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The Design of An Information Technology Model in Knowledge-Based Industries in the Pharmaceutical Sector, Considering the Economic Conditions of the Country (Using the Multi-Grounded Theory Method)

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Abstract

This article aims to present an information technology model in knowledge-based industries in pharmaceutical domain, considering country's economic conditions, relies on multi-grounded theory approach. study is applied in terms of its objective and is classified as qualitative research based on method of data collection to analyze data, Maxqda software was employed. The results show, with main variables being category of evaluating information technology strategies; formulating information technology strategies; and implementing information technology strategies. Other variables included in categories were defining organization's visions and goals; determining vital performance indicators for organization; analyzing organization's environment as causal conditions; variables related to foundations of strategic marketing orientation; foundations of strategic information technology orientation; and foundations of strategic organizational orientation as facilitators. This also encompassed challenges related to size of the organization; challenges regarding extent of information technology utilization; and challenges pertaining to type of industry as intervening conditions. Finally, variables included enhancing information technology governance; improving information technology architecture; and implementing a library of information technology infrastructure as considered outcomes.

Keywords: Information Technology, Knowledge-Based, Drug, Multi- Grounded Theory

1. Introduction

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A "strategic map" is a tool that connects the organization's desired strategy with the processes and systems that assist in implementing that strategy. This tool provides employees with a direct and clear view of how their activities are linked to the organization's overarching goals, aligning and coordinating them to perform their tasks better. The best way to draw a strategic map is through a top-down approach (Akbari et al., 2020; Abusman & Saleem, 2013). This approach begins with examining the organization's goals and objectives and then outlines the pathways to achieve the desired destination. In this regard, senior managers of the organization should first review the mission statement and core values (why this organization exists and what it believes in). Then, equipped with this information, the managers can proceed to develop the vision, which represents what the organization aims to achieve in alignment with its fundamental philosophy. This vision should clearly depict the overall objective of the organization (Bao & Leopold, 2016; Salamatian, 2018).

The effective implementation of information technology is considered one of the key factors for organizations to achieve a competitive advantage and provide better services to customers (Cuiroz et al., 2020; Azadeh & Heydari, 2015). The need for up-to-date, accurate, and timely information has established the necessity of paying serious attention to the processes of producing, providing, and utilizing information as a fundamental tool for planning at various national, sectoral, organizational, and individual levels (Rostami, 2020). The significance of this key and valuable asset in the success of individuals, organizations, and countries in achieving optimal performance underscores the necessity of creating an efficient, holistic, realistic, and calculated system within organizations that employs information technology-based solutions for information management (Rostami, 2020; Jamshidi et al., 2019).Today, the development of information and communication technologies continues to evolve and innovate at an accelerating pace, compelling organizations to evaluate their software and hardware capabilities systematically and accurately. This evaluation is essential for clarifying objectives and outlining paths for the development of information technology based on a service-oriented approach, ensuring organizations do not fall behind current trends and can effectively ride the waves of disruptive information and communication technologies (Shao, 2019). The strategic map for information technology refers to the process of identifying computer-based application systems that assist organizations in executing projects and achieving their goals (Yin et al., 2020). Given the strategic role of information technology in knowledge-based organizations as an empowering factor in the competitive arena, the strategic alignment of information technology with the organization is of significant importance (Luqman & Gholami, 2021). The integration of enterprise architecture, management of organizational processes, and service-oriented architecture is an appropriate and effective solution for achieving optimal alignment between the organization and information technology (Malta & Sousa, 2016). "Information technology coordination" within an organization increases the performance and effectiveness of the information technology employed, enhancing goals, strategies, resources, integration, investment, and other related factors within the organization.

In the present era, leveraging information technology to create competitive advantage has become an important priority for organizations. To have an efficient knowledge management system that can effectively impact knowledge-based industries, information technology strategies play a key role (Malhotra et al., 2015). Knowledge-based organizations or institutions are formed to synergize knowledge and wealth, develop a knowledge-based economy, achieve scientific and economic goals (including the expansion and application of inventions and innovations), and commercialize research and development outcomes (including the design and production of goods and services) in areas of advanced technologies with high added value, particularly in the production of related software.In knowledge-based organizations, information is the most valuable asset, and many organizations have viewed information and knowledge management as a central strategy to strengthen their competitive advantage. A significant issue that knowledge-based organizations in Iran face includes factors such as sanctions, government regulations, the

advantages held by state organizations, traditional organizations, and the instability of economic conditions, particularly currency fluctuations, which are crucial for products in the field of information and communication technology. These factors heighten the degree of uncertainty and the challenges in this environment.

Knowledge-based industries enter the market with an idea, and since the growth in this environment is very high and accompanied by extensive and unforeseen changes, merely having operational capabilities cannot guarantee their success. In such an environment, competitive advantage is not sustainable, and knowledge-based industries require specific and unique capabilities tailored to this context in order to continue operations and achieve market share. One of the strategies that can be employed in this regard is the design of a strategic roadmap for information technology. Utilizing capabilities and addressing limitations in knowledge-based industries necessitates adopting a new strategy. One of these strategies is knowledge-based development, focused on science and technology, and enhancing the components of the knowledge-based economy. The design of a strategic roadmap in this area involves analyzing capacities, characteristics, and up-to-date knowledge and technological information, with the selection of strategic priorities for knowledge-based development, which leads to the proper utilization of capacities and the resolution of limitations in this domain. In fact, the issues of this research can be described as the complexity, fatigue, and ambiguity faced by decision-makers and managers of knowledge-based industries in the pharmaceutical sector, based on a combination of various analytical methods and multivariate modeling among the components of "dimensions of the strategic roadmap for information technology in the pharmaceutical industry"; the component of "variables of the strategic roadmap for information technology in the pharmaceutical industry"; and the component of "indicators of the strategic roadmap for information technology in the pharmaceutical industry."

According to the research conducted, no research has been done in Iran under the title "Designing an information technology model in knowledge-based industries in the field of medicine according to the economic conditions of the country (using the multi-grounded theory method)", so the design of this model The multi-ground method is considered as the theory of innovation of this research.

2. Literature Review and Theoretical Background

Information technology, with the internet at its forefront, has created a new environment in which producers, suppliers, sellers, and customers—and almost all actors involved in an economic cycle—can interact with each other in a shared virtual space, exchanging information, services, products, and money (Wang et al., 2022). The internet has introduced new theories and concepts, one of which is continuous employment. In this type of employment, an individual performs their work using computer facilities and provides the results to the employer or customers via the internet. Interestingly, receiving wages or making payments also occurs through the internet and via online credit channels such as internet accounts and credit cards. The entirety of these activities and interactions can be examined under what is now referred to as e-commerce (Kaboudjayi, 2023).

In fact, e-commerce is one of the manifestations and special applications of information technology, and a substantial volume of commercial interactions in developed countries is currently conducted electronically. Therefore, developing countries, by choosing a strategy for the internal use of this industry, will be able to easily pass through the stages of economic development. This means that with the expansion of information and communication technology in the country, all members of society will have access to modern technologies, and this strategy will lead to the proliferation of high-productivity modern technologies within society (Hajihosseini et al., 2023).The domestic utilization of these technologies, combined with the

expansion of information and communication technology in the country, has led to an increase in the supply of human capital, which is itself an important factor in the growth and economic development of these countries. Ultimately, these processes will also lead to the expansion of exports of products and services related to this technology.

Khalil et al. (2024), in a study titled "Sustainability through Innovation," evaluated knowledge-based strategies to enhance labor productivity in small and medium-sized engineering companies. They stated that this research focuses on performance drivers based on knowledge, which are often intertwined with intellectual capital. Specifically, the intellectual capital's value-added coefficient and its profound impact on labor productivity, moderated by key inputs such as education and research and development, were examined in the context of small and medium-sized engineering companies. Several hypotheses were established among the variables, which are expected to have a positive relationship, as intellectual capital, education, and research and development should lead to improved labor productivity. The findings revealed the critical issue of misallocated investments in structural capital created by this model. A notable finding was the positive change of 17 percent attributed to the intellectual capital value-added coefficient in labor productivity, along with the lack of significant impact from education and research and development on this relationship. While emphasizing the overall validity of the model, this intriguing discovery highlights the effect of intangible resources on the overall sustainability calculations of knowledge-based companies, particularly structural capital, which constitutes 31 percent of labor productivity. The practical implication is that this model can be utilized to uncover long-term financial performance strokes through intellectual capital metrics. A novel point is the application of labor productivity metrics derived from engineering literature instead of the conventional asset productivity ratios from intellectual capital literature. Akbar Dena et al., (2023), in a study titled "Information Technology and Digital Sufficiency for Building a Sustainable Circular Economy," stated that research into creating a sustainable circular economy in small and medium-sized enterprises (SMEs), especially in countries with abundant fossil energy, such as the Russian Federation, is very limited. Our results indicate that investment or the existence of research and development in SMEs, along with knowledge of a sustainable circular economy and government funding, as well as access to broader markets, collectively have a positive and significant impact on the implementation and investment in a sustainable circular economy in SMEs, while administrative barriers yield a small but negative effect. These findings may be useful for relevant stakeholders to identify the factors that attract the attention of SMEs involved in the transition to a sustainable circular economy, And it can also assist decision-makers who wish to strengthen the transition of small and medium-sized enterprises (SMEs) to a circular economy. We can conclude that supporting SMEs (both financially and through increasing public awareness) for their transition towards a sustainable circular economy has a social impact that can accelerate greener transitions and significantly contribute to enhanced energy efficiency. Hastings et al., in 2022, endeavored to design a model for increasing the utilization of information systems in the pharmaceutical industries. In fact, one of the main outcomes of their research is that the increasing necessity to reduce costs and enhance quality on one hand, and to improve organizational processes in accordance with customer demands and satisfaction on the other, has led to a growing recognition of the concept of information systems in pharmacies, prompting organizations to seek to expand this concept within their organizational framework. In other words, the global competitive market and changing customer needs have compelled organizations to extensively address the improvement of their information systems.

Mirshah Valayati et al., (2023), in a study titled "Iran's Roadmap for Transitioning to a Knowledge-Based Economy," stated that in their article, after examining the country's status in indicators of the knowledge-based economy, they analyzed its correspondence with innovation policy across various dimensions. The experiences, models, and analyses indicate that to strengthen the knowledge-based economy, innovation

policy, particularly in the "institutional" dimension, requires substantial reconsideration. The "policy tools" need to be enhanced and adapted, and the generation of knowledge-based approaches must be improved.

Nazemi (2023), in a study titled "A Review of the Impact of Information Technology on the Human Resources of Organizations," conducted a literature review, examining studies conducted in this field, and summarized the results and impacts of information technology on the human resources of organizations. Ultimately, it was determined that information technology has a positive and significant relationship with the performance and productivity of an organization's human resources. Kaboudjay (2023), in a study titled "Marketing Strategies in Knowledge-Based Information and Communication Technology Companies," stated that the lack of adequate financial resources in companies is the most significant weakness. The most important strength of these companies is the selection of a unique or specific product with clear market demand. The main threat to these companies is the rapid advancement of technology and the lack of investment in new technologies. The most significant opportunity for these companies is collaboration and partnership with the industry in the development of products and services. The strengths present in knowledge-based companies outweigh their weaknesses. On the other hand, threats are stronger than opportunities; therefore, the strategic positioning area is classified as ST, and the dominant strategy is defined as diversification.Mamouri and Zandi (2022), in a study titled "The Impact of Information and Communication Technology on Economic Growth in Iran," found that the impact of the development of information and communication technology on economic growth is positive and significant, approximately 0.12%. However, it is considered negligible compared to the effects of labor force and energy consumption on economic growth. The impact of the labor force is 1.17%, and energy consumption is approximately 1%. Additionally, this research indicated that capital accumulation has a positive but insignificant effect on economic growth in recent years.

3. Research Methodology

Considering that the present study focuses on designing a strategic roadmap for information technology in knowledge-based industries in the country, the research method is applied based on its objective; qualitative based on the type of data; and descriptive-correlational based on the data collection method and the nature and approach of the research.

The statistical population for this research can be categorized into three main groups: the first group includes expert professors (academic experts), the second group consists of specialists and professionals working in the pharmaceutical industries of the country (industry experts), and the third group encompasses customers and independent researchers (stakeholders). In fact, the sampling method used in this research is a combination of two methods: non-probability purposive (judgmental) sampling and snowball sampling. Given the nature of the sampling method, the final sample size of this research will be determined by the available experts who are willing to cooperate. The data collection tool in the qualitative section was semi-structured interviews. The interviewees consisted of 15 experts from knowledge-based industries in the pharmaceutical sector and academic experts in the fields of innovation management, industrial management, information technology management, and industrial engineering, who are knowledgeable in the field of research. The data was collected through in-depth interviews during the spring of 1401 (2022).

The analysis of qualitative data was conducted based on document analysis and semi-structured interviews using the grounded theory method. At this stage, 15 interviews were conducted on the topic of information technology in the knowledge-based industries of the country. The results obtained from the three stages of coding using †MAXQDA software are presented below.

† Qualitative Data Analysis

The steps for conducting research using the grounded theory approach include (Jalili, 2021; Sourani, 2019; Mazzidi & Dastouri, 2021): research design; data collection; data coding in three phases: a) open coding, b) axial coding, c) selective coding; note-taking: recording thoughts and interpretations of the data; and writing and formulating the theory. In fact, the qualitative grounded theory method is one of the oldest research methods in the social sciences. However, the grounded theory method is still evolving and refining its processes (Niazi & Nazari, 2018; Habibi, 2017). In fact, the multi-grounded theory approach attempts to combine specific aspects of induction and deduction. It seeks to avoid weaknesses while integrating strengths within the approach, reflecting a dialectical spirit. A significant portion of grounded theory also exists within the multi-grounded theory approach. In essence, multi-grounded theory can be viewed as an extension or amendment to grounded theory (Farasakhkhah, 2021). Therefore, multi-grounded theory emphasizes the role of theories and the researcher's interests more than grounded theory does. It is reiterated that the researcher's interest (operationalized in the research question) must evolve over time, and existing theories should be utilized as constructs within the research process. Multi-grounded theory is an approach for theory development. Strauss and Corbin took significant steps to move away from a purely inductive approach. The multi-grounded theory seeks to continue on this path. However, this does not imply a rejection of the inductive analysis of data as conducted in the grounded theory coding process. The process of developing multi-grounded theory encompasses three stages (Ismaili et al., 2021; Ghorbani Zadeh, 2018):

Table 1: General Framework of Grounded Theory (Source: Ismaili et al., 2021 and Ghorbani Zadeh, 2018)

	Development of Grounded Theory Inductive Coding Conceptual Coding Pattern Coding
Reflection and Revision of the Research Question	Theory Validation Process Theoretical Alignment Empirical Validation Evaluation of Theoretical Coherence
	Development of Final Theory Theory Enrichment

The localization tool for the components of the present research was evaluated by several professors and experts. In the next phase, to test the simplicity and fluency of the questions, a number of these localization tools were distributed among a portion of the research's statistical population, as the tool was intended to be distributed among experts. Finally, after examining the feedback from these individuals and receiving final approval from the supervising and advising professors, the localization tool for the components of the research was distributed.

The validation of the research for designing the model was achieved by utilizing the frequently occurring coding matrix in the Maxqda software, which was used for analyzing the qualitative data obtained from interviews with experts.

4. Research Findings

The stages of conducting qualitative analysis (Grounded Theory) for designing a strategic roadmap for information technology in the knowledge-based industries of the country, specifically for the pharmaceutical sector (including the following groups: Dr. Abidi Pharmaceutical Group; Caspian Pharmaceutical Group; Vitabiotics Iran; Drug Production Group; Barekat Pharmaceutical Group; Nano Alvand Pharmaceutical Group; Tamin Pharmaceutical Investment Organization (TIPICO); Exir Pharmaceutical Group; and DaroPakhsh Factories) are as follows:

4.1. Theory Development Stage

The multi- Grounded Theory method is employed to design a strategic roadmap for information technology in the knowledge-based industries of the country, aimed at recognizing, analyzing, and reporting existing patterns in the qualitative data of the research. In the theory development stage, based on inductive coding, conceptual refinement, and pattern coding, the data from the qualitative segment of the research is examined. The perspectives of 15 experts in the knowledge-based pharmaceutical industry and academic specialists in the fields of Innovation Management, Industrial Management, Information Technology Management, and Industrial Engineering—who are knowledgeable in the research area—were collected through in-depth interviews during the spring of 2022. The following table summarizes the demographic description of the qualitative sample:

Table 2: A Summary of the Demographic Description of the Research Sample - Qualitative Sample

Relative Frequency (Percentage)	Count	Characteristics	Type of Characteristics
%73	11	Male	Gender
%27	4	Female	
%13	2	Bachelor	Educational Qualification
%27	4	Master's	
%60	9	Doctorate	
%13	2	3to 5 years	Work Experience
%33	5	6to 10 years	
%44	8	More than 10 years	
%60	9	Employed in knowledge-based pharmaceutical industry (Industry Experts)	Type of Expert
%20	3	Experts (Public Stakeholders)	
%20	3	Academic Experts (Academic Experts)	

In the theory development stage, to justify the use of The multi- Grounded Theory method, studies related to the research topic were utilized. Through the development of existing models in the research (Haggis et al., 2021; Korpiola et al., 2022; Taher et al., 2022; Wang et al., 2022; Huang et al., 2021; Hastings et al., 2022; Perez et al., 2021; Gabel, 2021; Alsarami et al., 2020; Yin et al., 2020; Baker et al., 2014; Shao, 2019; Wang and Russo, 2018; Bao and Leopold, 2016; and Bachour et al., 2010), the main concepts from the qualitative methodology in the study were extracted in the form of variables and indicators emphasized by the experts:

Table 3: Extraction of Research Concepts for the Creation of Initial Codes and Coding

Contextual Conditions of the Information Technology Strategic Map (Facilitating)	Causal Conditions of the Information Technology Strategic Map (Influential)
Intervening Conditions of the Information Technology Strategic Map (Challenging)	Core Category of the Information Technology Strategic Map (Phenomenon)
Consequences and Effects of the Information Technology Strategic Map (Results)	Mechanisms of the Information Technology Strategic Map (Strategies)

The initial coding and code development begin once the data has been studied and familiarization has taken place. At this stage, essential concepts for the research are selected as variables and categories, derived from the implementation of qualitative methodology in the study, with an emphasis on the insights of experts. Here, a portion of the outputs from the in-depth interviews with experts is presented: An overview of the structure of the in-depth interview in the documentation browser section of MAXQDA software reveals that the causal conditions of the IT strategic roadmap (influential factors); the main category of the IT strategic roadmap (phenomenon); the contextual conditions of the IT strategic roadmap (enabling factors); the intervening conditions of the IT strategic roadmap (challenging factors); the mechanisms of the IT strategic roadmap (strategies); and the outcomes and impacts of the IT strategic roadmap (results) are the main concepts of the research.

Figure 1. Outputs of in-depth interviews with experts

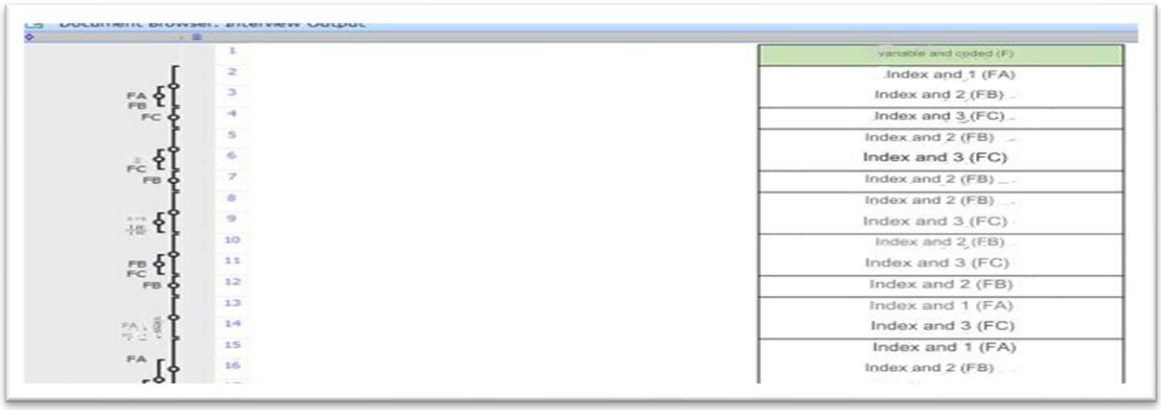

Figure 2. Overview of the in-depth interview structure for creating initial codes and coding

4.2. Theoretical Validation Stage

In the theoretical validation stage, various codes are organized into concepts based on theoretical alignment, empirical validation, and evaluation of theoretical coherence, focusing on a broader level of analysis beyond just the codes. All relevant coded data associated with each of the concepts are identified and collected. Essentially, in this stage, the codes are analyzed, and attention is given to how different codes are combined and integrated to form core categories. During this phase, using the grounded theory method within MAXQDA software, connections are established between the main concepts for selecting terminology relevant to the research. The indicators present in the main concepts of the study, according to expert opinions, are as follows:

Table 4. Establishing Connections Between Concepts Based on the Coding Matrix

Contextual Conditions of the Information Technology Strategic Map (Facilitating)	**Causal Conditions of the Information Technology Strategic Map (Influential)**
Category of Contexts for Strategic Marketing Orientation	Category of Defining the Organization's Vision and Goals
Category of Contexts for Strategic Orientation in Information Technology	Category of Defining the Organization's Critical Performance Indicators
Category of Contexts for Organizational Strategic Orientation	Category of Environmental Analysis of the Organization
Intervening Conditions of the Information Technology Strategic Map (Challenging)	**Core Category of the Information Technology Strategic Map (Phenomenon)**
Category of Challenges Related to Organization Siz	Category of Evaluating the Information Technology Strategy
Category of Challenges Related to the Level of IT Utilization	Category of Formulating the Information Technology Strategy

Category of Challenges Related to Industry Type	Category of Implementing the Information Technology Strategy
Consequences and Effects of the Information Technology Strategic Map (Results)	**Mechanisms of the Information Technology Strategic Map (Strategies)**
Category of Enhancing IT Governance	Category of Implementing the IT Infrastructure Library Category of Mechanisms for Addressing Organization's Needs in a Competitive Environment
Category of Improving Information Technology Architecture	Category of Mechanisms for Rapid Development of Services and Products for Customers
Category of Implementing the IT Infrastructure Library	Category of Mechanisms for Addressing Organization's Needs in a Competitive Environment

In this section, the distribution of expert responses in partitioning the content of the research shows that for each of the six main variables of the study, three categories have been extracted: The concept of "causal conditions of the IT strategic roadmap (influential)" encompasses categories such as: the category of determining the vision and goals of the organization; the category of identifying vital performance indicators of the organization; and the category of analyzing the organizational environment. The concept of "the main category of the IT strategic roadmap (phenomenon)" includes categories like: the category of evaluating the IT strategy; the category of formulating the IT strategy; and the category of executing the IT strategy. The concept of "contextual conditions of the IT strategic roadmap (facilitative)" comprises categories such as: the category of strategic marketing orientation contexts; the category of strategic IT orientation contexts; and the category of organizational strategic orientation contexts. The concept of "intervening conditions of the IT strategic roadmap (challenging)" incorporates categories including: the category of challenges related to organizational size; the category of challenges related to the extent of IT utilization; and the category of challenges related to the type of industry. The concept of "mechanisms of the IT strategic roadmap (strategies)" includes categories such as:The concept of "mechanisms for leveraging the internet infrastructure to provide organizational services anytime and anywhere"; the concept of "mechanisms for rapidly developing services and products for customers"; and the concept of "mechanisms for addressing the organization's needs in a competitive environment." The concept of "outcomes and effects of the IT strategic roadmap (results)" encompasses categories such as: the category of enhancing IT governance; the category of improving IT architecture; and the category of implementing an IT infrastructure library.

4.3. Theoretical Enrichment Phase

In the theoretical enrichment phase, based on selective coding, it was determined that some of the proposed concepts overlap with each other and it may be necessary to separate other concepts into distinct categories. At this stage, efforts were made to select terms for the research concepts, and to integrate and refine the concepts for designing the IT strategic roadmap in knowledge-based industries of the country using the MAXQDA software:

Table 5. Integration and Improvement of Research Concepts

Intervention Conditions of the Strategic Roadmap of Information Technology (Challenging) with code (D)	Conditions Influencing the Strategic Roadmap of Information Technology (Influential) with code (A)
Topic of Challenges Related to the Size of the Organization with code (DA)	Topic of Defining the Vision and Goals of the Organization with code (AA)
Topic of Challenges Related to the Level of IT Utilization with code (DB)	Topic of Defining Key Performance Indicators of the Organization with code (AB)
Topic of Challenges Related to the Type of Industry with code (DC)	Topic of Analyzing the Organizational Environment with code (AC)
Mechanisms of the Strategic Roadmap of Information Technology (Strategies) with code (E)	**Core Topic of the Strategic Roadmap of Information Technology (Phenomenon) with code (B)**
Topic of Mechanisms for Utilizing the Internet Infrastructure to Provide Organizational Services Anytime and Anywhere with code (EA)	Topic of Evaluating Information Technology Strategy with code (BA)
Topic of Mechanisms for Rapid Development of Services and Products for Customers with code (EB)	Topic of Formulating Information Technology Strategy with code (BB)
Topic of Mechanisms for Addressing Organizational Needs in a Competitive Environment with code (EC)	Topic of Implementing Information Technology Strategy with code (BC)
Consequences and Impacts of the Strategic Roadmap of Information Technology (Results) with code (F)	**Contextual Conditions of the Strategic Roadmap of Information Technology (Facilitating) with code (C)**
Topic of Improving Information Technology Governance with code (FA)	Topic of Strategic Marketing Orientation Foundations with code (CA)
Topic of Improving Information Technology Architecture with code (FB)	Topic of Strategic Information Technology Orientation Foundations with code (CB)
Topic of Implementing the Information Technology Infrastructure Library with code (FC)	Topic of Organizational Strategic Orientation Foundations with code (CC)

In the theoretical enrichment phase, the drawn concept networks are examined and analyzed. Ultimately, the ranking of the research codes is based on their frequency in the coding matrix as follows:

Table 6. Ranking of research codes

	Code	All coded segments	Position
	AB	12	2
	BA	11	4
	EB	11	14
	FB	11	17
	DC	10	12
	EA	10	13
	CB	9	8
	FC	9	18

	AC	8	3
	BC	8	6
	CA	8	7
	CC	8	9
	DA	8	10
	FA	7	16
	EC	6	15
	AA	5	1
	BB	5	5
	DB	5	11

Ultimately, the theory extracted from the multiple grounded theory method for designing the IT Strategic Roadmap (ITSP) in the country's knowledge-based industries states that the IT strategic roadmap is designed based on the following components: causal conditions of the IT strategic roadmap (influential); the core category of the IT strategic roadmap (phenomenon); contextual conditions of the IT strategic roadmap (facilitating); intervening conditions of the IT strategic roadmap (challenging); mechanisms of the IT strategic roadmap (strategies); and outcomes and effects of the IT strategic roadmap (results). In fact, the concept of "causal conditions of the IT strategic roadmap (influential)" encompasses categories such as: the category of determining the organization's vision and goals; the category of establishing the organization's key performance indicators; and the category of analyzing the organization's environment. The concept of "core category of the IT strategic roadmap (phenomenon)" includes categories such as: the category of evaluating the IT strategy; the category of formulating the IT strategy; and the category of implementing the IT strategy.The concept of "contextual conditions of the IT strategic roadmap (facilitating)" encompasses categories such as: the category of strategic marketing orientation frameworks; the category of strategic information technology orientation frameworks; and the category of strategic organizational orientation frameworks. The concept of "intervening conditions of the IT strategic roadmap (challenging)" includes categories such as: the category of challenges related to the size of the organization; the category of challenges related to the level of IT utilization; and the category of challenges related to the type of industry.The concept of "mechanisms of the IT strategic roadmap (strategies)" includes categories such as: the category of mechanisms for leveraging the Internet to provide organizational services anytime and anywhere; the category of mechanisms for rapidly developing services and products for customers; and the category of mechanisms for addressing organizational needs in a competitive environment.The concept of "outcomes and effects of the IT strategic roadmap (results)" encompasses categories such as: the category of improving IT governance; the category of enhancing information technology architecture; and the category of implementing an IT infrastructure library.Finally, the qualitative model extracted from the qualitative methodology is as follows:

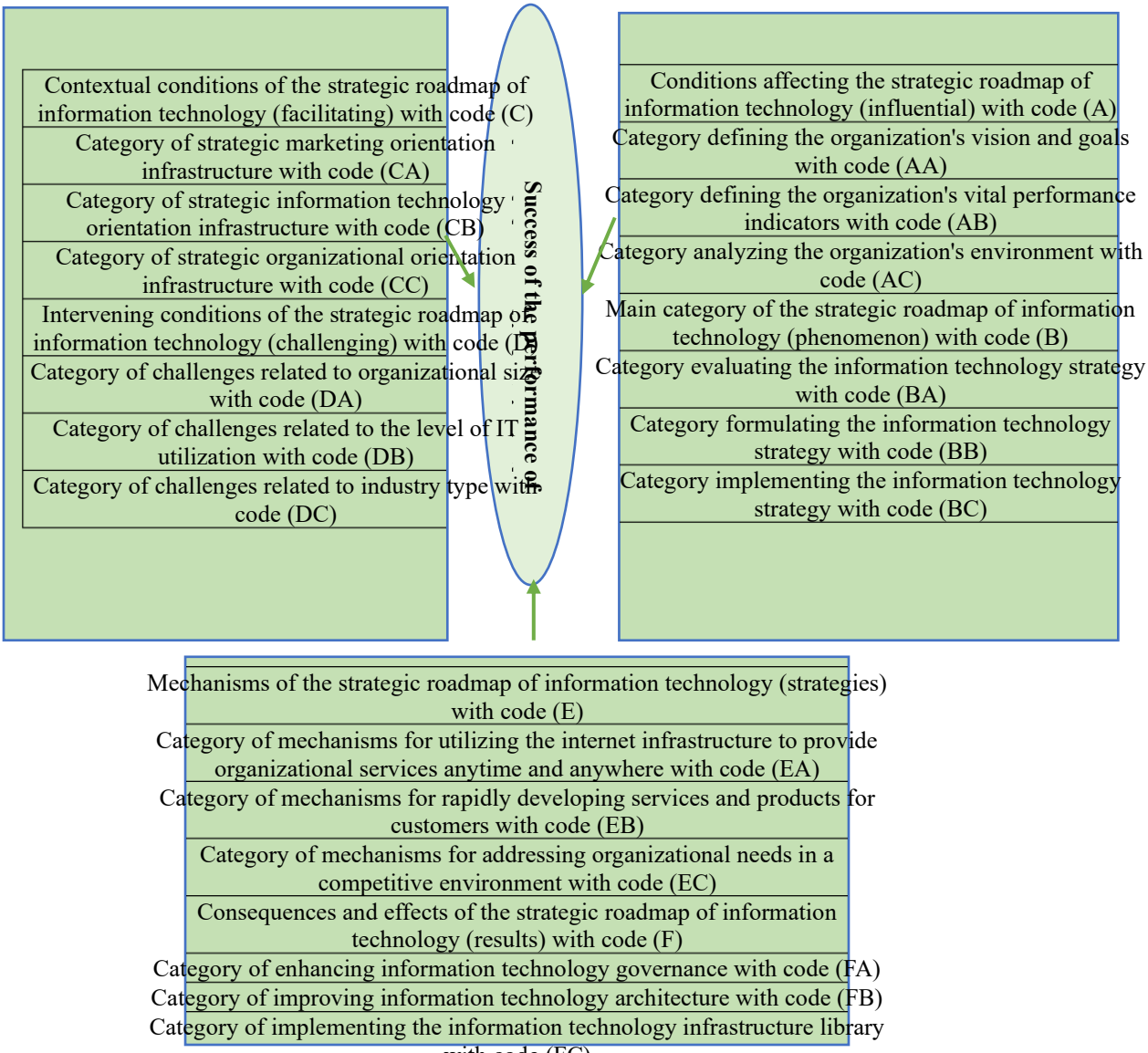

Figure 3: Qualitative model extracted from the research methodology

The topic of determining key performance indicators for the organization with code (AB) has the highest frequency in contextual conditions of the strategic roadmap for information technology (influential) with code (A), with a frequency of 12 out of 15 experts.The topic of improving the architecture of information technology with code (FB) has the highest frequency in the outcomes and effects of the strategic roadmap for information technology (results) with code (F), with a frequency of 11 out of 15 experts.The topic of evaluating the information technology strategy with the code (BA) has the highest frequency in the main category of the strategic roadmap for information technology (phenomenon) with code (B), with a frequency of 11 out of 15 experts.The topic of mechanisms for rapidly developing services and products to customers with code (EB) has the highest frequency in the mechanisms of the strategic roadmap for information technology (strategies) with code (E), with a frequency of 11 out of 15 experts.The topic of challenges related to the type of industry with code (DC) has the highest frequency in the intervening conditions of the strategic roadmap for information technology (challenging) with code (D), with a frequency of 10 out of 15 experts.The topic of platforms for strategic orientation of information technology

with code (CB) has the highest frequency in the contextual conditions of the strategic roadmap for information technology (enabling) with code (C), with a frequency of 11 out of 15 experts.To assess the extent to which the measurement tools of this research measure the desired characteristics, scientific documents and business standards, as well as the opinions of supervising and consulting professors and some experts and specialists working in the knowledge-based pharmaceutical industry, have been utilized. The tool for determining the variables of the initial decision-making model was finalized after incorporating their feedback through qualitative methodology.

5. Conclusion and Recommendations

The Grounded Theory method was utilized for designing a strategic roadmap for information technology. This qualitative analysis (Grounded Theory) was conducted to create a strategic roadmap for information technology in the knowledge-based industries of the country, specifically for the pharmaceutical industry. It aimed to identify, analyze, and report the patterns present in the qualitative data of the research. In the theory development stage, based on inductive coding, conceptual refinement, and pattern coding, the research data were explored. The opinions of 15 experts in knowledge-based pharmaceutical industries and academic scholars were collected through in-depth interviews during the spring of 2022. In the theory creation phase, to justify the use of the Grounded Theory technique, studies related to the research topic were referenced. By developing existing models from various studies, the main concepts derived from executing the qualitative methodology were extracted in the form of variables and indicators emphasized by the experts. In the theory validation phase, word selection for the research concepts was established using the Grounded Theory method through the MAXQDA software, creating connections among the main concepts. In the theoretical enrichment phase, based on selective coding, the theory extracted from the multi-grounded theory method for designing a strategic roadmap for information technology in the country’s knowledge-based industries states that the "causal conditions of the strategic roadmap for information technology (influential factors)" encompass categories such as: the category of determining the organization's vision and goals; the category of establishing vital performance indicators for the organization; and the category of environmental analysis. The concept of the "main category of the strategic roadmap for information technology (phenomenon)" includes categories such as: the category of evaluating the information technology strategy; the category of formulating the information technology strategy; and the category of implementing the information technology strategy. The "contextual conditions of the strategic roadmap for information technology (enabling factors)" encompass categories such as: the category of strategic marketing orientation; the category of strategic orientation in information technology; and the category of strategic orientation in the organization. Lastly, the concept of "intervening conditions of the strategic roadmap for information technology (challenges)" includes categories such as: the category of challenges related to organizational size; the category of challenges related to the level of information technology utilization; and the category of challenges related to the type of industry. The concept of "mechanisms of the strategic roadmap for information technology (strategies)" encompasses categories such as: the category of utilizing the internet infrastructure to provide organizational services anytime and anywhere; the category of rapidly developing services and products for customers; and the category of addressing organizational needs in a competitive environment.The concept of "consequences and effects of the strategic roadmap for information technology (results)" includes categories such as: the category of enhancing IT governance; the category of improving IT architecture; and the category of implementing an IT infrastructure library.

The findings related to the causal conditions of the strategic roadmap for information technology (influential factors) in the present research align with the results of the studies by Kurpila et al. (2022) and Hogue and McDonough (2021), as significant attention has been given to determining the organization's

vision and goals, conducting environmental analysis, and establishing vital performance indicators for the organization. The findings related to the main category of the strategic roadmap for information technology (the phenomenon) in the present research align with the results of the studies by Priz et al. (2021) and Yin et al. (2020), as the formulation, implementation, and evaluation of the information technology strategy have been examined.

The findings regarding the contextual conditions of the strategic roadmap for information technology (enabling factors) in this research correspond with the results of the studies by Priz et al. (2021) and Gable (2021), as significant attention has been given to the enabling environments for strategic orientation in information technology, organizational strategic orientation, and marketing strategic orientation.

The findings related to the intervening conditions of the strategic roadmap for information technology (challenges) align with the results from the studies by Shao (2019) and Orsa et al. (2018), as the challenges concerning the type of industry, organizational size, and the level of utilization of information technology have been investigated.

The findings related to the mechanisms of the strategic roadmap for information technology (strategies) in the current research are in line with the results of the studies by Yin et al. (2020) and Kurpila et al. (2022), as substantial emphasis has been placed on mechanisms for the rapid development of services and products for customers, mechanisms for addressing organizational needs in a competitive environment, and mechanisms for utilizing internet infrastructure to provide organizational services anytime and anywhere.

The findings related to the consequences and impacts of the strategic roadmap for information technology (results) in the present research align with the results of the studies by Priz et al. (2021) and Gable (2021), as enhancements in information technology governance, the implementation of IT infrastructure libraries, and improvements in IT architecture have been examined.

The development of information technology has brought about profound transformations in the objectives, execution processes, products, and organizational structures. Information technology provides organizations with the opportunity to eliminate many parallel and repetitive tasks, allowing a significant volume of manual activities to be transferred to computer systems. Consequently, this enables organizations to have more capacity and time to engage in revisions and work planning.

From a structural perspective, organizations have witnessed numerous transformations due to the widespread adoption of computer systems, which necessitate new viewpoints and thoughts among managers and employees, as well as new principles and definitions for their implementation and use. In this context, a new vision is being implemented in organizations, leading to the establishment of appropriate working principles between customers and organizations based on information technology services.

All these mentioned transformations have created a foundation for organizations to develop a fresh perspective on the concept of information and the impact of information technology in optimizing and utilizing information to generate benefits. Today, information is regarded as a valuable resource and asset for organizations, and its value and credibility surpass even significant indicators such as capital or workforce. Information technology can assist organizations in competitive processes. The advantages and benefits of applying information technology in business can include various factors. These factors include increased speed of information and service delivery, enhanced quantity and quality of production, the potential for market expansion, the ability to assess needs for offering new goods and services, prevention of customer turnover to competitors, and the creation of added value for customers. Successful utilization

of such a system within an organization requires a thorough and precise understanding of the organization, its resources, and awareness of methods for selecting and developing information technology in business.

Developing countries, by adopting a strategy for the domestic utilization of this industry, can more easily navigate the stages of economic development. That is, as information and communication technology expands within the country, all segments of society will have access to modern technologies. This strategy will promote the dissemination of modern technologies with high productivity throughout society. The internal usage of these technologies, accompanied by the growth of information and communication technology in the country, will lead to an increase in the supply of human capital, which is itself a significant factor in the growth and economic development of these countries. Ultimately, these processes will also result in the expansion of exports of products and services related to this technology. Considering the aforementioned issues, the adoption of an information and communication technology (ICT) strategy varies between large and small countries. For large countries, where transfers are significantly important for economic growth, adopting a strategy for domestic utilization of this technology can have a greater impact on growth and economic development than a strategy focused on exporting ICT goods and services. By implementing such a strategy, the sustainability of this industry within society is enhanced, and the economy is better protected against external shocks.

In contrast, small countries, where the extent of economic activities is less critical, can benefit more from policies aimed at expanding the export of ICT products and services. Therefore, governments in developing countries should adopt a national strategy for the expansion of information and communication technology in their countries. Among these strategies, the domestic utilization of ICT for large countries, particularly for our own country, will be the best and most effective strategy. Based on the research findings, it is suggested that one of the advantages of utilizing case studies in this study is that a case study provides a systematic approach to examining events, collecting data, analyzing that data, and reporting results for research execution. This approach is particularly important as digital transformation and the provision of services across all sectors and industries have been among the most significant factors for growth and development. The healthcare industry, albeit to a limited extent, has also benefited from this transformation.

Operators and stakeholders in the healthcare industry at all levels, both public and private, from providing medical services to the distribution of pharmaceuticals, have recognized that improving and enhancing the health and wellness of the country at a global level requires digital transformation. This is because, in the near future, the healthcare system will shift towards a consumer-centered approach, transferring the responsibility for managing individuals to the consumers themselves.

Electronic medical and pharmaceutical consultation services must leverage new information technology systems to train skilled technical personnel and reduce error rates in this industry—between the patient and the medicine. Establishing an IT infrastructure with modern global technologies in the pharmaceutical industry can not only enhance the quality of pharmaceutical products and standardize them but also facilitate their export to patients. This improvement will lead to a reduction in medication errors and the distribution of defective and substandard products within society.

Furthermore, by establishing this system within the pharmaceutical industry, the first step can be taken toward creating a communication bridge among various stakeholders, including producers and distributors, to prevent the proliferation of biological drugs and mixed products while ensuring quality convergence among different pharmaceutical products.

In fact, the research recommendations aimed at ensuring the successful performance of knowledge-based industries in the pharmaceutical sector include: In fact, the implementation of information technology in the pharmaceutical industry of the country can play a more effective and reliable role in the industry by

creating a consistent quality management system and delivering pharmaceutical-medical products. It is important to reach the point that good intentions and thoughts alone do not create a good product or service. Rather, by establishing a strong communication and information system aimed at integrating and mechanizing the pharmaceutical industry of the country, sharing this information in all places providing pharmaceutical services and medical equipment can have an impact. The current prescription and procurement process for medications includes issues that can sometimes lead to problems such as finding a suitable pharmacy, increased urban traffic, searching for specific or rare medications, misuse of insurance services, wasting time, and paying cash amounts.

Considering that our society has moved towards dynamics and the research method is not dynamic and dynamic and it is considered as a limitation of this research, therefore to future researchers.

Considering the aforementioned points, the most important recommendations and suggestions for future research can be expressed as follows: utilizing the system dynamics technique (Vensim) for modeling the dynamic success of performance in knowledge-based industries in the pharmaceutical sector; employing the data envelopment analysis (DEA) technique to model the efficiency of successful performance in knowledge-based industries in the pharmaceutical sector; and leveraging other artificial intelligence (AI) techniques, especially artificial neural networks, along with the most relevant and important algorithms available in the field of artificial intelligence to enhance the content richness of the aforementioned system and improve its fuzzy inference process for the successful performance of knowledge-based industries in the pharmaceutical sector.

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