, creating smart products and processes to meet the innovative demands of individual customers (Prause, 2015).

In contrast to the preceding industrial revolutions, Industry 4.0, as a post-modernist structure, prioritizes globalization, protects intellectual property through patents, and emphasizes service automation (Vardar, 2016: 10). This transformative paradigm presents an opportunity for countries lagging behind in earlier industrial revolutions to regain a competitive advantage in production. Additionally, Industry 4.0 generates its own economy, disrupts established value chains, adds higher value, and underscores the importance of a qualified workforce (TÜSİAD, 2016: 13). This emergence, driven by the impact of communication, informatics, internet, automation, data collection, artificial intelligence, and robotic technologies on production processes, is anticipated to complete its transformation in the coming years (Pereira & Romero, 2017: 1207).

Discussions on Industry 4.0 gained prominence at the "World Economic Forum" in 2016 (Çiğdem, 2019: 161; ILO, 2018; Schwab, 2016; WEF, 2016). Notably, according to Fortune magazine's report, 90% of the 500 corporate enterprises with the highest turnover in the last 50 years have exited the market and ceased operations (SIEMENS, 2022). Organizations striving to adapt to evolving conditions and sustain their activities must vigilantly monitor competitive factors. The advent of new players into the market, Industry 4.0, and digital transformation are pivotal in intensifying competition (Porter, 2015). Unlike previous industrial revolutions, Industry 4.0 technologies are evolving rapidly, transforming production, marketing, communication, and management, thereby necessitating a redefinition of job descriptions. Future expectations include a relative contraction in employment and positive outcomes such as the transfer of lower-level jobs threatening human health to machines or robots (Saatçioğlu et al., 2018).

The Industry 4.0 concept, poised to have significant macroeconomic effects, embodies a digital revolution. This revolution, potentially redefining the nature of human work (Ekşi, 2024: 92; Berg et al., 2018: 5), necessitates a reassessment of contemporary labor force concepts (Çiğdem, 2019: 161). Preparing for this transformative process becomes a critical contemporary challenge. The evolving industrial landscape, influenced by technological developments, requires measures at the individual, organizational, or global levels as fundamental keys to adapting to the competitive dynamics of a changing world (Preuveneers & Illie-Zudor, 2017). Moreover, as machines play a more substantial role in production processes and assume more tasks, the labor force's engagement may diminish, leading to structural changes in labor and employment conditions (Asiltürk, 2018). Thus, it is imperative to investigate the expected impact of the Industry 4.0 revolution on the future labor force structure. However, before delving into the research phase, a brief elucidation of labor force and employment concepts is essential for a clearer understanding of the subject.

So, the discourse on Industry 4.0 and its intricate relationship with the workforce is a multifaceted exploration encompassing diverse theoretical perspectives, technological foundations, and global economic dynamics. Optimistic, pessimistic, and neutral views underscore the uncertainty in predicting the impact of Industry 4.0 on employment conditions. Navigating this complex landscape reveals that the Industry 4.0 revolution, initiated in Germany in 2014, represents a pivotal moment in industrial evolution. Rooted in technological advancements like the Internet of Things, automation, and cyber-physical systems, Industry 4.0 presents challenges and opportunities for the workforce. While some foresee increased unemployment, others anticipate new job opportunities and a shift toward a more specialized, technologically adept workforce. The global discourse on Industry 4.0 necessitates continual examination, considering its potential repercussions on the labor market, economic structures, and the nature of work in the digital age. This exploration employs a methodological approach that critically evaluates existing literature, theoretical frameworks, and empirical insights to provide a comprehensive understanding of the nuanced interplay between Industry 4.0 and the workforce. Ultimately, the future trajectory of Industry 4.0 and its impact on employment remains a dynamic interplay of theoretical frameworks, evolving technologies, and the adaptive capacities of individuals, organizations, and nations.

METHOD

This study comprehensively outlines the chosen research methodology, covering objectives, model, study area, target population, and sample characteristics. This foundation sets the stage for subsequent analytical processes. The tools and techniques for data collection are systematically presented, offering insights into methodological intricacies. Additionally, a detailed exposition highlights sample analysis procedures, ensuring the robustness and reliability of gathered data. This methodological framework acts as a roadmap for the research process, enhancing academic rigor by emphasizing the systematic approach to obtaining and analyzing research data. The elucidation of the research methodology not only guides the research process but also contributes to the academic rigor, underscoring the systematic approach in acquiring and analyzing research data.

Research Model

To achieve the predetermined objective outlined in the introduction part of this study, particular emphasis was placed on addressing the following question.

> *To what extent do participants perceive Industry 4.0 transformation influencing the dynamics of labor structure and shaping employment conditions?*

In alignment with the identified research questions and existing literature, a set of inquiries was formulated to guide participant interviews. These questions, organized under thematic headings, encompassed crucial aspects such as Industry 4.0 transformation, labor force structural dynamics, and their intricate relationship with employment conditions. The semi-structured interview texts were meticulously analyzed through these predefined headings, providing a structured framework for interpreting and synthesizing rich qualitative data. Thematic organization facilitated a nuanced exploration of key dimensions, including transformative impacts of Industry 4.0 on labor, the evolving workforce structure, adaptive strategies employed by the labor force, and nuanced shifts in employment conditions. This methodological approach ensured systematic analysis of interview data, enhancing the study's depth and coherence, in alignment with established research practices in qualitative inquiry within the academic domain.

In qualitative research, theory construction often follows an inductive approach rather than testing hypotheses deductively. Building theories through an inductive approach is a distinctive feature of qualitative research (Kartarı, 2017: 212; Bayrakçı & Kayalar, 2016). The primary goal of qualitative research is to delineate the contours of this interpretive process by uncovering how individuals make sense of their world and articulating how people interpret their experiences (Merriam, 2013: 14). Denzin and Lincoln (2005) emphasized that qualitative researchers study phenomena in their natural environment, seeking to understand the phenomena and interpret the meanings people attribute to them.

Fundamentally, three distinct types of interviews are employed in qualitative studies: structured, semi-structured, and in-depth interviews. Each serves different purposes, with a structured interview being more suitable for descriptive or explanatory-based studies, and a semi-structured interview being more apt for exploratory and explanatory-based studies (Saunders et al., 2009: 318). The semi-structured interview method is the most widely utilized qualitative method, offering flexibility to the researcher. While the researcher has a list of predetermined questions and themes, the questions may vary from one interview to another (Bryman et al., 2011: 14). Simultaneously, this method has the capability to elucidate crucial aspects of human behavior, as a semi-structured interview can unveil answers not only to the "what" and "how" but also to the "why" questions. Consequently, researchers favor semi-structured interviews to comprehensively explain the factors analyzed during data evaluation (Qu & Dumay, 2011: 246).

During interviews, responses from interviewees can yield genuine and profound meanings, as well as superficial interpretations, allowing for the detection of insincere answers. This method introduces the

possibility of discerning insincere answers, and the researcher has the opportunity to address any ambiguities encountered through immediate follow-up questions (Karasar, 2013: 166). In this study, which aimed to evaluate the relationship between Industry 4.0 transformation and the labor force, the employment perspective sought to delve into the participants' views more profoundly. With the goal of comprehensively examining participants' views, accessing information thoroughly, and tapping into the insights of subject matter experts in detail, a qualitative approach utilizing the semi-structured interview technique was deemed appropriate.

Area, Universe and Sample of the Study

In qualitative research, where interviews and observations are commonly used data collection methods, working with a large sample group is generally not feasible. The qualitative approach aims to capture a holistic picture that represents diversity, richness, difference, and contradiction comprehensively, without the concern for generalization. Qualitative researchers often choose the non-probability purposive sampling method for an in-depth exploration of situations where accessing information in a comprehensive and detailed manner is deemed possible. In sample selection, the focus is on individuals directly relevant to the research subject rather than their representational power for the entire universe (Kayaoğlu & Gülmez, 2023: 76; Yaşar, 2018: 56; Neuman, 2012: 320; Yıldırım, 2010: 80). Consequently, the non-probability purposive sampling method was employed in this study.

When selecting participants for the study sample, criteria such as the country of operation and the number of employees in the organizations were prerequisites. Participants were required to work in organizations with a minimum of 500 employees, ensuring that predominantly middle and senior managers, including those in the human resources management unit, possess sufficient experience and expertise on the subject. Organizations with 500 or more employees were considered large-scale and included in the study (Torres et al., 2015: 30). The relevance of the organization's branch to the desired number of employees was confirmed before the interview.

Another significant criterion for determining the sample was the competence of the country in which the organization operates regarding the subject. The selection involved evaluating the country where the organization operates and/or is headquartered based on specific criteria. A 2018 World Economic Forum report analyzed 100 countries and economies representing over 96% of the Global Market Value Added (MVA) and more than 96% of the Global Gross Domestic Product (GDP). These countries were grouped, and 25, including Germany, the United States of America, China, and others, emerged as leaders in "Future Readiness in terms of Production Assessment Results" based on certain criteria. These countries were considered pioneers in new production technologies and integral to making a sound assessment of industrial transformation (WEF, 2022: 11-12).

Consequently, the research sample included middle and senior managers in enterprises and individuals in the human resources management unit who met both aforementioned criteria, located at the intersection cluster

of both. The aim was to capture perspectives from participants in various fields, holding different roles and positions, operating in diverse units (primarily in the human resources unit), recognized as pioneers or innovators in the relevant field within the organization, and closely following the subject in written or visual media. In this context, interviews were conducted with 24 participants.

Data Collection Tools and Techniques

The study utilized a semi-structured interview form, striking a balance between the rigidity of structured forms and the flexibility of unstructured interviews. This method is particularly suitable for interviews conducted by two or more individuals for a specific purpose, seeking in-depth information on a specific subject (Aycı & İlerisoy, 2018: 302; Yıldırım & Şimşek, 2008). In the form created for this study, questions were devised to explore concepts such as Industry and Industry 4.0, Industry 4.0 transformation, the relationship between Industry 4.0 transformation and human resources practices, planning, and policies, anticipated transformation in human resources due to Industry 4.0, the connection between human resources management and Industry 4.0, future expectations post-Industry 4.0 in terms of human resources, and the projected status of the labor force and its relationship with Industry 4.0 transformation. These questions were formulated to obtain comprehensive and in-depth information, facilitating a thorough understanding of the subject.

During the interviews, participants received briefings on the research's subject and scope, emphasizing its importance. They were encouraged to answer questions objectively and sincerely based on the principle of volunteerism. Given the linguistic diversity between the researcher and the participants, a good command of English was sought among those interviewed. The interviews, conducted in English, were scheduled for durations ranging from 45 to 75 minutes. Participants granted permission for the recording of interviews, with assurances that no information about them or their businesses would be shared. Voice recordings, both in-person and virtual, were transcribed into Word format for subsequent analysis. Since the interviews were conducted in English, the common language of the researcher and participants, they were initially transcribed in English and later translated into Turkish, the language to be used in this study. During the translation process, utmost care was taken to maintain fidelity to participants' responses and not alter the essence of the interviews.

Interviews with the 24 participants in the study were conducted using a combination of in-person and virtual methods. Before the Covid-19 pandemic, some interviews were conducted in person by the researcher, involving visits to participants' respective countries, mainly in Europe. However, due to travel restrictions during the pandemic, face-to-face interviews with participants outside of Europe were not feasible. Instead, virtual interviews, either through video or audio, were conducted. Initial contact with participants was made via email, and contact information was then obtained for further inclusion in the research. Thus, the demographic information of the participants in the study is as follows:

Table 1. Demographic Information of the Participants

Age	Gender	Education	Position	Country	Experience	Participant Number	Sector
23	Male	Bachelor's Degree	HR Executive Assistant	Germany	Less than 1 Year	3	Automotive
23	Female	Master's Degree	HR Executive Assistant	USA	3 Years	23	Chemistry
25	Male	Bachelor's Degree	R&D Specialist	Germany	1 Year	16	White Goods
27	Male	Bachelor's Degree	System Engineer	Czechia	3 Years	13	Automotive
28	Female	Bachelor's Degree	HR Executive Assistant	France	5 Years	10	Automotive
29	Male	Bachelor's Degree	R&D Specialist	Malaysia	4 Years	11	Technology
29	Male	Bachelor's Degree	HR Talent Acquisition Specialist	Singapore	4 Years	6	Technology
30	Male	Master's Degree	Senior Manager	Malaysia	6 Years	5	Machine
30	Male	Bachelor's Degree	Design Engineer	Hollanda	5 Years	18	Agriculture
32	Male	Bachelor's Degree	R&D Specialist	Poland	5 Years	17	Automotive
33	Male	Master's Degree	Research Assistant	Germany	5 Years	19	White Goods
34	Female	Bachelor's Degree	Expert Engineer	Poland	8 Years	15	Food
34	Female	Bachelor's Degree	HR Executive Assistant	Germany	13 Years	1	Automotive
36	Male	Bachelor's Degree	Senior Manager	Hollanda	10 Years	21	Food
39	Female	Bachelor's Degree	HR Manager	USA	16 Years	22	Chemistry
39	Male	Master's Degree	HR Manager	France	15 Years	8	Machine
41	Male	Bachelor's Degree	Senior Manager	Poland	19 Years	14	Health
42	Male	Bachelor's Degree	HR Manager	Czechia	18 Years	7	Tourism
42	Female	PhD	R&D Centre Manager	USA	19 Years	12	Technology
45	Male	PhD	Senior Manager	Singapore	21 Years	20	Chemistry
46	Female	Bachelor's Degree	Senior Manager	Singapore	20 Years	4	Tourism
47	Male	Bachelor's Degree	Manager	Malaysia	25 Years	24	Textile
51	Female	Master's Degree	Manager	Czechia	27 Years	9	Agriculture
63	Male	Bachelor's Degree	Assistant General Manager	Poland	36 Years	2	Machine

Analysis of Research Data

In qualitative research, the analysis process involves categorizing data into groups and revealing specific themes from these categories. These themes are then compared with existing data, and if necessary, they may be revised. Ultimately, the researcher interprets participants' perceptions in their own words and reports them

(Eatough & Smith, 2017). The data from this study underwent analysis using the content analysis technique, facilitated by MAXQDA 12 software. Content analysis, a systematic technique, involves grouping similar data under specific concepts and themes, interpreting them in a reader-friendly manner. The content analysis typically proceeds through four stages: coding the data, identifying themes, organizing codes and themes, and describing and interpreting the findings (Yıldırım & Şimşek, 2008: 243).

Coding was carried out during the interviews based on participants' responses, ensuring anonymity by not using their real names for ethical reasons. Transcripts from the interviews were then analyzed using the descriptive content analysis method. Content analysis, widely employed in the social sciences, is a systematic technique wherein words in a text are summarized with smaller content categories through coding according to specific rules. It allows for inferences about the message conveyed in texts by determining the existence, meanings, and relationships of certain concepts (Büyüköztürk et al., 2018).

The data analysis in this study followed several steps. Initially, audio recordings and documents from the interviews were transferred to a computer environment. Subsequently, these documents were examined, divided into meaningful sections using the MAXQDA 12 program, and coded to capture the conceptual meaning of each section. Commonalities between codes were identified, and the data were categorized accordingly. Finally, the codes and themes were interpreted by establishing relationships between the findings and by including direct quotations from the interviews. Table 2, provided as a sample, summarizes the data analysis process, with raw data representing participants' verbatim answers. The sub-themes were derived from participants' responses, and superordinate themes were formed by combining these sub-themes (Aydın, 2021: 145-146).

Table 2. Example of Data Analysis Process

Themes	Sub Themes	Raw Data	Researcher's Comment
Question: You said that machines can do more work with technology, what happens or will happen to people who are unemployed in this situation? How do you prepare for this situation?			
Upon the completion of the Industry 4.0 transformation, what potential impacts and outcomes does this transformation foresee on the current structure of the labor force?	The expected possible impact of Industry 4.0 transformation on labour force planning.	*As a person, I am constantly doing research on the subject and trying to improve myself. Our business is in the same mindset with me. We believe that we should work well in this period and follow technological developments closely. Only in this way can we catch up with the changing world.*	The participant notes that due to the Industry 4.0 transformation, machines are currently capable of performing more tasks than in the past, and anticipates this trend to escalate in the future. In response, the participant emphasizes the necessity for workforce and organizational development to keep pace with the evolving world. Furthermore, the participant highlights alignment with the institution's shared perspective on this matter.

In the initial stage of data analysis, all information obtained from participants' responses underwent a comprehensive review. Following this, MAXQDA 12 data analysis programs were utilized for coding the data. The coding process in qualitative research is pivotal for concept development using available data (Corbin & Strauss, 2008: 62) and is considered a crucial stage in processing raw data. Three fundamental approaches in determining codes, as outlined in the literature, were considered (Aydın, 2021: 148):

- Codings emerging after data collection.
- Comparison of codings emerging before data collection and their alignment with the collected data.
- The amalgamation of codings established before data collection and those emerging after data collection.

This study adopted the third approach. Before the analysis phase, specific codes were established based on literature pertaining to Industry 4.0, employment, and the labor force. Throughout the analysis, new codes were introduced, taking participants' responses into consideration.

Interviews were cataloged in Word format by assigning a numerical identifier to each participant, avoiding the use of names. These files were then uploaded to MAXQDA 12 programs with corresponding numerical names. Sub-codes were created for each document, and main codes were determined based on these sub-codes. The researcher refrained from making additions or comments during the coding process.

To evaluate the reliability of the codes generated within the study, the same codings were executed on the relevant programs three times at specific intervals. Minor differences were observed between the initial and second coding. After addressing these differences, the codings were uploaded for the third time, revealing no disparities between the second and third coding. Similar codes were then consolidated into a more comprehensive framework, yielding thematic outcomes. Throughout this stage, the codes and main codes established in the relevant programs were revisited.

Throughout the study, the above-mentioned issues were thoroughly addressed. The determination of the number of interviews adhered to the principle of "reaching data saturation," a rule applied in the semi-structured interview method. Data saturation occurs when acquiring new data becomes challenging, and interviews start to repeat. In this study, saturation was perceived after the 20th interview, confirmed through four control interviews. No new data emerged, affirming saturation, resulting in a total of 24 interviews. The saturation point, indicating the absence of novel data, was verified during control interviews, leading to the conclusion of the interview phase.

In the subsequent phase of the research, the findings were elucidated by associating themes with the research questions. The results documenting and substantiating these connections were conveyed through direct quotations. In the final segment of the analysis phase, the research findings' intended conveyance was expounded upon. Utilizing participants' responses, data such as themes and sample cases were elucidated and categorized.

FINDINGS

Numerous researchers have delved into the transformations instigated by Industry 4.0 and its components within industrial organizations, fueling curiosity and speculation. A comprehensive literature review and insightful face-to-face interviews conducted in the research revealed three prevailing perspectives on the nexus between Industry 4.0 and employment.

Path 1. The Optimistic View

Starting with the first perspective, the optimistic stance, the supporters of this view argue that technological advancements will enhance employment conditions and create new job opportunities. Rejecting the idea that machines will lead to unemployment, they draw parallels with historical industrial revolutions. For example, during the first industrial revolution, although labor-intensive jobs decreased, the advent of steam energy spawned new industries like railways, subsequently generating employment. Advocates of the optimistic view assert that a similar pattern will unfold during the transition from Industry 3.0 to 4.0, introducing novel technologies and employment opportunities (Koca, 2018; Aksoy, 2017; Fırat & Fırat, 2017; Lorenz et al., 2015; Castells, 2008). Some participants align with this perspective, expressing beliefs that echo these sentiments:

> *"I don't think that the people whose jobs are taken by machines will be unemployed. These people can find other jobs, and new jobs may also emerge. Because in a way, every new technology also means new jobs (Participant 1-Germany)."*
>
> *"People think that they will lose their jobs when robots proliferate, but I think it will be the other way round (Participant 2-Poland)."*
>
> *"I think every new technology is a new business opportunity. For example, when a new technology comes to a factory, there will definitely be a need for an employee to use that machine. Because new technology means a new labour force (Participant 3-Germany)."*
>
> *"As technology develops, new business areas emerge (Participant 15-Poland)."*
>
> *"If people are unemployed, it will not be a problem as it will create a deficit in other sectors and other lines of business, and there will be a shift. I think everyone can find a job in time with the change between jobs (Participant 16-Germany)."*
>
> *"People who are unemployed will find other jobs. There have been jobs since humanity has existed, only the names of the jobs are changing. In the future, people will find jobs suitable for changing conditions (Participant 20-Singapore)."*

Researchers holding an optimistic view emphasize that the evolution of new business domains leads to the emergence of novel professions, fostering an upswing in employment. They argue that the heightened

productivity and profitability resulting from the integration of Industry 4.0 technologies will act as a safeguard against potential employment contractions (Wisskirchen et al., 2017; Becker & Stern, 2016). Some scholars posit that, despite an initial reduction in the workforce engaged in production upon the implementation of Industry 4.0 in organizations, new employment avenues will materialize in the medium to long term as sales surge following the completion of digital transformation (Kabaklarlı, 2016). Reflecting this perspective, a participant, anticipating that the Industry 4.0 era will amplify organizational profitability, and employment opportunities will burgeon, conveyed the following insights:

> *"Developing technology may cause some people to be unemployed, but people should improve themselves. People who can adapt to technology by improving themselves will not have problems in finding a job in the future and I think there will be enough jobs for everyone in the future (Participant 22-USA)."*

Researchers highlight the growing significance of technical and mental attributes in the upcoming era. The prevailing view is that the human factor will take center stage in production with Industry 4.0, necessitating an increased reliance on individuals' technical and mental skills to address complex tasks within automation systems (Kamber & Bolatan, 2019). Researchers focusing on the cognitive and mental attributes of the workforce argue that despite potential automation-induced reductions in employment or a deceleration in hiring, Industry 4.0 technologies are anticipated to generate numerous new jobs. In this vein, researchers suggest that while Industry 4.0 applications may initially lead to a reduction in employment, the subsequent adaptation of highly skilled personnel will result in the gradual re-employment of human labor due to the irreplaceable nature of technical, mental, emotional, and cognitive skills (Brinded, 2017; WEF, 2016). Participants attempting to elucidate this situation expressed thoughts such as:

> *"We will definitely need manpower for technical support and maintenance. Or as operators. Because I think machines will not be able to do all the work of human beings. I think there will definitely be a need for human labour, maintenance, repair, operator. These are jobs that only humans can do (Participant 21-Netherlands)."*

> *"Human is an indispensable element for production, I think it is not possible to completely remove humans from production. Although artificial intelligence is useful in many areas, I think the need for human will always exist (Participant 24-Malaysia)."*

In the upcoming era of digital transformation, a notable aspect regarding employment conditions is the perception that the unskilled labor force is more susceptible to changes in the labor market due to its easy replaceability by automation technology and robots (Thuc, 2017; EBSO, 2015). As production conditions undergo changes, it is expected that the demand for employees with diverse competencies will rise, while opportunities for employment in unskilled labor with low qualifications will decrease. The evolving industrial processes driven by new technologies are foreseen to automate simple, repetitive tasks traditionally associated

with low-skilled labor. Another perspective suggests that the growing utilization of software, connectivity, and analytics will elevate the demand for employees proficient in information technologies, such as mechatronics experts with software development and programming skills (Arucu, 2020; Gabaçlı & Uzunöz, 2017; Acemoglu, 2002). While losses may occur during the Industry 4.0 transition, long-term gains are projected to outweigh these losses (Genç, 2017). Participants emphasized that employees with the skills to adapt to technological transformations are less likely to face unemployment.

> *"In my opinion, cheap labour will no longer be attractive in the future because robots are coming. Then many people will be unemployed, but there will be new jobs. Therefore, people should adapt to the future. People who do not have the appropriate skills for new technologies may lose their jobs (Participant 1-Germany)."*

> *"With machines taking people's jobs, important people with good competences will not have problems, but the situation may be different for the so-called blue-collar workers (Participant 8-France)."*

> *"We have not yet reached the point where machines will take people's jobs, so the people who are unemployed are those who fail to work with machines. The important thing is that employees can adapt to the machines (Participant 9-Czechia)."*

> *"In the future, in my opinion, people who can work with machines or robots will be successful. Because they (robots) will be in our lives. Not only for production but in every aspect of life (Participant 10-France)."*

Another participant exemplified his/her thoughts on this issue as follows;

> *"Let me talk about my department (Human Resources). Firstly, we look at the technological ability of the person in recruitment. We can look at this as technological literacy. In other words, we need technologically qualified or technologically inclined labour force and I think this will be the case in the future (Participant 22-USA)".*

In this regard, participants underscored the crucial need for employees to continually enhance their skills, considering the evolving conditions of the labor force. They emphasized the idea that a qualified labor force, capable of adapting to changing conditions, is unlikely to encounter difficulties in securing employment in any period.

Path 2. The Pessimistic View

Contrarily, the pessimistic view anticipates a reduction in employment opportunities and an escalation of unemployment due to technological advancements. Researchers holding this viewpoint argue that, despite fostering economic growth through increased productivity and efficiency in capital-intensive production

processes and flexible management models, the corresponding rise in employment is not substantial (Akaev & Rudskoi, 2017; Çondur et al., 2016). The failure to observe significant changes in employment despite radical transformations in the production process with Industry 4.0 is identified as a primary factor contributing to this perspective. Researchers suggest that with Industry 4.0, economic growth will surge, yet unemployment will reach unprecedented levels (Yılmaz & Yılmaz, 2023: 23-24; Hepaktan & Şimşek, 2022: 80; Kureş & Şık, 2022). Some participants echoed sentiments aligning with this perspective in their responses.

> *"In the future, with artificial intelligence shaping technology, new generation products and solutions will be realised in the field of robotics. The need for human labour will decrease (Participant 15-Poland)."*

> *"As technology advances, machines can do the work of people. Thus, less manpower is needed (Participant 21 - Netherlands)."*

Kagermann et al. (2013), among researchers forecasting the potential impact of technological advancements on future unemployment rates, contend that more than half of the current jobs worldwide will be automated by smart systems within the next 20 years. According to their assertion, the labor force may witness a reduction of 250 thousand people over a 15-year period due to the effects of Industry 4.0. Another researcher, Wakefield (2015), suggests that robots have the capacity to replace human workers, leading to the displacement of individuals from their current jobs. He further claims that approximately 35% of the jobs in the UK today have the potential to be mechanized within the next two decades. Another research conducted in China, highlights that a factory, which previously employed 650 people for mobile phone production, now operates with only 60 employees and 60 robot arms across 10 production lines. This case illustrates how technological advancements, particularly in Industry 4.0, have significantly reduced the need for human labor in the factory (Javelosa, 2017). In light of these perspectives, some research participants shared their views, as illustrated in the following responses.

> *"When we establish a system equipped with Industry 4.0 technologies, we will hire fewer people. We are considering a more technological structure with new devices and machines. Then we will do the work with fewer people (Participant 5-Malaysia)."*

> *"Today, a product passes through the hands of 5 employees and reaches the customer. In the coming years, the number of employees needed will decrease as machines will take more place in production and same product can be produced with 1 or 2 employees (Participant 10-France)."*

> *"For example, the production of the engine part, which is the most important part of a vehicle, used to be done by combining manpower. But now the machine does most of the work. We only make corrections and inspections on the assembly line. 10 years ago, 3 people were doing this job, now 1 person is enough (Participant 14-Poland)."*

"Machines are also developing with technology. The work that was done by 5 people before is now done by 2 people and we do it better quality, faster and cheaper (Participant 8-France)."

Also Industry 4.0, has the potential to eliminate not only physical jobs but also intellectual jobs (Bonciu, 2017). New technologies in the Industry 4.0 era might act as substitutes rather than complements to human labor and another study highlights that jobs requiring social and cognitive skills are less susceptible to automation, while routine occupations are more likely to be automated (Frey & Osborne, 2013; Sachs & Kotlikoff, 2012). This suggests that computerization in labor markets may lead to a decrease in employment, especially in routine and intensive jobs. With the advent of Industry 4.0 technologies, there is a concern that this situation will lead to economies growing with new unemployed individuals (Ansal, 2016; Bowles, 2014; Brynjolfsson & McAfee, 2011). Thus, Harari (2018) predicts that one consequence of technological transformation in the 21st century will be a problem of "qualification" in terms of the labor force. He argues that, the changing labor force structure with technological transformation will result in unemployment for individuals who cannot prepare themselves for the conditions of the future or acquire the competencies demanded by new technologies. Some participants in the research share opinions aligning with this view mentioned in the literature.

"A great danger awaits humans. Robots - I mean machines - can replace humans. That means fewer people will be needed. People should be prepared for the future. The jobs we do should be jobs that machines cannot do (Participant 11-Malaysia)."

"Then competition comes into play. If there is more than one person who can do the same job, we prefer the most skilled or the best educated (Participant 7-Czechia)."

The Industry 4.0 transformation integrates labor-intensive activities with mechanized and robotic systems. This shift offers opportunities for qualified employees adept at technology, but it may replace lower-level jobs with technological systems. Despite new employment possibilities, challenges arise, potentially increasing unemployment within the current structure. The literature suggests that with Industry 4.0, the significance of unqualified labor force may diminish, making it increasingly difficult for unqualified individuals to secure employment. The rise of artificial intelligence and robots gradually replacing labor-intensive jobs is considered a tangible reality, not merely a prediction (Brunet-Thornton & Martinez, 2018; Bulut & Akçacı, 2017; Eğilmez, 2017).

Some researchers contend that the demand for unqualified labor may decline as Industry 4.0 emphasizes the need for qualified workers with advanced informatics skills to operate smart machines and analyze data (Kılıç & Atilla, 2023: 18). Concerns arise about how organizations will utilize their unqualified workforce in this era. Studies suggest that self-educated, qualified individuals who consistently update their knowledge may be less adversely affected by technological developments, while unqualified labor could face challenges in adapting to changing employment conditions (Ammirato et al., 2023: 9; Fırat & Fırat, 2017). Researchers recognize that individuals labeled as "skilled" and employed in the labor market reshaped by Industry 4.0 might eventually

face the impact of industrial transformation, yet they could still be among the least affected groups. A participant in the study provided insights into the importance of a qualified labor force in navigating evolving employment conditions.

> *"Humans will have to compete with robots in the future. Therefore, we have to work hard. I think well-educated and skilled people will be less affected by changes. They are always more advantageous in finding a job (Participant 13-Czechia)."*

In the Industry 4.0 era, the rise of highly automated factories, where machines outperform humans in efficiency, poses a threat to low-skilled occupations centered on repetitive tasks. Concerns arise that such jobs may become obsolete in the new era. Machines possess advantages like continuous operation without breaks, no need for healthcare, resistance to salary increases, and the ability to perform two independent tasks simultaneously with independent arms (Quiroz-Flores & Vega-Alvites, 2022; Sony & Mekoth, 2022; Spöttl & Windelband, 2021). In this context, the unskilled labor force is perceived to encounter challenges in securing a place in the emerging digital era, as highlighted by certain research participants.

> *"Sometimes people who cannot adapt to change cannot adapt to life. The world changes, they stay behind and get worse over time. Employees should also prepare themselves for change. We need to improve ourselves for the future (Participant 10-France)."*

> *"In the future, I think many people will be unemployed. No matter how well you do your job, you cannot do it as well as a robot. Robots do not make mistakes, do not get tired, do not take a meal break. Therefore, we should work for the development of the capacity we have (Participant 12-USA)."*

> *"People need to adapt to technology to prepare the current workforce for the future. People have to learn to work with new technology. This will be one of the most important issues in the future, some people will be unemployed because they cannot adapt to technology. They will try to find a place for themselves in different business lines or in different fields (Participant 15-Poland)."*

Path 3. The Neutral View

Another view regarding the influence of Industry 4.0 on employment conditions is neutral view. Unlike the optimistic or pessimistic stances, the neutral view indicates uncertainty about the future of labor and employment conditions, acknowledging that various factors will shape it. Advocates of this perspective contend that individual, organizational, national, and global policies will play a role in shaping future employment conditions, and the specific impact of technology remains undetermined. On this issue, Weyer et al. (2015) contend that the prevailing belief about widespread job loss in the future is countered by the potential increase in productivity and organizational performance through the advancement of digitalization technology in Industry 4.0. They argue that while the number of employees in production might decrease, the

technologies linked to Industry 4.0 will give rise to new and globally popular business lines. Also some researchers acknowledge the multifaceted nature of digital transformation, encompassing the disappearance of certain professions and the emergence of new ones (Pfeiffer, 2017). Some predict a future where robots replace both blue and white-collar labor forces but argue that this may not necessarily result in more job losses than the opportunities created by technology (Pew, 2014). In their study, Spöttl and Windelband (2021) highlight the uncertainty surrounding the future relationship between man and machine.

The use of technology is acknowledged as a significant factor contributing to unemployment due to changing production structures resulting from technological developments. Labor-saving technology enables more efficient processes with fewer human workers. However, it's crucial to recognize that advanced technology can also increase demand for goods, leading to enhanced quality, standards, and productivity. This situation may create new markets and job opportunities. To address potential structural unemployment, solutions involve creating new products and job opportunities through technological developments, coupled with measures to employ the labor force in other fields and provide training in new areas (Küsbeci & Tekin, 2021; Nergiz & Barutcu, 2020; Şendoğdu, 2020; Serinikli, 2018; Gabaçlı & Uzunöz, 2017; Kökocak et al., 2015). A participant in the study echoed a similar sentiment, emphasizing the need for a comprehensive approach to address the complexities of technology's impact on employment.

> *"We are facing important questions in terms of industry. Some problems await businesses in the future. Because as machines increase, people's jobs are changing. Some of my friends say that new jobs will emerge with new technologies. Some say there will be more unemployed in the future. To be honest, I am also confused about this. I think both will happen. Those who cannot adapt to new conditions will be unemployed, those who prepare themselves for new situations will not lose their jobs. Maybe they will even find better jobs (Participant 3-Germany)."*

Also, according to Dhanpat et al. (2020), human resources professionals play a crucial role as strategic business partners and talent managers in organizations, particularly in effectively managing human resources to capitalize on the opportunities presented by Industry 4.0 and mitigate potential challenges. The changing labor structure in the new era is predicted to involve a decrease in the demand for labor in traditional manufacturing industries and an increase in the demand for labor in high-tech industries (Oanh et al., 2021). A participant in the study expressed a similar perspective, highlighting the importance of human resources professionals in navigating the workforce through the changes brought about by Industry 4.0.

> *"We can say that as machines increase, people's jobs will decrease, but on the other hand, new lines of work are emerging with new technology. I think we can protect the existing labour force and our children against unemployment by looking at the changing world. It is inevitable that there will be unemployed people in the future, but governments should train human resources and our children to work with new technologies and machines. Governments can do this in*

schools. This situation can be managed by training human resources units in enterprises (Participant 19-Germany)."

The participants' responses, forming the foundation of this study, present varied opinions on future employment conditions. The preceding sections have detailed the perspectives of the research participants on the subject, with the acquired findings presented alongside existing literature. Consequently, the assessment and presentation of the findings, organized based on the research question, along with the conclusions derived from the study's results, are integrated into the next section for readers' examination and evaluation. Until now, the study's findings have been elucidated in light of information gleaned from existing literature. It is evident that while participants' opinions align with certain aspects of the literature, they also diverge on various points. This disparity will be collectively presented in the final section of the study, where this information will be synthesized, and the study's outcomes will be comprehensively discussed.

CONCLUSIONS AND DISCUSSIONS

As a conclusion, the study reveals varying participant opinions on future employment conditions. Participants emphasize the anticipated impact of technology on the evolving employment landscape. Notably, technological advancements are expected to reshape employment, echoing the transformations observed since the first industrial revolution. Some participants foresee technology leading to unemployment as machines replace human jobs, aligning with existing literature.

Certain participants hold the perspective that employment conditions will not necessarily lead to increased unemployment. They contend that historical industrial revolutions have similarly transformed employment conditions, emphasizing the adaptability of the workforce. Those affected by changing conditions, according to this view, can explore job opportunities in different sectors and emerging business lines facilitated by technology—a viewpoint supported by existing literature.

The literature and participants in the research present diverse opinions on the relationship between Industry 4.0 and employment. Some argue for increased unemployment due to changing conditions, countered by the creation of new business lines through new technologies. Others express uncertainty about predicting future employment conditions. While there are minor inconsistencies with the literature, the overall findings of the study align with and mostly support existing results in this field.

In summary, the answers given by the participants within the scope of this study revealed their thoughts on the relationship between Industry 4.0 and employment and labour force. While some of the answers given by the participants support the literature, some of them have revealed incompatible results with the literature.

The study also provides guiding recommendations on the policies that can be implemented regarding the labour market and employment conditions of the future, which are expected to change with the impact of Industry 4.0. In this context, the main general recommendations that can be implemented in order to adapt to the changing production world of the future are as follows:

- Increasing the technical capacity of the existing labour force,
- Determination of business lines suitable for new technology,
- Preparation of the labour force according to the changing conditions of the future,
- Training new generations in accordance with new technologies and changing labour force structure,
- The labour force should be withdrawn from unqualified fields and the ground should be prepared for the development of qualified labour force in the field of global economy,
- Existing business models need to be adapted to the new era,
- It can be listed as the need to develop technology-oriented education policies.

Apart from these, the following specific suggestions can be made by considering the unique answers of some participants:

- **Emphasis on Technical and Mental Characteristics of Employees;** It is predicted that many jobs will be transferred to robots and artificial intelligence applications with the Industry 4.0 revolution, but this transfer process will contribute to the specialisation of people and encourage people to use technical and mental power rather than physical power. In this context, it is thought that the human factor will come to the centre of production with Industry 4.0 in the coming years, and it is stated that the technical and mental skills of human beings will be needed more than before to solve complex tasks in automation systems. Although Industry 4.0 technologies cause a more automated production, a decrease in the number of workers or a slowdown in recruitment, they create the expectation of creating many new jobs. There is always a high probability that technological developments will change the ways of working today, but this should be taken into account in the design of the future workforce, as it is not possible for machines and robots to imitate unique human skills such as creativity, emotional intelligence and cognitive skills in case of human-machine harmony.

- **Preparing the Ground for the Development of Qualified Labour Force by Withdrawing the Labour Force from Unqualified Areas**; Unqualified labour force is seen as the group that is more prone to change in the labour market since it can be easily changed by automation technology and robots. With the changing production conditions, employment opportunities for unskilled labour with low qualifications will decrease while the demand for employees with different competencies is expected to increase. With the development of technology, it is inevitable that automation will take over the simple, repetitive tasks of low-skilled labour. In this context, withdrawing the labour force from unqualified fields and preparing the ground for the development of qualified labour force in the field of global economy will increase employment opportunities.

- **The necessity of updating occupations according to changing conditions;** Some of the participants of the study emphasised that people who do not adapt their jobs to the new era or who cannot adapt to technology will be unemployed in the future. In this context, the participants state that

some jobs will come to the fore and some jobs will disappear, but unemployed people will find other jobs. The view on which this idea is based is that the concept of work has always existed since the existence of mankind, and the changing conditions over time have only changed the names of the jobs. With the change in the shape of technology, the labour force will have to adapt to change and the professions they work in will differentiate. For this reason, those who formulate and implement labour force policies in the country should focus on this fact. Authorities should seek answers to questions such as "How will the work structure of the future be in a changing world?", "What are the professions of the future?".

- **Preparing for Changing Competitive Conditions;** One of the factors expected to change in the Industry 4.0 period is competition. Some of the study participants stated that Industry 4.0 will deeply affect national and international competition conditions, and that organisations that lag behind in adapting to changing conditions will also lag behind in terms of competition. Therefore, preparing the labour force for the future is of great importance in order to catch up with the changing world or to be a pioneer in change. In this context, increasing the adaptation capacity of the workforce and equipping them with the qualifications to work with new technologies can provide organisations with competitive advantage.

- **Importance of Education Policies;** Education is the factor that plays the key role in increasing the capacity of the existing labour force and preparing the labour force of the future. Because, only through education activities, new generations can be prepared for the future, the current workforce can be adapted to technological developments, organisations can increase their competitiveness and countries can implement labour policies. In a sense, the concept of education constitutes the intersection set of all these possibilities and it does not seem possible to achieve these gains without education. In this context, countries should not ignore technological developments while formulating their education policies. Countries should have an education policy for technology and policies should be developed not only for schools but also for organisations to increase their capacities.

- **Increasing the Labour Force's Technology Aptitude**; In order to prepare the existing labour force for the future, people need to adapt to technology and in this context, the labour force needs to learn to work with new technologies. Because the changing world makes this situation compulsory. In the production conditions of the future, in a production environment equipped with technological infrastructure and equipment, it does not seem possible to accommodate employees who cannot adapt to technology and who are far away from it. For this reason, there is a possibility that some people may be unemployed in the future because they cannot adapt to technology. In this context, the biggest role falls to governments and ministries. The adaptation of a country's labour force to changing technological conditions will be possible with national policies rather than individual initiatives on an organisational scale.

- **Increasing the Workforce's Susceptibility to Change**; Another important point for the preparation of the existing workforce for the future is that the employees of the new era should consist of people who are ready for the future, who are not worried about change and who aim to increase their individual skills. Because it is not enough to improve the capacity of the existing labour force only through training, employees must also be mentally prepared for changing conditions. The labour force, which is hesitant to change by nature, needs to be informed about the Industry 4.0 revolution and should be mentally convinced and prepared for the future.

- **Developing Human Resources Management Capacity**; Human resources professionals play an important role as strategic business partners and talent managers in organisations and ensure that human resources are managed effectively in order to take advantage of the opportunities of Industry 4.0 or to reduce the challenges that may be encountered. In this context, human resources departments are engaged in activities such as increasing the capacity of the existing workforce, bringing new talents to the workforce, preparing the workforce for the conditions of the future, and increasing employees' susceptibility to technology and change. In order for human resources departments to contribute to the organisation and to continue their activities smoothly, they need to get rid of their traditional origins and follow the industrial transformation. In this context, organisations need to continuously update their human resources planning, direct their human resources to different job opportunities that will emerge in the light of new developments, and make an effort towards training and development in this regard.

SUGGESTIONS

In this study, general and specific suggestions are presented about the relationship of Industry 4.0 revolution with employment conditions and labour market. While some of the suggestions are applicable on an organisational scale, some of them have the possibility of being implemented on a national or international scale. In this context, it is aimed to contribute to the policy development and planning activities in order to prepare for the employment conditions of the future, to predict the expected changes in the labour market under the influence of technological developments and to adapt to the changing competition conditions under the influence of the Industry 4.0 revolution.

The suggestions put forward as a result of the study are also applicable for our country (Türkiye). Türkiye, which is not among the 25 countries in the study sample, will be able to be among these countries in the coming years and adapt to the changing industrial conditions with Industry 4.0 only by determining what the future will bring. In this context, in our country, it should be aimed to increase scientific studies and training activities on the subject, to update today's professions according to changing conditions, to improve human resources management capacity, to increase the existing labour force's susceptibility to technology and change, and to make the existing labour force suitable for employment in qualified fields. In this way, our country will

be able to adapt to changing industrial conditions and perhaps be among the pioneer countries of the next industrial revolution.

Ethical Disclosure

This article has complied with the journal writing rules, publication principles, research and publication ethics rules, and journal ethics rules. Responsibility for any violations that may arise regarding the article belongs to the author(s). Ethics committee approval for the article was given by Süleyman Demirel University Ethics Committee decision dated 05.07.2021. It was taken with the decision numbered E-87432956-050.99-78861.

Declaration of Author's Contribution

In this research, the contribution rate of the first author is %50 and the second authors contribution is %50.

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