# Digital Human Resource Management: A Mix Method to Identifying Technical Components

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*Abstract*— **The sustainability of digital human resources management in organizations requires attention to soft behavioral components as the basis of human interaction. This means respecting the human dignity of employees and fulfilling the responsibilities of managers towards internal customers and external audiences. The purpose of this research is to identifying technology-oriented infrastructure, required processes and the role of employees in digital human resources management with a practical and developmental approach. Therefore, in the first stage of the research, after studying the scientific documents and determining the framework of the qualitative research method and the techniques used in it, a semi-structured interview was conducted with the experts. The opinions collected from 14 human resource managers or digital transformation project managers in the studied companies were analyzed by thematic analysis method. The main components were identified as intelligent technology, intelligent knowledge management, organizational learning, employee participation and the development of employee intelligence. In the second stage, the fuzzy DEMATEL method was used to determine the weight of the indicators and build a causal network, in which the organizational learning component has the highest priority over other components.**

*Keywords— Digital Age; Digital Human Resource Management; Technical Components; Knowledge-Based Companies.*

## I. INTRODUCTION

Today, the introduction of digital technologies in business and organizations is inevitable and digital transformation is created in businesses when information technology tools lead to changing the business structure and patterns and making people and processes smarter. In this research, digitization means benefiting from the data collected by the smart tools of the digital era, which help managers and employees as decision support systems. Digital transformation and digitization in organizations have started since the early 1975s .Over the years, there has been a significant transformation in accounting and current activities and transaction processing. This transformation has been further augmented by advancements in computational and analytical capabilities, machine learning, big data, artificial intelligence, the Internet of Things, and cloud computing. All these technologies are playing a vital role in modern organizations, enabling them to enhance their efficiency and productivity[1]. Digital transformation is the process of continuous change resulting from digital technology in organizations and society using the convergence of hard (technology) and soft (people and businesses) forces[2]. The proliferation of digitalization in businesses and society has resulted in an abundance of big data that can be utilized to foster business growth and development[3]. As a result, digitization is the first step in the digital transformation that must happen before digitalization. Digitalization is also necessary before digital transformation, which leads to the smartness of businesses and their functions. Digital transformation is the process of using digital technologies to create or modify existing business processes, culture, and employee and customer experiences to meet changing business and market needs[4]. Regarding the digitization of organizations, Matt and Hess emphasize that "If the utilization of information technology tools results in a transformation of the business structure, enhancement of employee intelligence, and a shift in value creation patterns, which is then followed by a change in business processes, we can say that we have successfully taken steps towards achieving digital transformation." [5].

With the advent of mobile internet, cloud computing, big data, and artificial intelligence, organizational lifestyles have changed, which heralds a paradigm shift in how we interact with the world around us. Organizations are currently facing the ongoing reality of digital transformation, which is no longer a distant future. In this ever-increasing transformation, human resource management, which is a central component of organizational management, is undergoing deep changes due to digitalization [6]. Therefore, the nature of human resource management is changing, such as the formation of the digital workplace, digital human resource management processes, and digital employee services, which require the implementation of platforms and technical influencing factors on digital human resource management[7]. New digital tools in the support layer collect data that is used in the value-creation process, and the value-creation layer uses digital tools as a basis and companion for co-creation and decision-making[8]. Among the features of the digital age that lead to transformation in organizational processes, especially human resource management processes, the main features can be mentioned in the Fig.1.

Technological advances are increasing day by day and can be the basis of the fourth industrial revolution, but in the meantime, the level of readiness of the human resources of organizations to achieve these advances is unclear[10]. Organizations that emphasize deep technology integration, key stakeholder participation, increased skills development, and employee leadership in this era can respond to the goal of sustainable development of human resource management

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planning in digital transformation. On the other hand, there are various challenges and obstacles that organizations face when implementing digital human resources management. These include difficulty in predicting the skill needs of employees and their cultural identity, resistance to change, the need for initial and continuous investments, maintaining a balance between human and digital resources, technological uncertainty, and adapting to specific needs such as customization of processes[11]. It has made the researcher think that in addition to dealing with technology-oriented factors in digital human resources management, she should pay special attention and study to the role of employees and their characteristics in the digital age. The introduction of artificial intelligence in organizational processes can form a new paradigm in human resource management, and this paradigm requires more reflection on the psychological issues of employees, teams, their level of dynamism and participation, and examining the complex interactions between artificial intelligence and human resource management[12]. Deep digital transformations and their entry into organizational processes, platforms, and conditions, and many changes in organizational processes, especially human resource processes, are underway. Given the recent changes in working conditions, it is crucial to consider the impact on workspaces, employee mindset, and other relevant factors in the context of digital human resources management. Therefore, it is important to prioritize the implementation of smart and digital human resources management solutions, while also identifying and addressing the challenges, gaps, and concerns that may arise, so this research aims to identify and prioritize technical variables affecting digital human resource management by surveying experts active in knowledge-based companies. The technical dimension of digital human resources management describes the functions of technology and the processes required for digital human resources management, which studies all related concepts such as hardware, software, data, standards, and information technology laws as the first influential point in human resource management systems. The technical aspect is the benefit of data-oriented technologies and capabilities to achieve the goals and tasks of human resource management in the organization.

## II. RESEARCH BACKGROUND

In the following, to make the concepts more transparent, some of the current researches are mentioned:
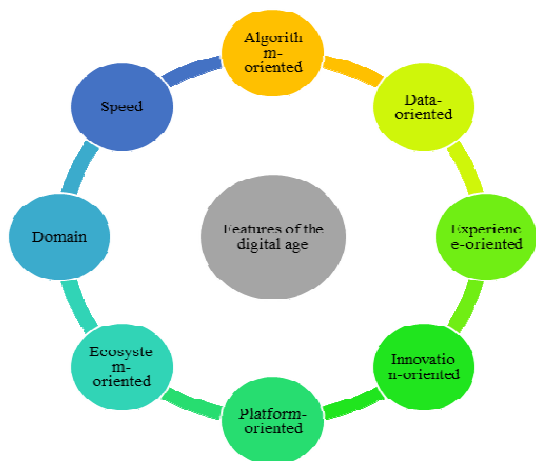


Fig. 1.  Features of the digital age (Venkatraman, 2018) [9]

In his research, Koshki Jahromi (2022) interviewed 21 human resource managers and specialists of technology companies to identify the competencies of human resource managers in the digital age during the outbreak of the Coronavirus. The results of this research show that digital human resources significantly contribute to the development of businesses in the digital field. Also, for this form of development, human resource managers need to equip themselves with soft and hard competencies in this field. Changes should be made in the subsystems of human resources management, including recruitment, performance evaluation, development, and service compensation so that the coordinated model of digital human resources management can be established and developed in the best way[13].

To design a structural model for digital transformation in the human resource management systems of knowledge-based companies, Rastgar et al. (1401) conducted research and interviews with a practical and developmental goal. After identifying the three comprehensive categories of management, process, and human resources, based on the analysis, they concluded that the strategies of organizational architecture, human resources management, technology-oriented, employee participation, and human resources architecture have the most influence in structural model design as well as on knowledge management and organizational learning. And making human resources smart can be achieved by paying attention to these two factors[14].

Al-kharabsheh et al. (2023) in their research to identify factors affecting digital human resources management, concluded that employee motivation and performance management are one of the most important factors in the advancement of digitalization of organizational processes, especially human resource management processes. It has been identified that increasing motivation leads to improved performance and, as a result, reduces resistance and increases employee cooperation to keep pace with digital developments in the organization[15].

In their 2021 study titled "The Relationship between Digital Organizational Culture, Capabilities, Organizational Readiness, and Innovation: A Survey of Small and Medium-Sized Organizations Active in the Digital Economy", Yoosefi et al. investigated 227 ICT companies in Pakistan. The study found that digital organizational culture and capabilities are important factors that determine an organization's readiness and willingness to accept digital innovation. So that these factors provide a base for promoting digital innovation with the mediating role of organizational readiness and focusing on the integration and mobilization of human resources and technological resources[16].

Melo & Machado (2018) pointed out in their book that technological developments have increasingly affected various aspects of society. Management procedures and practices have faced many changes under the influence of technology. In parallel with the use of new technologies to achieve a high level of quality and productivity, human analysis, electronic recruitment, development, and digital training were also proposed, which move in the direction of identifying talents and motivating people[17].

Bondarouk et al. (2017) acknowledged in their research that despite many reviews and research on electronic human

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resource management, there is still no comprehensive understanding of the factors affecting the adoption and consequences of digital platform-based human resource management. This article examines the changes in technology, organization, and human resources in four decades to address the necessity of changes and revisions in the goals of electronic human resources management in line with the strategic change of human resources and human resources supply[18].

## III. DIGITAL HUMAN RESOURCE MANAGEMENT PLATFORMS

One of the biggest challenges in human resource management in the digital age is the need to collect a large amount of data and analyze this data, especially in the recruitment and hiring processes to performance evaluation, from service compensation to human resources planning and maintenance. Organizations in the digital age use organizational network analysis and interaction analytics to better understand employee behaviors to take advantage of business opportunities. Also, in this era, we are facing an increase in automation and smart functions. Intelligent automation is a combination of artificial intelligence that includes natural language processing, machine learning, image processing, and automation that collects and combines a large amount of information, and after automating processes and workflows to help learn and adapt to different situations and changing contexts[19]. Considering the changes in organizational needs, especially despite the performance changes in the field of human resources management, current policies and laws, and regulations are outdated and insufficient. The emergence of new issues such as online platforms, and freelancers, which leads to the implementation of new methods of human resource management, requires challenging and fundamental changes in labor laws, platforms, and labor and organization relations[20].

New digital technologies have changed the structure and nature of the organization, the lifestyle of employees, and working conditions. Especially in human resource management, for example, the traditional methods of recruitment and selection are no longer useful, and access to millions of job candidates at the same time is possible only with the presence of modern information technologies, and this system becomes more efficient and effective[21]. In the digital world, human resource management requires the following elements to take advantage of new technologies:

*Smart workforce*: The fourth and fifth generations are the smart human resources of organizations, they have made daily life more attractive by using devices and software connected to the Internet and web-based programs and services. Therefore, human resource management to interact with these smart employees should benefit from a re-analysis of systems, mobile-based applications, behavioral economics estimation, and other requirements.

*Smart work processes*: Considering the huge digital transformation in the nature of work, to implement this new flow, work processes must be integrated towards becoming smart. Manual and paperwork must give way to digital tools and media, and these new processes also require new work information and communication.

*Smart Support Management*: This includes planning, implementing, and using digital technologies to support human resource management activities such as payroll, compensation and benefits, performance management, training and development, and other human resource systems.

*Updated HR technology*: There have been significant changes in conventional HR and its paradigm has shifted towards digitalization and smartness. Human resource management should adapt and update its operations through a network-based system and social and mobile media capabilities [22].

Based on the extensive survey they conducted in their research, Ulrich and his colleagues identified six competencies for the success of HR professionals in Generation 4.0 as shown in Table I. They also emphasized the competence of digital managers and leaders[23].

Smart human resource managers and other business managers are facing two serious challenges in digital transformation. First, the effective management of the organization's human resources and workforce, which can help managers and employees to take advantage of smart thinking, culture, change management style, organization, and smart leadership, and in this way, have a fundamental role in guiding and managing the change of this direction. Secondly, it is a scenario created by human resources management to improve the employees' experience through collaboration and interaction with the organization. This is achieved by implementing new smart platforms and applications, as well as innovative approaches to human resources management that enhance the provision of services to the employees. Organizations must prioritize creating a positive experience for their employees, who are the first audience of a brand. Employees play a crucial role in crafting an attractive experience for customers, and they must have a clear understanding of what constitutes a unique experience when interacting with the organization. If employees lack this understanding and are not provided with a pleasant experience, they will be unable to create a similar experience for customers [24].

## IV. RESEARCH METHOD

To begin the research process, we will first study the theoretical topics related to our research purpose. This will include reviewing and studying specialized books, articles, websites, and other library documents. We will conceptualize categories such as human resources management, digital transformation, digital employees, digital human resources

TABLE I. COMPETENCIES OF HR PROFESSIONALS IN THE DIGITAL AGE[23]

| | |
|---|---|
| **The developer** | The ability to align individual competencies with the organization's culture and competencies; |
| **Capable of changing** | The ability to dynamize, activate, and maintain the organization in times of change; |
| **creative** | Ability to develop talent, drive performance, and create employer brand; |
| **strategist** | The ability to interact with employees and managers, use business language, and create guidelines and agendas for the organization's strategies to achieve the goals and internal and external needs of the organization's stakeholders; |
| **Trustworthy activist** | The ability to build trust through establishing relationships, developing business intelligence, and promoting professional ethics in the organization |
| **Technology fan** | Ability to use technology and digital tools in human resource management functions; |

management, and decision support systems. Additionally, we will write the internal and external background information related to the subject under study. To identify digital functions and connect them to human resource management systems, data extracted from interviews with digital human resource management experts and qualitative methods have been used. In this regard, during the semi-structured interview process, elites were asked questions about their experiences and studies, focusing on digital human resource management and the factors affecting this category. The statistical population of the current research includes experts in smart information systems with executive experience in the fields of human resources. These experts are selected in a purposeful way using the snowball method. In the selection of experts, education (at least a master's degree), work experience (at least 10 years in the relevant field), and authorship of books and articles were considered. Sampling experts and conducting interviews continued until theoretical saturation. In the first stage, to present the architecture of smart human resources management, qualitative analysis of the theme was used in the analysis of research data.

After the implementation of the interviews, the researcher did the following: 1- searching for meanings and patterns 2- identifying primary codes 3- searching for themes 4- retrieving themes 5- defining and naming themes, and 6- preparation of the final report to finalize the main and sub-categories of the work output under the title of Max Map was taken from the MAXQDA software. To increase the acceptability of the interview results, the review method was used by the participants, and the Holsti coefficient was also used to evaluate the reliability of the qualitative part. For this purpose, the text of the conducted interviews was coded in two stages. Then the Percentage of Agreement Observation was calculated. In the next step, the fuzzy demater ial method is used to weigh the indicators and draw the causal network. The fuzzy DEMATEL method (Decision Making Trial and Evaluation Laboratory) is one of the accepted decision-making methods in an uncertain environment, which is used to design and analyze structural models and causal relationships. By benefiting from triangular fuzzy numbers, Dimatel deals with managing uncertain and incomplete information while choosing the criteria of the research subject and dealing with the ambiguities of human decisions. In addition, taking into account the independence between the criteria, it suggests a method that identifies the mutual relationships between the criteria and the cause-and-effect components of the system [25] and [26]. Fuzzy Delphi method has been used to reach expert consensus based on fuzzy logic calculations and fuzzy inference. In general, the Delphi technique is based on the respondents' point of view. It is a process based on the structure of group communication, which is used in cases where incomplete and uncertain knowledge is available with the aim of reaching a group consensus among experts.

## V. DATA ANALYSIS

### A. Demographic characteristics of research experts

In Table II, the demographic characteristics of the experts participating in the interview were human resource managers who were aware of digital transformation, intelligence, and change management, presented separately by gender, age, education, and work experience. Among the experts consulted in this project are Mr. Dr. Farshad Aslani, Vice President of Human Resources of AP Company, Mr. Dr. Makan Sepehri, Director of Digital Transformation of Middle East Bank, Dr. Farshad Haj Alian, Director of Human Resources of Namino Holding and a member of the university's academic staff, Mrs. Dr. Elaha Azizi, Director The agent of Aindeh and Modares managers, Mrs. Engineer Taib, human resources consultant in technology-oriented companies, Mrs. Engineer Saidi, the human resources manager of Saman Bank Electronic Payment Company, Mr. Engineer Saleh Nejad, the executive director of Asiatech Company, etc.

### B. Findings of the qualitative part of the theme analysis method

This stage includes two stages of reviewing refining and forming sub-themes.

The first stage includes a review at the level of coding summaries. In the second step, the validity of sub-themes in relation to the data set is considered. At this stage, the researcher reached constructive themes. In the following, the analyzed themes are presented:

#### 1) Smart Technology
Fig.2 shows the output of the MAXQDA software with the theme of smart technology:

#### 2) Knowledge Management
Fig.3 shows the output of the MAXQDA software with the theme of knowledge management.

#### 3) Organizational learning
Fig.4 shows the output of the MAXQDA software with the theme of organizational learning:

#### 4) Employee Participation
Fig.5 shows the output of MAXQDA software with the theme of employee participation:

#### 5) Development and Smartening of Employees
Fig.6 shows the output of MAXQDA software with the theme of employee development and employee smartening:

### C. Creating a network of cause and effect relationships using the fuzzy Dematel method

After summarizing the survey of experts using the pairing matrix, the fuzzy direct correlation matrix was normalized . Then, the fuzzy matrix of the complete relationship was calculated and de-fuzzified, and finally, after determining the threshold, using it, the sum of the rows and columns was obtained to identify the relationships between the components. The obtained results, according to D and R, the

TABLE II. DEMOGRAPHIC CHARACTERISTICS OF EXPERTS

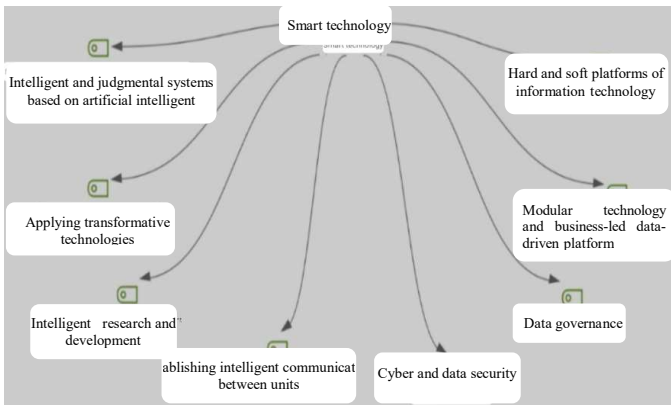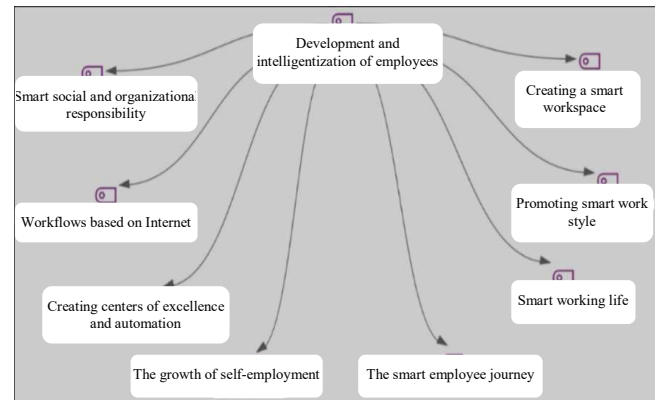| Demographic characteristics | | Frequency | percentage |
|---|---|---|---|
| gender | Man | 8 | 59% |
| | Female | 6 | 41% |
| Age | Less than 35 years | 2 | 14% |
| | 35 to 45 years | 7 | 50% |
| | 45 years and more | 5 | 36% |
| education | Masters | 3 | 21% |
| | P.H.D | 11 | 79% |
| Work Experience | 10 to 20 years | 2 | 14% |
| | Over 20 years old | 12 | 86% |
| | Total | 14 | 100% |

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Fig. 2. Output of MAXQDA software
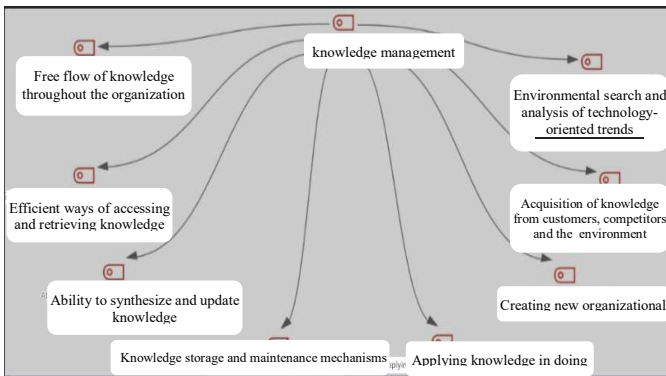


Fig. 3. Output of MAXQDA software



Fig. 4. Output of MAXQDA software
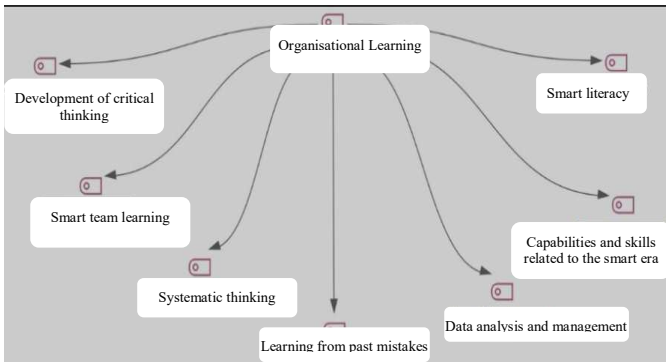


Fig. 5. Output of MAXQDA software
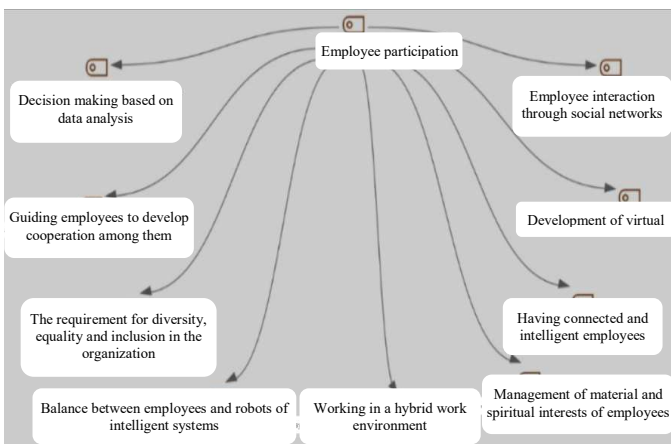


Fig. 6. Output of MAXQDA software

values of D+R and D-R are obtained, which respectively indicate the degree of interaction and the influence of the factors. The final output is shown in Table III.

Diagram 1 also shows the pattern of significant relationships. This pattern is in the form of a chart where the longitudinal axis is D + R values and the transverse axis is based on D - R. The position and relationships of each factor are determined by a point with coordinates (D + R, D - R) in the device.

### 1) Interpretation of the results

The degree of influence of variables: the sum of the elements of the column (R) for each factor indicates the degree of influence of that factor on other factors of the system. The horizontal vector (D + R) shows the degree of influential and permeable of the desired factors in the system. In other words, the higher the D + R-value of an agent, the more interaction that agent has with other system agents. In this research, criteria 5, 1, 2, 4, and 3 are respectively from the highest to the lowest degree of influence. The vertical vector (DR) shows the influence power of each factor. In general, if D - R is positive, the variable is considered a causal variable, and if it is negative, it is considered an effect. In this research, criteria 1, 2, 3, 4, and 5 are considered as an effect. Criterion 1 has the most influence, and Criterion 2, 3, 4, and 5 are in the next degrees of influential. In this research, Criterion 3 has the most influence, and Criterion 5, 4, 2, and 1 are in the next degrees of permeable.

## VI. DISCUSSION & CONCLUSION

In this research, by benefiting from books, articles, and lectures and using the opinions of 14 experts and after analyzing the content of the conducted interviews, the indicators of the problem were explained. Acceptability and confirmability criteria were used to measure the validity of reporting and analysis of interview data, and the retest reliability method was used to calculate reliability. The fuzzy Delphi method has been used for the final confirmation of the indicators. The components of digital human resources management in terms of technical dimension include 5 main variables, the details of each of which can be considered as follows:

### A. Smart technology:

In today's era, the introduction of digital technologies in the organization is inevitable. These technologies exist in two groups, maintenance and transformative technology.

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Maintenance technologies are technologies whose application at any point in time in organizations does not lead to gaining a competitive advantage, but their absence can disrupt the organization's daily activities. On the other hand, transformative technologies are those technologies whose absence does not necessarily disrupt the performance of an organization, but their presence can lead to a competitive advantage. In this research, transformative technologies are among smart technologies the most important of which are the Internet of Things, artificial intelligence, virtual and augmented reality, gamification, big data, blockchain, robotic applications, and other smart technologies [27].

The explanatory indicators of digital technology are summarized in the Fig.7.

*B. Knowledge management:*

Knowledge management is the facilitation of great transformation in organizations, and digital analytical tools can be considered as its most important drivers. Establishing a connection between multiple human intelligences and artificial intelligence leads to multiple, dynamic, scenario-oriented, and prospective inferences. Knowledge management is always based on data, information, and mental and organizational precedents. But from the point of view of smartening, knowledge management focuses more on the future and advanced horizons by using analytical tools. The knowledge-based nature of digital transformation and its highly dynamic and variable characteristics require changes in the type of attitude and facilitation of knowledge management. There should be a free flow of knowledge in organizations and the ability to acquire, store, combine, update, and disseminate knowledge throughout the organization should be strengthened. The Fig.8 shows the explanatory indicators of knowledge management.

*C. Organizational learning:*

It is a process that leads to the improvement of actions through better knowledge and more effective cognition. On this basis, the internal ability of an organization to create, enrich, and apply knowledge to work better than competitors in terms of performance and competitiveness is called organizational learning capacity. It is known as one of the basic and necessary tools for the operations and performance of organizations and shows the ability of an organization to implement appropriate management actions, structures, and procedures that facilitate and encourage the learning process. Organizational learning shows the organization's capacity to develop its abilities to acquire new information and transform that information into knowledge. The ability of organizational learning will help organizations to introduce new developments in their business and thus gain a new attitude. To the extent that organizations increase their learning capacity, they create better organizational strategies. Organizational learning is the most important way to improve long-term performance and in the near future, only an organization can claim superiority that can use the abilities, commitment, and learning capacity of people at all levels in a favorable way. In organizational learning, the members of the organization learn by identifying and correcting mistakes and their causes and preparing to deal with possible future changes and incidents. The explanatory indicators of organizational learning are shown in the Fig 9.

TABLE III. THE FINAL OUTPUT OF THE FUZZY DEMATEL MATRIX

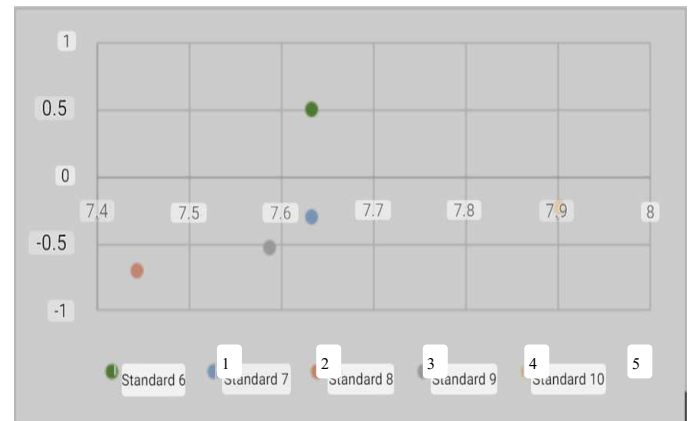| Components | R | D | D+R | D-R |
|---|---|---|---|---|
| Smart technology | 3.571 | 4.062 | 7.633 | 0.491 |
| Smart Knowledge Management | 3.971 | 3.661 | 7.633 | -0.31 |
| Organizational Learning | 4.079 | 3.365 | 7.444 | -0.714 |
| Employee participation | 4.061 | 3.527 | 7.588 | -0.534 |
| Development of employee smartening | 4.069 | 3.834 | 7.902 | -0.235 |



Diagram 1. Pattern of relationships

*D. Employee participation:*

Employee participation in smart business depends on the digital work experience that an employee has had during his journey with the organization and somehow lived with it. Maintaining and surviving organizations in the highly competitive environment in the market requires creating an experience for employees that delights them and leads to their maximum participation. Improving employee experience can be achieved through various ways. One way is to create a personalized work environment that caters to the individual needs of each employee. Another way is to leverage platforms, processes, and tools that can help tap into the potential of talented workers both within and outside the organization. Additionally, it is important to provide a space that allows employees to focus on creating value for themselves and the organization. Finally, tools such as data analysis and visualization can be provided to automate current activities and make decision-making more effective for employees. Therefore, each organizational department is expected to play its role to succeed in the path of digital transformation, and all stakeholders, from operational employees to senior managers, participate in making the organization and its processes smarter. The explanatory indicators of employee participation are presented in the Fig.10.

*E. Development and smartening of employees:*

Although in the review of the literature on the subject, common aspects of employee participation and their smartening can be seen, but in the current research, employee smartening deals with deep conceptualization regarding the concepts of digital work and workspace and digital lifestyle. In the application of new technologies, extensive

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coordination between people, processes, tools, and technology-based platforms should be established. Employee smartening happens when they start the digital journey and get the right experiences. In this journey, the employees first understand the organizational experience in the sense of aligning individual goals with organizational goals, effective performance without friction, and human-centeredness of space and the physical environment. Then they experience a work experience that includes attractive work, clear responsibilities and appropriate resources, work-life balance, motivation, and opportunities for growth and learning. Finally, they understand the social experience that includes teamwork and innovation, the sense of belonging to the organization and distinguishing hardworking employees. The indicators explaining the development and smartening of employees are presented in the Fig.11.

Hebraken and Bundark believe that technology plays an important role in the processes related to human resource management and should be considered as a basic requirement and a platform that affects other activities of the organization[28]. On the other hand, paying attention to the field of smart human beings and soft managerial and organizational aspects [29], along with its technology-oriented aspects, can be a suitable platform for the multifaceted, holistic, integrated, and technology-oriented evolution of the organization[30], [31].
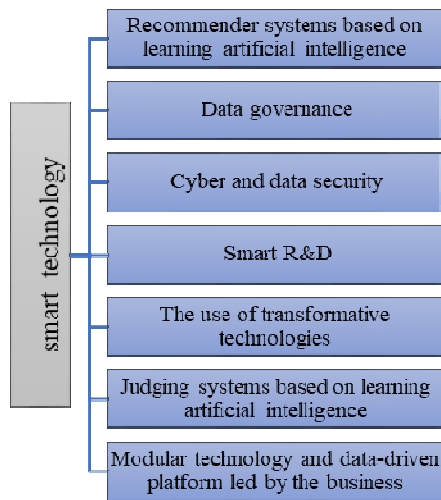
Based on the study conducted, it can be suggested to the audience of this research in knowledge-based companies that in any executive activity in the field of digital transformation, they
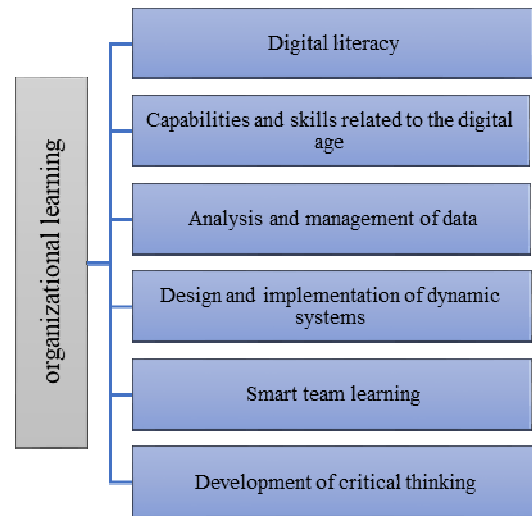
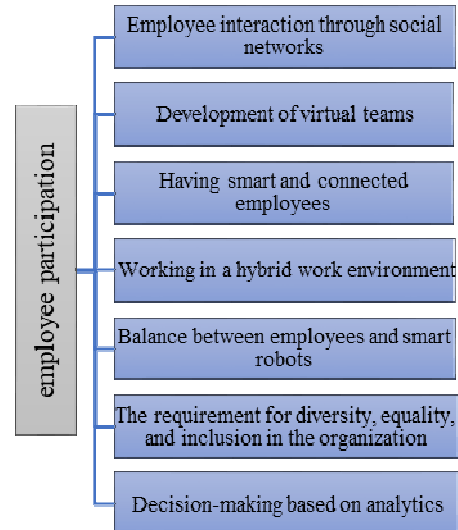Fig. 9. Descriptive indicators of organizational learning
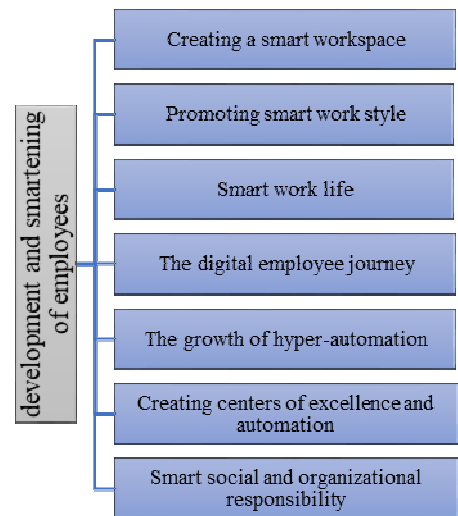
Fig. 10. Indicators explaining employee participation

Fig. 7. Descriptive indicators of smart technology

Fig. 8. Explanatory indicators of knowledge management

Fig. 11. Indicators explaining the development and smartening of employees

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should first draw a precise and clear vision of their organization and not focus solely on the technical aspects of the subject. Because knowledge-based companies, according to their characteristics and as an economic and social phenomenon, are like an urban utopia consisting of philosophers and wise men, so paying attention to the human aspects of the issue is as important as the technical aspects. Considering the various functions and systems of human resources management, it is recommended to carry out separate research with the specialized benefit of the experts of each of the technical factors to verify and identify the comprehensive factors in each of the dimensions. It is also suggested that the factors identified in this research should be investigated in other organizations, such as government organizations, private companies, and public non-governmental organizations, to identify the digital human resources management model suitable for each of them. Also, in all qualitative researches, the values and thoughts of the experts and the research group can influence the way of gathering materials, interviewing and analyzing the obtained results. Although an attempt was made in this research to cover this weakness with control methods such as the fuzzy Delphi method and the return of opinions and the aggregation of experts' opinions, unfortunately, the limitations of qualitative methods and soft systems such as fuzzy cognitive mapping cannot be completely eliminated.

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