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Research Article

Explaining the Effective Factors on Digital Transformation Strategies in the Telecom Industry of Iran Using the Delphi Method

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Digital transformation is emerging as the main driver of widespread change in the world around us. The communications industry is at the forefront of this transformation, both as an industry that is witnessing extensive changes in its market environment and as a major driver of digitalization around the world. The use of technology and the achievements of information technology alone will not lead to digital transformation in the organization because digital transformation is something of a strategy. The purpose of the research is exploratory and the type of applied research. The research method is data analysis, integrated, quantitative, and qualitative. The Delphi method has been used to identify the indicators, and the fuzzy DANP technique has been used to prioritize and affect. In this research, components and indicators of digital evolution have been extracted using qualitative content analysis. For this purpose, library studies including books and articles, structured interviews with industry experts, the content presented in domestic and foreign conferences and lectures, and reference models provided by leading organizations in the industry were used. The components and indicators were approved by the Delphi method, and the relationship between the components and the indicators and their ranking was done using the DANP (DEMTEL-ANP (DANP)) method. In the end, 6 components and 20 indicators were finalized and identified as indicators of high importance.

1. Introduction

The global connectivity trends provide people with access to all of their business and social activities, from simple instant messaging to global currency transactions on demand. To have a successful digital transformation program today, a business must have a proper understanding of digital strategy and operating model and must be actively involved in the increasingly competitive digital market in the face of increasing digital change instead of a passive approach. In recent years, powerful forces such as technical capabilities, legal requirements, population changes, and the economy have made significant changes to the business model [1].

The telecom industry has experienced rapid changes worldwide as the share of data and the revenue of operators increases. Although indexes of Iran are still lower than the rest of the world in terms of mobile and mobile bandwidth development, it has grown rapidly in recent years, providing a great opportunity for current and potential new entrants. It has created the largest markets in the Middle East. With the implementation of global technology in Iran and the improvement of the domestic situation in this country, Iran with the potential and significant increase in the share of ICT in GDP can be on the verge of a significant digital transformation. Years ago, a country like Iran was far from the latest technology in the world. Today, when we talk about digital technologies, the previous gap from the first level of the world is no longer conceivable. According to statistics published in 2018, the Internet penetration rate in the world was 53%, while the same figure in the country was about 70%

[2]. Emerging general technologies such as the latest mobile phones and hardware are also available shortly after the global markets in Iran. The existing frameworks for implementing a digital transformation are too general, essentially as a set of best practices and recommendations, rather than a systematic approach that presents the conventional structure and concerns. Based on this, we can say that digital strategy is equal to business strategy in terms of scope and scale of impact, and the basic principles that were set at the beginning are also true for it, but in terms of speed of responding to environmental changes, how to design and implement it is completely different. However, research shows that many organizations have not yet realized this and have not taken serious action. According to a 2016 Harvard Business Review survey, only 47% of organizations have formally formulated a business strategy for their digital future, which is a matter of great concern.

In view of the above, many studies should be done to prepare an accurate and complete model for the development of information technology strategies in the telecom industry transformation program and put on the agenda. The main problem is the lack of a custom and indigenous framework for categorizing and identifying areas that need to be changed and vital telecommunication systems to implement digital transformation in various dimensions and themes in this field. However, "digitalization" has found its way into corporate strategy, and the need for digital transformation is well understood. We do not fully understand how to implement this change. The key question is how to take advantage of digital developments in the telecom industry in Iran. And what can be the model of digital transformation strategies in the telecom industry?

1.1. Theoretical Gap. According to the mentioned cases and the current state of the art, numerous studies are required to be accomplished for the preparation and implementation of an accurate and complete model for the development of a digital transformation strategy in the telecom industry. The existing frameworks present the conventional structure and concerns with a general collection of the best practices and recommendations, rather than a systematic approach to implementation of the digital transformation model. The main problem is due to the lack of a custom and indigenous framework to categorize and identify the main vital and dynamically changing areas in telecom systems to implement digital transformation in various dimensions and criteria. However, "digitalization" has found its way into corporate strategy, and the need for digital transformation is well understood. But the method of implementing this change is not trivial [3]

The key question is how to take advantage of digital developments in the telecom industry in Iran. And how can develop a model of digital transformation strategies for the Iranian telecom industry?

1.2. Innovation in Research. Digital transformation is a new topic that has been seriously discussed in the world since 2014. Most of the articles in this field have been published since 2017, and the course of studies in this field is increasing rapidly. It is still a novel topic in the field of telecom research in Iran. The subject literature of digital transformation is under exploration by Iranian researchers, and according to the authors' knowledge and review, no deep studies have been conducted in this field. On the other side, the global and international research have focused on theoretical aspects.

In this study, the categories, indicators, and components in the field of digital transformation have been analyzed, and based on the Delphi approach, the main components of the Iranian telecom industry are selected and prioritized. Various data gathering methods including prepared questionnaires and semistructured interviews and surveys are employed by the experts who had deep experience and knowledge about the conditions and infrastructure of the telecom industry in the country. The expert's points of view and opinions were employed for the successful implementation of digital transformation in the telecom industry. In the next step, the fuzzy DANP technique has been applied to impacts, effectiveness, prioritization, and ranking of indicators and components. According to our knowledge, this approach has never been done in any study in any country. In addition, the approach and its results can be considered as a basement for continuing further studies in the field of digital transformation for other industries and for other countries.

1.3. Importance and Necessity of Research. Digital transformation refers to the use of digital technologies in all parts of a business, especially changing the way they process and transfer value to customers. On the other hand, digital transformation is a cultural change that constantly challenges the current state of the organization and the past experiences of personnel. Digital technology is improving the performance of companies based on the approach of process change. Digital is now a vital subject for an organization to survive in a competitive world [4].

The five main drivers of digital transformation are listed as follows:

(i) Strong communication with customers
(ii) Business agility
(iii) Operational efficiency and cost reduction
(iv) Innovation in services
(v) Growth opportunities

In this dynamic era where fast change is a default paradigm and the situation where competitors cannot be clearly analyzed and new technologies are emerging every moment, the classical process, analysis, planning, and implementation are not very efficient. In many industries and companies, digital technologies have revolutionized business strategies, processes, and capabilities. In this condition, organizations must use novel management methods to coordinate and overcome these changes. The approach used for this purpose is to develop a digital strategy that is used to integrate all interactions and actions and take advantage of digital developments in the organization [3]

A digital strategy helps the organization to align all digital activities in the organization with business goals. Therefore, all activities performed in the organization are related to digital strategy. To have this strategy, all the dimensions of the business that are being changed by transformational technologies must be examined and analyzed. This means that new decisions must be made in order to maximize the opportunities created in addition to reducing the risks posed by these technologies.

Given this, we can express that digital strategy is equal to business strategy in terms of scope and scale of impact, and the basic principles that were set at the beginning are also true for it, but in terms of speed of response to environmental changes, formulation process and implementation are completely different.

To survive in this digital age, organizations must develop and implement such a digital strategy and insure themselves against the probable risks of rapid changes in this age. The main factors that lead today's organizations to adopt digital strategy are as follows [5]:

(i) The importance of innovation in products and services
(ii) The need to provide digital services
(iii) Rapid advances in the digital environment
(iv) Risk optimization
(v) Increase control
(vi) Customer experience management

Digitalization will emerge dramatically in the coming decade with features that are different from the past, and organizations operating in the industry must be prepared to take advantage of the vast changes that are taking place in consumers lifestyles, the activities of companies, and economic models.

The increasing availability of technologies such as mobile phones, artificial intelligence, cloud computing, analytics, and platforms has dramatically changed the way we live, work, and communicate, a phenomenon known as the Fourth Industrial Revolution. The telecom industry is playing an important role in shaping this digital revolution [5].

The telecom ecosystem has provided the basic requirements, such as access, internal communications, and applications, needed to achieve such a revolution. Much of the potential value of digitalization across industries around the world in the next decade will go to the telecom industry, which provides the essential infrastructure, applications, and productivity improvement programs in many sectors [6].

In the following, in Section 2, the theoretical foundations and research literature are examined. Section 3 describes the research method and how the data were collected. Section 4 analyzes the data, and Section 5 presents the research conclusions.

2. Literature Review

2.1. Theoretical Foundations. Information and communication technology is considered to be one of the key technologies in developed countries, so countries with smart industrial policies for the development of the information technology industry will be able to take advantage of it as one of the largest and fastest-growing industries in the world. It is obvious that the share of each country in the benefits of this industry is directly related to the native capacity of that country in this field [7]. The main features of the telecom industry are as follows.

The trend of dominant technologies in this industry is very fast, and it can even be said that after the software industry, it is the highest speed of technology development in this industry. These approaches require extensive research and strong technological support [8]. The key importance of this industry is not limited to its economic dimensions. The high level of technological capabilities and close communication between this industry and other industries also leads to technology overflow in technical fields [9]. Due to the growing population of the world and the need to provide a clean environment, today, developed countries by developing programs tailored to this need to move industries and factories that pollute the environment from the interior and turn to green industries. The telecom industry is also one of the green industries due to its characteristics and use of superior technology, which has provided the growing need of the world for a wide market [10]. If the information exchange space and the use of information and communication technology are valued in a country, its direct impact can be seen with the proper functioning and security of the information space in daily life. It is noteworthy that all the officials of the country have many security concerns. The strength of the work is the existence of these concerns and the belief of all top officials to use internal power to address these concerns, which should be institutionalized by providing long-term decisions to localize the industry [11]. The value chain of the telecom industry is shown in Figure 1.

The goal of the Fourth Industrial Revolution is to create and use technologies that are capable of doing things beyond human ability. It is the core of the creation of many new industries and the survival of many of them and is possible only with a complete digital transformation [13]. Digital transformation is a set of profound transformations and changes in organizations and businesses, which allow them to take advantage of the opportunities arising from the development and promotion of technology and the resulting changes in their development in human societies and use them in line with strategies and priorities. Benefit yourself [14]. The exact definition of the term digitization is very important because it is easily confused and is often confused with the term digitization in the literature. Gartner defines digitization as "the process of changing from analog to digital" [15]. Digitization is defined as follows: "The use of digital technologies to change a business model and provide new opportunities to generate revenue and value is the process of transition to a digital business" [15]. Digitization goes beyond a technical process of encrypting all types of information in digital format.

2.2. Previous Study. Aghimin et al. [16] examined the critical success factors for digital participation of construction organizations. Construction companies in developing

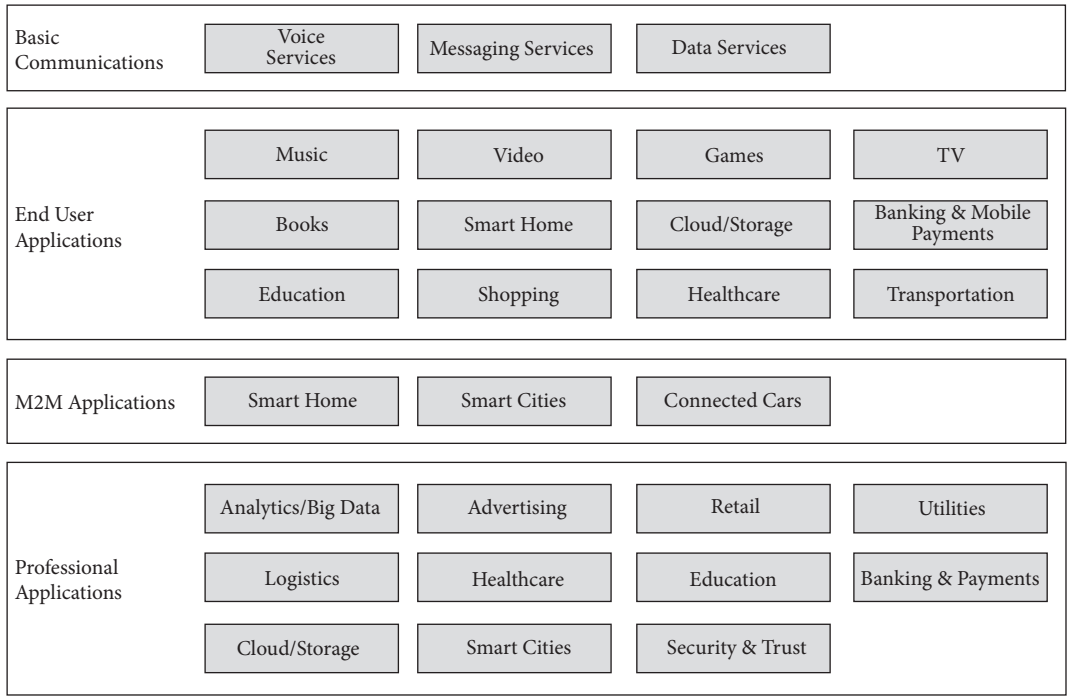

Figure 1: Telecom value chain [12].

countries are lagging behind in the use of digital technology. Hence, poor project delivery and technology backlog are still evident. In this study, the findings show that trust in digital partners, top management support, and digital partner selection are the three main success factors for participation. Other factors that can be considered along with these main factors are creating a common goal, a long-term commitment, effective communication, appropriate conflict resolution and structure, as well as continuous digital training, workshops, and meetings [16]. Melovic et al. [17] examine the impact of digital transformation and digital marketing on brand promotion, positioning, and e-commerce in Montenegro. By defining the impact of this concept on brand promotion and positioning, that is, the development of e-commerce through e-services, this paper examines the digital transformation methods in Montenegro influencing the use of digital marketing in business. The results show that a number of factors determine the methods of companies using digital marketing and the use of different levels of influence, including the implementation period, the ability of responsible people to use it, understanding the cost-effectiveness of digital marketing, and measurable. In addition, the results show that the more a company trusts the use of digital marketing in its business, the more important its impact on brand promotion and positioning [17]. Bossdekis and Cardaras [18] examine the digital evolution of local government: a case study from Greece. Digital transformation in the public sector means new ways of working with stakeholders, creating new service delivery frameworks, and creating new forms of relationships. This paper presents a research based on empirical data with the aim of identifying the current situation and potential for digital transformation in municipalities. This is a case study from Greece, and based on the results, it identifies the challenges of using digital technologies in the public sector, especially in local governments, and concludes on the steps taken for digital transformation [18]. Gabonenko et al. [19] examine value management in the digital transformation strategies of Russian companies and the Fourth Industrial Revolution. The purpose of this work is to define the impact of management on values on the transformation processes of digital business and then determine what digital or conventional technologies are used to increase the value of companies. This study has proven that as the digital transformation progresses and value-driven management makes digital transformation more efficient, the use of different digital technologies in management is worthwhile [19]. Reference [20] evaluated the critical success factors for smart mobility systems (SM) and assesses its current application level for smart city development using Nigeria as a case study. This study is based on a mixed-method approach (Delphi and quantitative survey). The study revealed seven critical success factors of smart mobility. Furthermore, the findings of this study revealed that factors such as sustainable, innovative, and safe transportation system; availability of ICT infrastructure; local accessibility of transportation infrastructure; and availability of transportation infrastructure (bike, cycling, and pedestrian mobility facilities) are the most significant smart mobility success factors. Also, a good consensus was achieved for all the success factors. Tjebane et al. [21] identified organizational factors imperative to driving the adoption of AI in construction organizations. The study uses a quantitative survey approach to collect data through snowball sampling of industry experts on factors associated with AI adoption. With data from 169 respondents, exploratory factor analysis was adopted to identify

critical organizational factors to ease AI adoption in the industry. Furthermore, confirmatory factor analysis was employed to demonstrate the relationship among the constructs. Ikuabe et al. [22] assessed the performance measurement indicators that influence the uptake of cyber-physical systems (CPS) for facilities management (FM) functions. Using a structured questionnaire, data were collected from built environment professionals in the Gauteng province of South Africa. Data collected was analyzed using a five-stage process that includes data reliability and validity, descriptive statistics, establishing a difference in groups' opinion, principal component analysis, and model testing and fit statistics for confirmatory factor analysis. Shojaei et al. [23] identified and described how enabling factors are implemented by large UK contractor firms to transform their organizations using building information modelling (BIM) for projects. For this purpose, a qualitative exploratory approach is employed in this paper. Data are gathered through 42 semistructured interviews with professionals in strategic and management roles in construction companies in the UK, followed by case studies of five leading main contractor companies selected to provide examples of how they implemented the identified enablers.

2.3. Research Gap. In this research, due to adopting a multifaceted approach to designing the digital transformation strategy model and trying to explain the phenomenon in the real context, the positivist paradigm has been used. Scientific limits and methods are considered. The ontology of the positivist paradigm of claiming to rely on universal laws and facts explains social phenomena. In methodology, too, positivism is based on observable and testable facts. This theory is rooted in the ideas of Newton, Descartes, and Kent, who established and validated positivism as a means of understanding the social world. Also, due to the use of in-depth interviews and case studies, the interpretive paradigm has been used to describe more precisely the meaning that has occurred. In the interpretive paradigm, the relationship between variables cannot be expressed by numbers and is a space for expression, explanation, and interpretation. Interpretive ontology sees the world as a structure composed of multiple realities and works naturally from the inductive approach (except to the whole) to explain the phenomenon under study. Communication with the interview of the listeners is subjective and does not rely solely on receiving the subjects' mindsets through questionnaires, and on the contrary, the positivist paradigm that seeks to understand the phenomenon from an external perspective understands the phenomenon from an internal perspective. The inner gaze identifies multiple realities because the views of all actors are considered and valued equally. Figure 2 shows the steps of conducting research. Also, Table 1 categorized the previous studies.

3. Research Methodology

Since quantitative and qualitative research methods alone cannot study the complexities of the issues and constituent elements, in this study, a combination of these approaches (mixed research) has been used. This study aims to identify the components and indicators needed to develop a digital transformation strategy in the telecom industry in accordance with the needs and current situation of the country and provide a local model for it. The time frame of this research is from the summer of 2020 to the fall of 2020. The spatial scope of this research is the Ministry of Information Technology and its affiliated organizations in Tehran. The objectives of this research are to identify the dimensions and main components of digital transformation in the telecom industry and to determine the priority and weight of the main components of digital transformation in the telecom industry in Iran.

3.1. Qualitative Content Analysis. This phase began with the initial collection of information and the development of the concept and the collection of information in a round trip in order to find resources to answer the research question. In the coding process, the raw information is regularly transformed into units for accurately describing the properties of the content, during which the research text is reviewed, listened to, or read, and the number (code) of each category according to the coding instruction and enters in the tab. The next step involves inferring the specified themes or categories and their properties. In this stage of the research, the inference is derived from the data, and the meanings derived from the data are reconstructed. The activities of this section include the properties and dimensions of the classes, determining the relationships between the classes, clarifying the patterns, and testing the classes against all the data. In open coding, the analysis process, the concepts identified, and their characteristics and dimensions are discovered in the data [6]. In other words, in this type of coding, the concepts within the interviews and the documents are classified based on the connection with similar topics. It forms the primary categories of information about the phenomenon under study by segmenting the information. "Concepts" are the basic units or microanalysis because it is from the mental imagery and conceptualization of data that theory is formed, not from the actual data itself [24]. Categories are more abstract and show a higher level of comparison with concepts. They are produced through the same analytical process of making comparisons to highlight similarities and differences, which are used at a lower level to produce the concepts used.

The statistical population of this study includes two categories of academic experts and industrial experts as follows:

(i) Academic experts: faculty professors and PhD researchers have articles and books in the field (information technology, strategy, and digital transformation)

(ii) Students and graduates: educated in management (information technology and industry), engineering (computer, information technology, and industry), and related fields

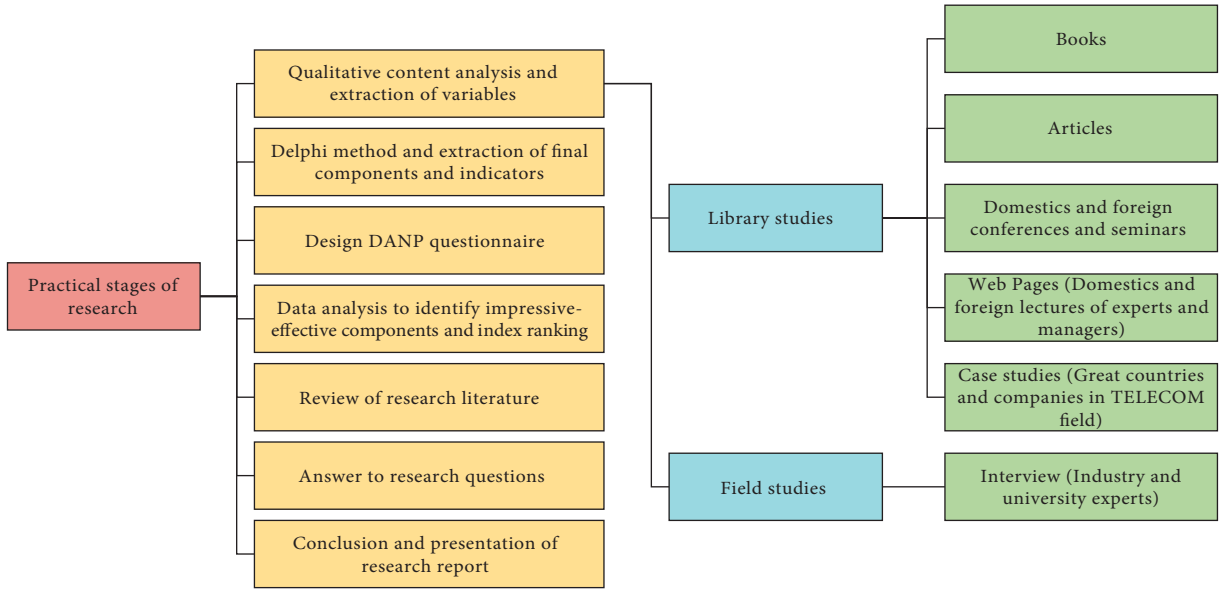

Figure 2: The research conceptual model.

Table 1: Categorized studies.

Authors	Goal	Application	Key factor
Aghmin et al. [16]	Examined critical success	Construction organization	TrustTop management support digital partner
Melovic et al. [17]	Examined impact of digital transformation	Digital marketing on brand promotion	E-commerce e-service
Bossdekis and Cardanas [18]	Examined digital evaluation of local government	Digital transformation in the public sector	Service delivery
Gabonenko et al. [19]	Examined value management in the digital transformation strategies	Russian companies	Digital business conventional technologies
Okafar et al. [20]	Evaluated the critical success factor	Smart mobility system	Sustainable innovative safe transportation system availability of ICT

(iii) Industry experts: senior and middle managers and consultants in the field of telecom and information technology managers with at least 5 years of work experience in the field of information technology

The sampling method in the qualitative part will be purposeful or judgmental. The concept of targeted sampling and snowball is used in qualitative research, and it means that the scanner selects people and study place because it can be effective in understanding the research problem and the central phenomenon of the study.

3.1.1. DANP. A fuzzy approach is used to deal with the uncertainty and ambiguity in respondents' verbal expressions. Since, in most decisions, the elements interact with each other and there are relationships and interdependencies between decision options and decision criteria and one of the goals of most research is to prioritize and identify complex interactions between them, the network analysis method (ANP) is a good method. Each cluster of criteria has the same effect, if according to the results obtained from the Demetel technique, there are different degrees of effectiveness between the criteria and, consequently, between the clusters consisting of criteria. Therefore, to solve this problem, the network analysis method (ANP) based on the DEMATEL technique, which is called DANP, has been used.

3.2. Delphi Method. The questions of the first questionnaire are in fact the same identified indicators or factors. The results showed that the experts have a common understanding of the subject and questions of the questionnaire, which indicates the validity of the questionnaire structure. In this study, based on the amount of skewness and skewness of the data, we have examined the normality of the data and the table below presents the skewness and skewness of the first questionnaire. As can be seen, the statistic values for the skewness and elongation index are as follows (2 and 2, respectively), so it is possible to accept the normality of the data related to each question and confirm the reliability of the questionnaire. The average of experts' opinions is used to identify important indicators. In other words, indicators or questions whose average value of expert opinions is greater than 3.5 are known as important and effective indicators, and indicators with questions for which the average value of expert opinions is less than this amount are considered as

ineffective or insignificant indicators are known. The purpose of realization is only to identify important and effective indicators. Therefore, in the research, insignificant indicators are eliminated.

At this stage, first, the questionnaires distributed among the experts were collected. After collecting the questionnaires, 14 questionnaires were returned out of 20 distributed questionnaires. Due to the size of the file, the completed questionnaires of the experts were refused one by one. After collecting the completed questionnaires of the first round, which was 14 questionnaires, the aggregation and the average opinions of experts are calculated, and based on the opinions of experts and the average opinions of experts, the analysis is performed. Table 2 summarizes the opinions of experts along with their mean and standard deviation.

Examination of the results of Delphi courses shows that the average of questions has increased and the standard deviation of questions has decreased, which indicates that the results have improved and the theoretical consensus of participants has increased. In the end, 20 indicators were finalized and identified as high-importance indicators.

3.3. Solution Approach

Step 1. Direct-influence matrix calculation: in this step, the respondents were asked to show the effect of criterion i on criterion j using Table 2. In this work, for data analysis, the opinions of $p = 8$ experts were gathered. For calculation of this matrix, triangular fuzzy number $\tilde{x}_{ij} = (l_{ij}, m_{ij}, u_{ij})$ is evaluated. To take into account the opinion of experts according to the following equation, an arithmetic mean is taken from them:

$$\tilde{z} = \frac{\tilde{x}^1 \oplus \tilde{x}^2 \oplus \tilde{x}^3 \oplus \ldots \oplus x^p}{p}. \tag{1}$$

where p is the number of experts; $\tilde{x}^1$, $\tilde{x}^2$, and $\tilde{x}^p$ are the pairwise comparison matrix of expert 1, expert 2, and expert p, respectively; and $\tilde{z}$ is a triangular fuzzy number in the form $\tilde{z}_{ij} = (l'_{ij}, m'_{ij}, u'_{ij})$.

Step 2. Direct-influence matrix normalization: to normalize the matrix obtained from the previous step, use the following formulas and call it the H matrix.

$$\begin{aligned} \tilde{H}_{ij} &= \frac{\tilde{z}_{ij}}{r} = \left(\frac{l'_{ij}}{r}, \frac{m'_{ij}}{r}, \frac{u'_{ij}}{r}\right) \\ &= \left(l''_{ij}, m''_{ij}, u''_{ij}\right), \end{aligned} \tag{2}$$

where r is obtained from the following relation:

$$r = \max_{1 \le i \le n}\left(\sum_{j=1}^{n} u'_{ij}, \sum_{i=1}^{n} u'_{ij}\right). \tag{3}$$

Step 3. Total-influential matrix (TC) calculation: after calculating the normal matrix, the fuzzy total-influential matrix is obtained according to formulas (4) to (7).

$$T = \lim_{k \longrightarrow +\infty}\left(\tilde{H}^1 \oplus \tilde{H}^2 \oplus \ldots \oplus \tilde{H}^k\right). \tag{4}$$

Each element is a fuzzy number $\tilde{t}_{ij} = (l^t_{ij}, m^t_{ij}, u^t_{ij})$ and is calculated by the following formulas:

$$\left[l^t_{ij}\right] = H_l \times \left(I - H_l\right)^{-1}, \tag{5}$$

$$\left[m^t_{ij}\right] = H_m \times \left(I - H_m\right)^{-1}, \tag{6}$$

$$\left[u^t_{ij}\right] = H_u \times \left(I - H_u\right)^{-1}, \tag{7}$$

where I matrix is the identity matrix and H_l, H_m, H_u. Each matrix is $n \times n$. Its constituents are the lower number, the middle number, and the upper number of the triangular fuzzy numbers of the H matrix.

Step 4. Calculate the total-influential matrix: first, the T_D matrix must be extracted from the total-influential matrix of the T_c criteria. Therefore, each T_D matrix element can be calculated as follows: if we know every T_D matrix element is t_{ij}, every t''_{ij} is obtained from the mean of every T^{ij}_C.

Step 5. Calculate the intensity and direction of the effect: according to equations (8) and (9), the r_i and c_j indices are calculated. The r_i index represents the sum of the i^{th} row, and the c_j index represents the sum of the j^{th} column of the T_c matrix for the corresponding dimension. Similarly, we calculate the values of the index $\tilde{R}$ and $\tilde{D}$. The R_i index represents the sum of the i^{th} row, and the C_j index represents the sum of the j^{th} column of the T_D matrix. To draw and analyze the chart, we need two indicators of impact intensity and effectiveness and direction of impact, which are obtained using D_i and R_j. For each $i = j$, we will have:

$$\begin{aligned} \tilde{D} &= \left(\tilde{D}_i\right)_{n \times 1} \\ &= \left[\sum_{j=1}^{n} \tilde{T}_{ij}\right]_{n \times 1}, \end{aligned} \tag{8}$$

$$\begin{aligned} \tilde{R} &= \left(\tilde{R}_i\right)_{1 \times n} \\ &= \left[\sum_{i=1}^{n} \tilde{T}_{ij}\right]_{1 \times n}, \end{aligned} \tag{9}$$

where $\tilde{D}$ and $\tilde{R}$ are $n \times 1$ and $1 \times n$ matrices, respectively.

The next step characterized the importance of the indicators $(\tilde{D}_i + \tilde{R}_i)$ and the relationship between criteria $(\tilde{D}_i - \tilde{R}_i)$. If $\tilde{D}_i - \tilde{R}_i > 0$; the relevant criterion is effective; and if $\tilde{D}_i - \tilde{R}_i < 0$, the relevant criterion is effective.

(i) $\tilde{D}_i + \tilde{R}_i$ = intensity of impact and effectiveness. (In other words, the higher the value of $\tilde{D}_i + \tilde{R}_j$, the more it interacts with other factors in the system.)

(ii) $\tilde{D}_i - \tilde{R}_i$ = direction of impact and effectiveness. (Thus, if $\tilde{D}_i - \tilde{R}_j > 0$, the relevant criterion is the cause, and if $\tilde{D}_i - \tilde{R}_j < 0$, the relevant criterion is the effect).

Table 2: Summarizing expert opinions.

Criteria	Code	Subcriteria	1	2	3	4	5	Ave 1	Ave 2	Ave 3	O_1	O_2	O_3
Customer	CU2	Customer experience	0	0	0	6	8	3.71	4.07	4.57	1.14	0.93	0.70
	CU3	Customer touch point	0	0	0	8	6	3.64	3.86	4.43	0.93	0.81	0.65
	CU4	Customer insight	0	0	4	5	5	3.64	3.64	4.07	1.29	0.99	0.87
Business model	BM1	Digitally modified system	0	0	1	5	8	4.36	4.43	4.50	0.74	0.67	0.63
	BM2	New digital business	0	0	1	7	6	4.21	4.29	4.36	0.78	0.76	0.72
Culture	CUL1	Train	0	0	0	4	10	4.71	4.71	4.71	0.36	0.28	0.28
	CUL2	Awareness	0	0	0	2	12	4.86	4.86	4.86	0.83	0.83	0.83
	CUL3	Organizational mindset	0	0	4	6	4	3.93	3.93	4.00	0.84	0.79	0.71
Workforce	WO1	Digital skills	0	0	0	6	8	4.43	4.43	4.57	0.83	0.83	0.80
	WO2	Mindset	0	0	0	8	6	4.36	4.36	4.43	0.63	0.63	0.60
	WO3	New talent and creativity	0	0	0	9	5	3.93	4.07	4.36	1.07	0.98	0.88
Governance	GO1	Leadership	0	0	2	4	8	4.36	4.36	4.43	0.84	0.84	0.79
	GO2	Policy	0	0	0	5	9	4.50	4.50	4.64	0.76	0.76	0.74
	GO3	Policies and rules and regulations	0	0	0	7	7	4.43	4.50	4.50	0.65	0.59	0.59
	GO4	Sustainability (environmental, social, and economic)	0	0	2	4	8	4.43	4.43	4.43	0.67	0.67	0.67
	GO5	Operation	0	0	0	6	8	4.57	4.57	4.57	0.93	0.71	0.71
	GO6	Agile	0	0	0	4	10	4.64	4.64	4.71	0.28	0.21	0.21
Technology	TEC1	Infrastructure (spatial technologies, virtualization, SDN/NFV, 5G, cloud, and quantum processors)	0	0	1	4	9	4.57	4.57	4.57	0.65	0.65	0.65
	TEC2	Applications (open architecture, microservices, etc.)	0	0	3	3	8	4.36	4.36	4.36	0.84	0.84	0.84
	TEC3	New technology trends (blockchain, IoT, 3D printers, UAVs, etc.); cognitive technologies (artificial intelligence, machine learning, robotics, and natural language processing); digital reality (augmented reality and virtual reality)	0	0	0	6	8	4.57	4.57	4.57	0.51	0.51	0.51
	TEC4	Security (identification tools, cyber security, etc.)	0	0	1	4	9	4.57	4.57	4.57	0.65	0.64	0.64
	TEC5	Data (data sovereignty, etc.)	0	0	0	12	2	3.57	3.57	4.14	0.65	0.65	0.65
	TEC6	Communication (social networks, etc.)	0	0	0	10	4	3.64	3.64	4.29	0.63	0.63	0.63

According to the calculated values, the values of $\widetilde{D}_i + \widetilde{R}_i$ and $\widetilde{D}_i - \widetilde{R}_i$ indexes for the criteria and also the indexes $\widetilde{D}_i + \widetilde{R}_i$ and $\widetilde{D}_i - \widetilde{R}_i$ are obtained for the dimensions, and then defuzzification is calculated using the following equation:

$$\text{defuzzy} = \frac{((u-l)+(m-l))}{3} + l. \tag{10}$$

Step 6. Normalization of the total-influential matrix ($\mathbf{T}_\mathbf{D}^{\propto}$): for normalization of total-influential matrix, the matrix is separated into three tables with lower, middle, and higher bounds. Then, for all bound, each element is divided by the sum of all elements in the row. After that, the matrix is transposed. In our use case, the results are shown in Table 3.

Step 7. Normalization of total-influential matrix $\mathbf{T}_\mathbf{C}^{\propto}$ criteria and formation of an unbalanced supermatrix: we normalize the T_c matrix using the sum of each row T_C^{ij} calculated according to the relevant dimension, and then in each T_C^{ij}, each element is divided by the sum of the elements of the corresponding row. By transposing the matrix $T_C^{\propto}$, an unbalanced supermatrix is obtained.

Step 8. Formation of a balanced supermatrix: in this step, we multiply the matrix $T_D^{\propto}$ by the matrix W. In this way, each $t_D^{\propto ij}$ is multiplied by W_{ij}.

Step 9. Limit the rhythmic supermatrix: according to equation (11), bring the rhythmic supermatrix to power (consecutive odd numbers) so that all the numbers in each row converge:

$$\lim_{Z\longrightarrow\infty}\left(W^{\propto l}\right)^Z, \lim_{Z\longrightarrow\infty}\left(W^{\propto m}\right)^Z, \lim_{Z\longrightarrow\infty}\left(W^{\propto u}\right)^Z. \tag{11}$$

Step 10. Calculation of Weights and Priorities: in this step, by using equation (10), an exact value is resulted from the limited supermatrix. The weight of main factors is calculated from the sum of its subfactors. The results are shown in Table 4.

4. Results

In this study, using literature review and research background, research factors and components were enumerated. The main factors include 6 main criteria and 20 subcriteria, which are listed in Table 5 of these factors.

According to steps 1 and 2, total-influential matrix (T_C) calculation is shown in Table 6. T_c calculation is necessary. Because, we can calculate relation pattern of T_C matrix. In Tables 7 and 3, relation patterns of T_c matrix are shown based on step 4.

Table 3: Pattern of causal relations of T_D matrix.

	Di	Ri	$(Di)^{defuzzy}$	$(Ri)^{defuzzy}$	Di + Ri	Di – Ri
C1	(0.224, 0.671, 1.968)	(0.274, 0.762, 2.118)	0.955	1.051	2.006	−0.097
C2	(0.297, 0.801, 2.138)	(0.29, 0.788, 2.14)	1.079	1.073	2.151	0.006
C3	(0.306, 0.84, 2.327)	(0.266, 0.773, 2.271)	1.158	1.103	2.261	0.054
C4	(0.208, 0.695, 2.289)	(0.241, 0.754, 2.36)	1.064	1.118	2.182	−0.054
C5	(0.307, 0.854, 2.417)	(0.255, 0.766, 2.308)	1.193	1.110	2.303	0.083
C6	(0.28, 0.793, 2.28)	(0.296, 0.811, 2.223)	1.118	1.110	2.227	0.008

Table 4: Normal correlation matrix of complete dimensions.

	C1	C2	C3	C4	C5	C6
C1	(0.149, 0.151, 0.154)	(0.179, 0.169, 0.16)	(0.186, 0.171, 0.159)	(0.165, 0.165, 0.159)	(0.162, 0.162, 0.158)	(0.164, 0.161, 0.156)
C2	(0.203, 0.176, 0.159)	(0.136, 0.149, 0.154)	(0.182, 0.172, 0.161)	(0.212, 0.181, 0.162)	(0.176, 0.171, 0.161)	(0.179, 0.169, 0.159)
C3	(0.161, 0.166, 0.169)	(0.168, 0.17, 0.171)	(0.144, 0.155, 0.166)	(0.195, 0.175, 0.171)	(0.168, 0.167, 0.169)	(0.159, 0.166, 0.169)
C4	(0.14, 0.164, 0.178)	(0.155, 0.165, 0.176)	(0.154, 0.164, 0.176)	(0.109, 0.141, 0.169)	(0.165, 0.169, 0.178)	(0.154, 0.165, 0.177)
C5	(0.157, 0.169, 0.175)	(0.169, 0.169, 0.173)	(0.156, 0.164, 0.172)	(0.151, 0.164, 0.172)	(0.137, 0.151, 0.166)	(0.175, 0.172, 0.175)
C6	(0.19, 0.175, 0.164)	(0.192, 0.178, 0.166)	(0.178, 0.174, 0.166)	(0.169, 0.173, 0.167)	(0.192, 0.179, 0.167)	(0.169, 0.167, 0.163)

Table 5: The main criteria and subcriteria in the study.

Criteria	Code	Subcriteria	Code
Customer	C1	Customer insight	C11
		Customer touch point	C12
		Customer experience	C13
Business model	C2	New digital business	C21
		Digitally modified system	C22
Culture	C3	Awareness	C31
		Train	C32
		Organizational mindset	C33
Workforce	C4	Mindset	C41
		New talent and creativity	C42
Technology	C5	New trend	C51
		Security	C52
		Infrastructure	C53
		Applications (game architecture, microservices, etc.)	C54
Governance	C6	Sustainability (environmental, social, and economic)	C61
		Leadership	C62
		Data (data sovereignty, etc.)	C63
		Operation	C64
		Policies and rules and regulations	C65
		Communication (social networks, etc.)	C66

Table 6: Total-influential matrix calculation.

	C1	C2	C3	C4	C5	C6
C1	(0.033, 0.102, 0.304)	(0.046, 0.118, 0.313)	(0.036, 0.111, 0.332)	(0.031, 0.11, 0.351)	(0.035, 0.113, 0.345)	(0.043, 0.117, 0.324)
C2	(0.053, 0.136, 0.342)	(0.04, 0.119, 0.329)	(0.05, 0.136, 0.366)	(0.046, 0.132, 0.377)	(0.05, 0.135, 0.369)	(0.057, 0.143, 0.355)
C3	(0.057, 0.143, 0.37)	(0.056, 0.145, 0.375)	(0.044, 0.13, 0.386)	(0.047, 0.138, 0.41)	(0.048, 0.138, 0.4)	(0.055, 0.146, 0.386)
C4	(0.034, 0.115, 0.364)	(0.042, 0.126, 0.372)	(0.04, 0.122, 0.391)	(0.23, 0.098, 0.387)	(0.031, 0.114, 0.394)	(0.035, 0.12, 0.381)
C5	(0.05, 0.139, 0.382)	(0.054, 0.146, 0.389)	(0.052, 0.143, 0.409)	(0.051, 0.145, 0.431)	(0.042, 0.129, 0.402)	(0.059, 0.153, 0.404)
C6	(0.046, 0.128, 0.356)	(0.05, 0.134, 0.362)	(0.045, 0.131, 0.386)	(0.043, 0.131, 0.405)	(0.049, 0.136, 0.398)	(0.047, 0.132, 0.372)

Based on calculated results in Tables 6 and 7, the network relation map is determined. The significant relationships are shown in Figure 3.

According to Figure 3, the factors mapped above X-axis have positive D-R values that show a net influence on other factors. Based on this process, C2, C3, C5, and C6 is categorized as cause factors. The effect factors are those with negative D-R value and influence by cause factors. In the figure, C1 and C4 are categorized in this group. Figure 4 shows the subcriteria.

For normalization of total-influential matrix, the matrix is separated into three tables with lower, middle, and higher

Table 7: T_c relational pattern of T_c matrix.

	Di	Ri	$(Di)^{defuzzy}$	$(Ri)^{defuzzy}$	Di + Ri	Di – Ri
C11	(0.103, 0.314, 0.94)	(0.094, 0.283, 0.831)	0.452	0.403	0.855	0.050
C12	(0.11, 0.317, 0.931)	(0.076, 0.277, 0.896)	0.453	0.416	0.869	0.036
C13	(0.088, 0.285, 0.864)	(0.13, 0.355, 1.008)	0.412	0.498	0.910	−0.086
C21	(0.084, 0.241, 0.635)	(0.079, 0.235, 0.655)	0.320	0.323	0.643	−0.003
C22	(0.078, 0.236, 0.681)	(0.082, 0.241, 0.661)	0.332	0.328	0.660	0.003
C31	(0.126, 0.39, 1.193)	(0.14, 0.404, 1.167)	0.570	0.570	1.140	−0.001
C32	(0.139, 0.393, 1.123)	(0.14, 0.397, 1.142)	0.552	0.560	1.111	−0.008
C33	(0.13, 0.389, 1.161)	(0.115, 0.371, 1.168)	0.560	0.552	1.112	0.009
C41	(0.06, 0.216, 0.801)	(0.03, 0.175, 0.746)	0.359	0.317	0.676	0.042
C42	(0.031, 0.177, 0.747)	(0.061, 0.218, 0.802)	0.318	0.360	0.679	−0.042
C51	(0.171, 0.514, 1.594)	(0.161, 0.493, 1.557)	0.760	0.737	1.497	0.022
C52	(0.173, 0.528, 1.565)	(0.163, 0.521, 1.647)	0.755	0.777	1.532	−0.022
C53	(0.181, 0.535, 1.676)	(0.166, 0.517, 1.605)	0.797	0.763	1.560	0.034
C54	(0.148, 0.493, 1.602)	(0.183, 0.538, 1.626)	0.747	0.782	1.530	−0.035
C61	(0.262, 0.72, 2.03)	(0.242, 0.723, 2.199)	1.004	1.055	2.059	−0.051
C62	(0.322, 0.877, 2.418)	(0.288, 0.814, 2.305)	1.206	1.136	2.341	0.070
C63	(0.34, 0.914, 2.463)	(0.293, 0.786, 2.201)	1.239	1.094	2.333	0.146
C64	(0.279, 0.778, 2.225)	(0.268, 0.778, 2.214)	1.094	1.087	2.181	0.008
C65	(0.261, 0.755, 2.237)	(0.333, 0.884, 2.379)	1.084	1.199	2.283	−0.114
C66	(0.242, 0.717, 2.035)	(0.281, 0.776, 2.11)	0.998	1.056	2.054	−0.058

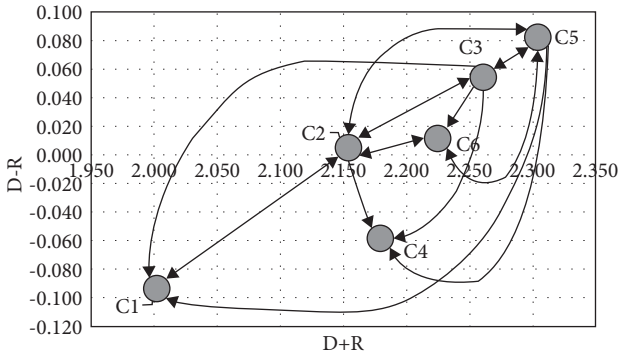

Figure 3: Causal diagram of the main criteria.

bounds. Then, for all bound, each element is divided by the sum of all elements in the row. After that, the matrix is transposed. In our use case, the results are shown in Table 4.

Finally, according to equation (10), an exact value is resulted from the limited supermatrix. The weight of main factors is calculated from sum of its subfactors. The results are shown in Table 8.

Based on the results summarized in Table 8, the first priority is governance with weight value of 0.174. The business model and culture are the second and third criteria with the weight value of 0.17 and 0.167, respectively. Technology, customer, and workforce are the 4th (0.165), 5th (0.163), and 6th (0.161) criterion. In Figure 5, the diagram of the main criteria weights is shown.

5. Discussion and Managerial Insights

Digital strategy in terms of scope and scale of impact is far beyond business strategy, and its basic principles are institutionalized at the highest levels of decision-making and decision-making in the highest authorities. The digital transformation plan can be considered as a roadmap for organizations for a comprehensive transformation with regard to digital transformations in the ecosystem governing the organization's space. According to Gartner, digital transformation consulting services are services provided to leaders, stakeholders, and senior executives of the organization to help upgrade digital technologies to create new opportunities and innovate the entire business and change components or all models of operations. Designing this roadmap is in itself a complex challenge that requires a deep and two-way understanding of the organization's business and digital age technologies. According to the majority of experts in this study, the need to pay serious attention to governance and legislation is a key requirement for the development and implementation of digital transformation in all industries and the telecom industry. Policy and rules and regulations of digital transformation based on the upstream documents of the strategy, roadmap, and vision of the organization and with regard to the macro development programs of the country is a basic necessity and needs to be seriously considered at the highest levels of decision making. In formulating policies and laws and regulations, in addition to the macro needs of the country and in line with international interactions, the risks and challenges of the path and scenarios to deal with them are also anticipated. Digital transformation in the communications industry generates $2 trillion in revenue for industry and society. Therefore, the need to establish the principles of digital transformation governance in the industry becomes more important. Digitalization has emerged dramatically in the coming decade with features that are different from the past, and organizations operating in the industry must be prepared to take advantage of the vast changes that are taking place in the way consumers live and the company's activities. And economic models will be created.

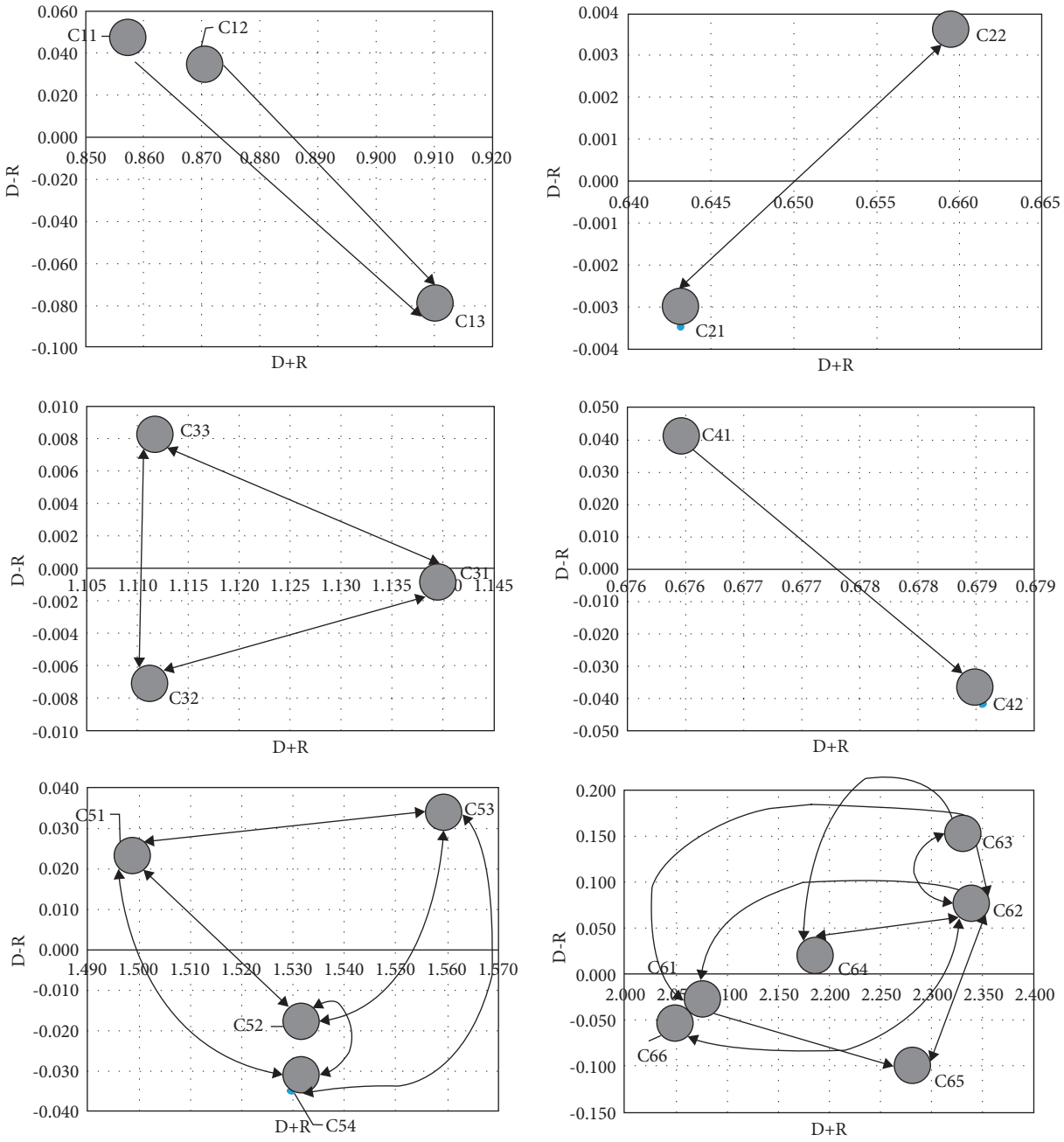

Figure 4: Causal diagram of subcriteria.

We need to know that digital transformation requires a shift in thinking to shift the focus of business models from product and service to problem-solving models and provide the realization of the digital revolution. Much of the potential value of digitalization around the world in the next decade will go to the telecom industry, which provides the necessary infrastructure, applications, and efficiency improvement programs in many sectors. Various industries such as retail industry, automotive industry, electricity industry, and so on are affected by the rules and regulations of the telecom industry. The industry faces a rapidly changing economic and competitive landscape that is driven by digital developments within and outside the industry.

Data strategy for digital transformation and the position of data governance requires a comprehensive approach. Data independence in data management, data control in data governance, data access in data mobility, and data-driven vision in data analysis are the main pillars of developing a suitable strategy for digital transformation. Paying attention to data and its ability to play a role in creating value is the focus of digital developments. Data as an organizational asset requires attention to data management requirements throughout the data life cycle. Undoubtedly, data governance is one of the most important and vital components of a data management program throughout the data life cycle, and perhaps that is why establishing a data

Table 8: Global factors weight.

Factors	Code	Weight
Customer	C1	0.163
	C11	0.321
	C12	0.325
	C13	0.354
Business model	**C2**	**0.170**
	C21	0.497
	C22	0.503
Culture	**C3**	**0.167**
	C31	0.351
	C32	0.334
	C33	0.315
Workforce	**C4**	**0.161**
	C41	0.466
	C42	0.534
Technology	**C5**	**0.165**
	C51	0.227
	C52	0.254
	C53	0.263
	C54	0.256
Governance	**C6**	**0.174**
	C61	0.145
	C62	0.179
	C63	0.154
	C64	0.171
	C65	0.180
	C66	0.170

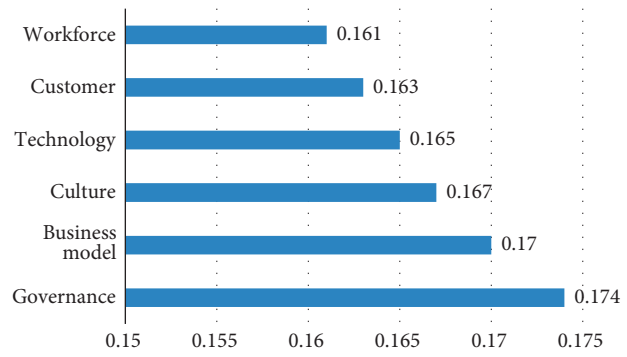

Figure 5: The weight of the main criteria.

governance program in many organizations is essential for the successful implementation of digital transformation. A strategy whose maturity level should be constantly monitored using data maturity models and moved towards its improvement and development.

Designing new interindustry business models in areas such as the internet of things will require extensive and agile networks that provide comprehensive coverage of customers and objects, software capabilities defined by the software, personal information protection and cyber flexibility, very low latency communications, and improved bandwidth. The research results show that the business model is very important in the successful realization and implementation of digital transformation. Changing business models from traditional to digital begins with the step-by-step modification of processes and progresses to digital transformation with the digitization of new business models. In short, digital transformation is not in emerging technologies but in the business model and operational model. However, the digitization of the industry requires changing existing policies and improving regulatory models. A prerequisite for developing a digital transformation strategy is to know the components of this strategy. One of the main prerequisites for developing such a strategy is to determine the relationship and how it affects the organization's business models. We need to know that digital transformation requires a shift in thinking to shift the focus of business models from product and service to problem-solving models.

The main task of cultural leadership for digital transformation is the responsibility of the most senior managers of the organization and the foundations of this great change must be formed from the context of culture and at the highest management levels. Senior managers of the telecom industry have a big role in drawing the digital vision of the organization, sharing the vision and involving the whole organization in creating change, creating technology leadership capabilities, and paving the way for changing the organizational culture to accept the great digital transformation. However, education is very important as one of the main subcriteria of culture, and managers' planning to understand digital realities for all organizational levels is inevitable. Research results show that the subcriterion of personal awareness and insight of employees is more important in digital transformation. Individual attitude and awareness of employees and identifying potential points for successful implementation of digital transformation increase the speed of change of acceptance culture far more than education. Although the role and effect of education are undeniable, in organizations where organizational thinking and its hierarchical structure are already well-formed, the role of awareness will undoubtedly be much deeper.

The telecom industry with its special features such as having advanced technologies with rapid changes, technology overflow in other industries, rapid rate of return on investment and job creation, and the high strategic importance of this industry in political and economic exchanges as a leader in exploiting emerging technologies understands the importance of this influential component in designing and formulating its macro strategies. IoT, cloud computing, mobile applications, social media, virtual and augmented reality, data analytics, artificial intelligence, and blockchain are some of the most important types of transformational technologies. These technologies will positively subvert business models, stakeholder experiences (such as customers and employees at the organizational level, and citizens at the national level), and operational processes.

Most telecom companies use the power of emerging technology to reuse their business models, rebuild market positions, and create creative offerings for customers and provide global currency transactions on demand. To have a successful digital transformation program, a business must have a good understanding of digital strategy and operating model and, instead of taking a passive approach to digital

transformation, must be actively involved in the increasingly competitive digital market. A digital organization really needs to be innovative, in which case it is easy for customers to deal with it, and to move and adapt quickly.

Research results show that the digital transformation of the customer is one of the main pillars of designing strategy models in the telecom industry. The following effective criteria in the customer index from the point of view of Weber experts, based on the results of the analysis, are important and effective, including the customer experience, customer contact point, and customer insight.

The results show that the digital workforce is one of the main and influential components in the design and development of digital strategy. Jobs must employ and retain digital talent and promote a culture in which employees, temporary workers, and robots work together effectively. Lack of skilled talent is a challenge for businesses in finding and retaining the right talent. Creating a digital workforce is not limited to hiring and nurturing talent because there is a need to improve their workforce in other ways as well. Organizations that are thinking about change (digital, etc.) are constantly trying to attract external consultants, who often prescribe solutions with a single pattern to methods and organizations. The approach to creating change in the organization should be based on people within the company and have sufficient and deep knowledge about constructive and non-constructive solutions [25]. To achieve such ideals, employee thinking, which originates from the culture of the organization, is very important in achieving the goals of digital transformation. But there is new talent and creativity and digital skills, especially in organizations and industries. More tradition should be on the agenda as an irreplaceable priority.

6. Conclusion

We conclude the results as follows:

(i) By carefully examining the coefficients of the principal components and key indicators, we find that the obtained quantitative values are not much different. This small difference shows that the digital transformation is achieved only if we pay attention to all extracted components. It also shows that all the influential factors in the implementation and realization of digital transformation can be considered as components of the whole ecosystem that are growing together to achieve the goal. Therefore, while analyzing each of the effective components, it is necessary to fully implement and properly exploit all the benefits of digital transformation, and the set of impact factors identified in a dynamic ecosystem should be examined.

(ii) Based on the results obtained and the review of recent crises, it is clearly stated that for the successful implementation and realization of digital transformation, it is necessary to pay attention to all components and align the indicators.

(iii) Based on the results, governance has the highest impact factor. However, in practice, not much attention has been paid to it. For example, in the field of regulation, infrastructure, policy-making, and the formulation of laws and regulations at the macro level, less has been paid. And we have never been able to create appropriate and consistent laws and regulations in line with technology and other operational indicators, and the main influential indicators in governance have always been raised later than other components. And, in the face of many technologies, we have seen that the alignment of the government with technology does not happen.

(iv) Examining the results, it was found that business models, along with governance, are very important. Extensive changes in the world in all aspects of life and in the economic sphere have led to the emergence of new business models, which in many cases there are severe structural differences from previous business models and in some cases new business models have been created that did not previously exist and have been created solely on the basis of new technology trends and tailored to new needs. In such circumstances, the domestic market of Iran is undergoing major changes: on the one hand, the relentless and increasing influx of new technologies and, on the other hand, the existence of traditional markets and old business models have caused some confusion. In such a situation, alignment of governance, business models, and technology are felt more and more. In other countries, in line with new technologies, new business models have been created, and in many areas, there are approved and sustainable business models. But the condition for successful implementation of digital transformation in domestic markets is to make a fundamental change in traditional business models and to create localized business models in line with emerging phenomena.

(v) In interviews with domestic experts and opinions extracted from experts in foreign conferences, the culture component is considered one of the vital and influential factors. The results of the research also showed that this component is in third place in terms of impact. A clear example in this area is social media. Social media has grown exponentially in recent years. In general, in the face of such phenomena, the spread and influence of which are beyond the control of societies, it is necessary to establish appropriate laws and regulations in the discussion of sovereignty, at the right time and with the nobility of all overt and covert visions.

(vi) Unfortunately, in our country, there are still no precise, specific, and complete regulations for using social media. And, in the most optimistic case, laws and regulations have occurred much later than the advent of technology. On the other

hand, the main context of such phenomena generally occurs in societies that are very different from the cultural structure of our society. Therefore, in the face of the emergence and arrival of such phenomena, it is necessary to culturally harmonize and approve the laws and regulations of exploitation in appropriate conditions and time. In many cases, we have seen that the capabilities and possibilities of new social media are fundamentally different from the traditional infrastructure of our culture. Proper planning at the right time has created new problems as well as the spread of mistrust and lack of full use of social media.

(vii) Another example, in the field of culture, is the issue of dispersion and diversity of demographic classes in the country. A population of the community that has a higher average age is not easily able to use up-to-date and complete technologies. Most of these people are business owners and craftsmen who sometimes still follow traditional business models, or be ignored perhaps because of their inability to update information on the use of technologies and for cultural reasons. Therefore, while creating the necessary physical and cultural infrastructure, in changing new business models, this issue should be considered by the legislature. This part of the society, on the one hand, is important as an important economic sector and the owner of wealth and, on the other hand, as a customer of technology services, is of special importance. The level of literacy and awareness of up-to-date technology is very important in the successful realization and implementation of digital transformation.

(viii) One of the key necessities in digital transformation is related to a skilled and specialized workforce in this field. The statistics of the educated and university population in relation to the total population are acceptable. This part of society, as a customer and operator of technology, can more easily adapt to change. But, in order to implement and realize the digital transformation, the need for expert force in this field is very critical. The presence of people with related specialties and knowledge of the latest technologies in the world, along with strong scientific and technological centers, which are constantly active in the field of research and development, creates strong scientific support in updating and adapting to the conditions of society and the culture of the community. The digital transformation workforce must identify and meet the needs of society, update and localize existing technologies, and in terms of governance must act in such a way that we are not merely importers and users of technology. We need to play a more effective role in the research and development of technologies by increasing knowledge and collaborations.

What has been obtained from the results of research and analysis undoubtedly implies based on the high impact and continuity of all the studied components and should be considered in formulating the digital transformation plan strategy. Finally, successful and complete realization of digital transformation is only based on the emphasis and focus of all main components. Finally, as a suggestion for future research, the development of the model proposed in this research using other decision-making tools such as VIKOR and TOPSIS is proposed. Given that decision-making methods are highly dependent on the weights of the indicators, the use of integrated weight determination techniques such as BWM-entropy is recommended.

Data Availability

The data collected from the company are presented as a table in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] R. Fenech, P. Baguant, and D. Ivanov, "The changing role of human resource management in an era of digital transformation," *International Journal of Entrepreneurship*, vol. 22, no. 2, 2019.

[2] A. Belous and V. Saladukha, "Basic components of telecommunication systems," in *High-Speed Digital System Design*, pp. 177–289, Springer, Cham, 2020.

[3] J. Reis, M. Amorim, N. Melão, and P. Matos, "Digital transformation: a literature review and guidelines for future research," in *Proceedings of the World Conference on Information Systems and Technologies*, pp. 411–421, Springer, Cham, 2018, March.

[4] G. C. Kane, D. Palmer, A. N. Phillips, D. Kiron, and N. Buckley, "Strategy, not technology, drives digital transformation," *MIT Sloan Management Review and Deloitte University Press*, vol. 14, no. 1-25, 2015.

[5] B. Solis, J. Buvat, K. V. J. Subrahmanyam, and R. R. Singh, "The innovation game: why and how businesses are investing in innovation centers," *Capgemini Consulting Altimeter*, 2015.

[6] K. Lee, Y. Park, and D. Lee, "Measuring efficiency and ICT ecosystem impact: hardware vs. software industry," *Telecommunications Policy*, vol. 42, no. 2, pp. 107–115, 2018.

[7] N. Shiraishi and J. Iijima, "Inter-firm relationships in the telecommunications industry: characteristics and typology," *Contemporary Management Research*, vol. 5, no. 4, 2009.

[8] G. Lanzolla and J. Anderson, "Digital transformation," *Business Strategy Review*, vol. 19, no. 2, pp. 72–76, 2008.

[9] E. Dessers, S. Dhondt, M. Ramioul et al., "Towards a multidisciplinary research framework for studying the digital transformation of industry," *European Journal of Workplace Innovation*, vol. 5, no. 1, 2019.

[10] W. Vereecken, W. Van Heddeghem, D. Colle, M. Pickavet, and P. Demeester, "Overall ICT footprint and green communication technologies," in *Proceedings of the 2010 4th International Symposium on Communications, Control and Signal Processing (ISCCSP)*, pp. 1–6, IEEE, Limassol, Cyprus, 2010, March.

[11] Y. Zou, J. Zhu, X. Wang, and V. C. Leung, "Improving physical-layer security in wireless communications using diversity techniques," *IEEE Network*, vol. 29, no. 1, pp. 42–48, 2015.

[12] C. Czarnecki and C. Dietze, "Understanding today's telecommunications industry," in *Reference Architecture for the Telecommunications Industry*, pp. 17–54, Springer, Cham, 2017.

[13] S. Chanias, M. D. Myers, and T. Hess, "Digital transformation strategy making in pre-digital organizations: the case of a financial services provider," *The Journal of Strategic Information Systems*, vol. 28, no. 1, pp. 17–33, 2019.

[14] S. K. Ayer, J. I. Messner, and C. J. Anumba, "Augmented reality gaming in sustainable design education," *Journal of Architectural Engineering*, vol. 22, no. 1, Article ID 04015012, 2016.

[15] J. Bloomberg: Digitization, digitalization, and digital transformation: confuse them at your peril. Forbes. Retrieved on August, 28, 2018.

[16] D. O. Aghimien, C. O. Aigbavboa, and A. E. Oke, "Critical success factors for digital partnering of construction organisations – a Delphi study," *Engineering Construction and Architectural Management*, vol. 27, no. 10, pp. 3171–3188, 2020.

[17] B. Melović, M. Jocović, M. Dabić, T. B. Vulić, and B. Dudic, "The impact of digital transformation and digital marketing on the brand promotion, positioning and electronic business in Montenegro," *Technology in Society*, vol. 63, Article ID 101425, 2020.

[18] A. Bousdekis and D. Kardaras, "Digital transformation of local government: a case study from Greece," in *Proceedings of the 2020 IEEE 22nd Conference on Business Informatics (CBI)*, pp. 131–140, Antwerp, Belgium, June 2020.

[19] A. Gaponenko, A. Erokhina, and M. Pokrovskaya, "Management by values in digital transformation strategies of Russian companies and the Fourth industrial revolution," in *Digital Strategies in a Global Market*, N. Konina, Ed., Palgrave Macmillan, London, 2021.

[20] C. C. Okafor, C. Aigbavboa, and W. D. Thwala, "A Delphi approach to evaluating the success factors for the application of smart mobility systems in smart cities: a construction industry perspective," *International Journal of Construction Management*, pp. 1–10, 2021.

[21] M. M. Tjebane, I. Musonda, and C. Okoro, "Organisational factors of artificial intelligence adoption in the South African construction industry," *Frontiers in Built Environment*, vol. 8, Article ID 823998, 2022.

[22] M. Ikuabe, C. Aigbavboa, C. Anumba, A. Oke, and L. Aghimien, "Confirmatory factor Analysis of performance measurement indicators determining the uptake of CPS for facilities management," *Buildings*, vol. 12, no. 4, p. 466, 2022.

[23] R. S. Shojaei, K. Oti-Sarpong, and G. Burgess, *Enablers for the Adoption and Use of BIM in Main Contractor Companies in the UK*, Engineering, Construction and Architectural Management, UK, 2022.

[24] M. E. Porter, "The five competitive forces that shape strategy," *Harvard Business Review*, vol. 86, no. 1, 2008.

[25] M. J. Sousa and Á. Rocha, "Digital learning: developing skills for digital transformation of organizations," *Future Generation Computer Systems*, vol. 91, pp. 327–334, 2019.