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Future Studies of Information Technology Service Management (ITSM) for the Implementation of E-Government in Iran with a Focus on Cross-Impact approach

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ABSTRACT

E-governance encompasses a range of functions and studies that refer to the use of information and technology to support and enhance government policies, governmental operations, citizen engagement and participation, and the provision of timely and comprehensive government services. The aim of this research is to study the future of IT Service Management (ITSM) with the goal of implementing e-governance in the country, focusing on the interactions between various factors **.**

The aim of this research is to study the future of IT Service Management (ITSM) with the goal of implementing e-governance in the country, focusing on the interactions between various factors . This research is applied in terms of its objective and exploratory in nature. The participants in the study consisted of 15 experts in technology and information management, selected through purposive sampling of a judgmental type. Cross-impact analysis and the MICMAC software were used for data processing .

The effective drivers of IT Service Management (ITSM) aimed at implementing e-governance were categorized in this research. These drivers include: executive role, authoritative role, transparency procedures, ITSM procedures, electronic citizen engagement, electronic social interaction, organizational interaction, digital social components, environmental components, development of ITSM applications, role of government institutions, role of private institutions, complexity of collaboration, project goal orientation, investment in digital infrastructure, data sharing management, digital attitude change, transparency of digital knowledge, standardization of data digitization, digital technical infrastructure, human resources infrastructure, financial infrastructure, international aspects, and national aspects. **©authors**

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Introduction

Information technology (IT) is a key factor in the transformation and progress of modern societies, facilitating information and communication management, increasing productivity and efficiency in all aspects of life (He, Zhang & Li 2021; Li, Akouatcha, Akram & Anaba 2021). In organizations, IT is a powerful tool for improving business processes, reducing costs, and increasing the quality of services and products. By automating repetitive and complex tasks, IT allows managers and employees to focus on strategic decision-making. Also, IT provides valuable insights into the market and customers through data management and information analysis systems, which leads to the development of innovation and competitiveness (Tian & Wang 2023). In everyday life, IT allows people to access global information and communicate with others anywhere in the world. Social networks, online educational programs, and e-commerce are examples of the positive impacts of IT on people's lives (Liu 2023). In addition, IT also plays a vital role in areas such as healthcare, education, and the environment (Liu, Sun, Du & Edziah 2022). For example, IT-based medical systems help doctors diagnose diseases faster and provide better treatments. In general, information technology has become a key factor in social and economic development by accelerating the exchange of knowledge and expanding access to resources (Berdik, Otoum, Schmidt, Porter & Jararweh, 2021).

The use of information technology (IT) in an organization guarantees the success of information technology in the organization, which is the responsibility of Information Technology Service Management (ITSM). This model forms a structure based on facilitating affairs in various dimensions and is fundamentally based on improving conditions in society (Peng 2021). Accordingly, IT service management is referred to as the totality of activities carried out by the organization with the aim of designing, planning, delivering, operating, and controlling Information Technology (IT) services to provide to customers (Sun 2020). This structure includes information on various activities that are directed to maintain the Information Technology Infrastructure (ITIL). Therefore, IT service management is considered important for any organization, even in an organization that is not related to IT (Yandri 2019). E-governance encompasses a range of practices and studies that refer to the use of information and technology to support and improve government policies, government operations, citizen engagement and engagement, and the delivery of relevant, timely, and comprehensive government services (Ramakrishnan, Gregor & Shrestha 2024). As one of the key concepts in modern government management, e-governance encompasses a set of practices and studies that aim to utilize information and communication technology to improve the efficiency and transparency of government operations. This concept emphasizes the use of technology to support and implement public policies, improve government organizational operations, and increase citizen participation (Rashidi 2019). Through digital tools such as e-government platforms, data management systems, and public service applications, governments can provide timely, accurate, and comprehensive services that save time and money while also increasing the quality of communication between government and citizens (Rajagopal & Ramkumar 2023). In addition, e-governance plays a key role in enhancing transparency and public trust. The use of new technologies such as artificial intelligence, blockchain, and data mining in government processes can help detect and prevent corruption, reduce bureaucracy, and improve government accountability. Also, by providing platforms for citizen participation in decision-making and policy-making, e-governance plays an important role in making societies more democratic. As such, the concept is not only a tool for efficient service delivery, but also provides a framework for promoting social interactions and strengthening the connection between government and society (Karamitsos, Murad & Modak 2022).

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In explaining the importance of the issue of information technology and the necessity of adapting to a technology-driven world, technological developments and new technologies have led to the rapid development of urban areas and the need to improve the lives of citizens (Fernandes 2021) and have led to the evolution of modern public administration (Liao & Wang 2018). In a smart city, the main responsibility of public administration is to ensure the achievement of smart city goals by ensuring open data, long-term commitments, targeted policies and leadership. Public administration acts as a vehicle for sustainable development, so it needs to be redesigned to work more successfully and overcome the challenges arising from the heavy reliance on centralized systems (Sohn & Kwon 2020). To reduce the aforementioned challenges, the use of new technologies and their management has the potential to expand the scope of public service systems and create more innovative public service delivery channels (Chu & So 2021), and this structure creates e-government within society. Accordingly, e-government refers to the use of information technology to implement administrative system policies (Feversani, De Castro & Marcos 2023). To implement these policies, the government uses information technology to transfer information between people, organizations, the market, and other government organs. Accordingly, given the importance of IT service management and its role in creating e-government, as well as the importance of planning and forecasting the future in e-government and information technology in order to remove development barriers, this study examines the status of IT service management (ITSM) with the aim of implementing e-government in the country. Therefore, the research questions are:

-Identifying the indicators and components of the future of information technology service management with the aim of implementing e-government

- Identifying the causal structure of the indicators and components of the future of information technology service management with the aim of implementing e-government

Literature Review

ITSM is process-focused and in this sense has common links and interests with frameworks and methodologies of the process improvement movement (e.g., Total Quality Management (TQM), Six Sigma, Business Process Management, CMMI). The discipline is not concerned with the details of how a particular vendor's product is used or necessarily with the technical details of the systems being managed. Instead, it focuses on providing a framework for structuring IT-related activities and the interactions of IT technical personnel with customers and business users. One of the main origins of ITSM can be found in the systems management services and functions that were historically performed in large-scale environments. Through continuous refinement over the years, these services and functions have reached a high level of maturity (Neves & Silva 2023). The Office of Government Commerce (OGC), the developer of ITIL, defined ITIL as "a set of best practice guidelines for ITSM" (Figure 1) and ITSM as "a top-down, business-driven approach to IT management that specifically addresses the strategic business value generated by the IT organization and the need to deliver high-quality IT services. ITSM is designed to focus on the people, processes, and technology issues that IT organizations face. It takes its name from a series of publications written by IT professionals and industry experts that provide guidance on best practices for IT service management (Axelos 2019).

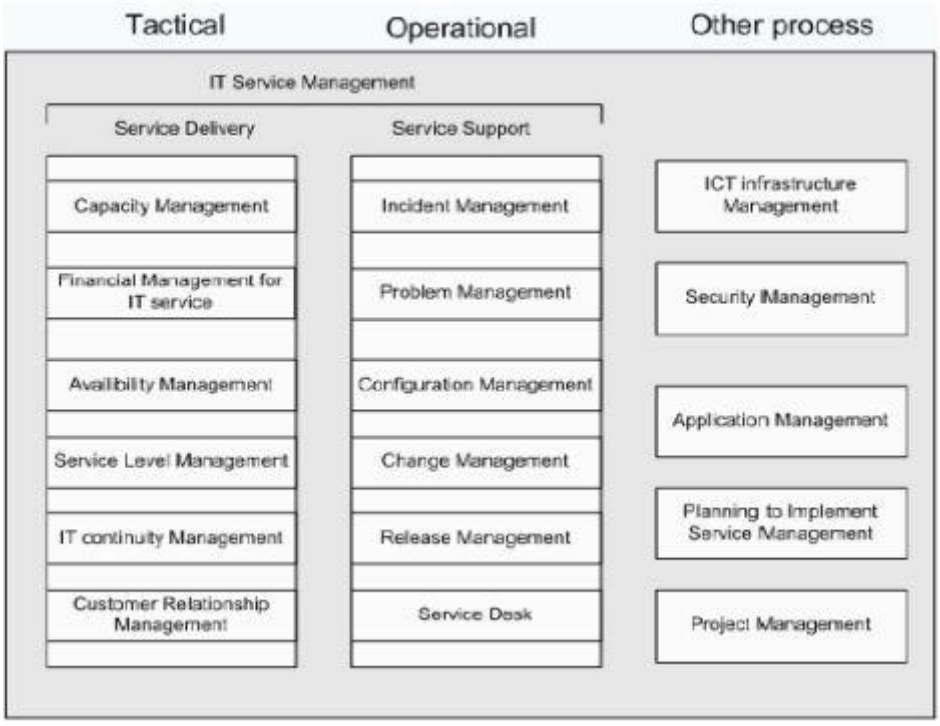

Figure 1. *ITIL Infrastructure (Meziani & Saleh 2010)*

ITIL describes two domains and eleven processes of IT service management as follows: the service support domain with the processes of service desk, incident management, critical situation management, configuration management, change management and system resilience. and the service delivery domain with the processes of service level management, capacity management, IT service continuity management, availability management and financial management for IT services. A hierarchical structure of roles and responsibilities is also presented within each process. In addition, the International Organization for Standardization (ISO) created ISO20000 as an international standard specification for IT

service management in 2005, which, based on the ITIL OGC standard, replaced the British Standards Institution's BS15000 specification (Nam, Kim & Nam 2022). IT is a concept that drives business. The reality is that business profitability and the quality of customer service depend on the high availability, reliability, security and performance of IT services. ITIL provides the foundation for high-quality IT service management. IT proactively supports the company's goals by providing services based on efficient principles and adequately meeting business requirements. It can become a profit generator rather than being considered an unavoidable cost burden. The main benefits of using ITIL principles are (Bergeron et al., 2020):

- Improved availability, reliability, and security of mission-critical IT services
- Documented and communicated roles and responsibilities in service delivery
- Optimized IT infrastructure to meet existing and projected business needs.
- Permanent reduction in IT total cost of ownership (TCO), including service costs (Sharifian 2022).

Given the increasing growth of IT and the dependence of organizations on it, IT service management is recognized as a strategic and critical process. IT service management is a set of practices, methods, roles, and other activities used to deliver business value to customers through IT services. Businesses are increasingly relying on information and communication technology, which requires the delivery of high-quality applications and IT services tailored to their needs. The ITIL standard describes how to establish IT service management practices and ensure their continuous improvement. Organizations and businesses are rapidly transitioning from a commodity-based economy to a service-based economy. For this reason, there has been an increased focus on IT service innovation and IT service management standards that help businesses create, deliver, implement, and manage IT services to achieve their business objectives (Castro & Lopes 2022). Managing growth while reducing costs is a demand for digital businesses, but it is particularly difficult for IT infrastructure and operations. The authors concluded their paper by claiming that many IT companies have begun automating repetitive and repetitive activities and are moving towards an opportunistic approach to automating their IT processes (Dhaoui 2022). The authors specifically examined the scope of IT service management automation from the perspective of the ITIL process and discussed the potential benefits and drawbacks of automation in the IT industry. A systematic approach to assessing IT processes is essential for successful implementation in large-scale IT service management automation projects. An IT service management scope matrix was also developed to validate the automation approach (Eikebrokk & Iden 2017).

The authors state in their study that IT service management is considered a critical component of a company's IT development (Hochstein, Tamm & Brenner 2005). They concluded that many IT service management tools are available to facilitate organizations in implementing ITSM, however, since these tools are complex, difficult to apply and overlap, companies will find it much more challenging to implement all of them simultaneously (Kouladoum 2023). In view of these, IT service management as a strategic factor in e-organizations can help improve the organization's performance and performance, increase productivity, reduce costs and risks, improve user experience and increase customer satisfaction. Consequently, IT service management should be considered as a critical element in e-organizations and should be considered as a strategic and vital part of the organization (Adeleye, Adedoyin & Nathaniel 2021). The following is a review of domestic and foreign research in line with the objectives of the study: Morteza Nejad et al. (1401) in a study titled Investigating the Effects of Covid-19 on e-Government showed that e-Government has been a key catalyst in the new public management transformation agenda to reinvent public administration and make it more efficient and effective. The value of e-Government is recognized worldwide. Transparency, efficiency, cost reduction, improved service delivery, accountability, and corruption reduction are the most important benefits of e-Government, which are considered

to be the main goals of governments. John Fazza et al. (2022) in a study titled The Necessity of Establishing e-Government in Government Organizations concluded that e-Government is a new approach for governments that uses new technologies to facilitate individuals' access to government information and services, improve the quality of services, and provide more opportunities for people to participate in democratic processes and institutions. In other words, e-government plays an important role in connecting citizens with each other and with the government by providing services at lower cost and higher effectiveness. On the other hand, Salehi & Vazvi (2019), in a study that examined the impact of implementing ISMS (Information Security Management System) and ITIL (Information Technology Infrastructure Library) on the improvement of information systems and the continuity of IT services, showed that these two frameworks play an effective role in improving information systems and IT services. This study identified the effective factors and provided suggestions for improving the performance of organizations in this area. Saroor et al. (2023) in a study titled Digital Transformation of Public Sector Governance with IT Service Management - A Pilot Study showed that the provision of public services depends on the quality of IT services that can be achieved through IT service management. This research study reviews some of the established standards and frameworks of IT service management and suggests the most appropriate and sustainable tools and implementation roadmap for the digital transformation of public sector governance (Sarwar, Abbas, Alyas, Alzahrani, Alghamdi & Alsaawy 2023).

In a study titled Digital Governance: Performance Assessment and Best Practices, Manoharan et al. (2023) showed that e-government has evolved from providing static content and services to integrating user-generated content and social media technologies. This allows citizens to participate and provide regular feedback on policies and programs, both of which enhance public value through e-democracy (Manoharan, Melitski & Holzer 2023). Dehai (2022) in a study titled e-government for sustainable development: Evidence from MENA countries showed that digitalization improves corruption control and government effectiveness, and to a lesser extent, the quality of oversight. The Middle East and North Africa countries should promote competitive business environments, increase accountability, and improve education and skills development systems (Dhaoui 2022). According to the studies conducted, despite numerous studies on various aspects of e-government, few studies have been conducted on the impact and consequences of e-government and the ultimate goals of e-government in the world and Iran, and in a way, it can be said that the performance assessment of IT service management and the impact of e-government is unclear. On the other hand, Iran's relatively low rank among countries in the world and the Asian continent, and considering the goals of the Iranian government to improve this rank and the predictions made in the text of the Sixth National Development Plan, is another reason for the importance of conducting this research. Therefore, the researcher in this study intends to reveal the dimensions of this interaction through conventional research methods and balanced analysis methods, given this undeniable impact and influence of e-government. Meanwhile, conducting the present study is considered important for the following reasons:

1- The first reason is that the country does not have much time to achieve the goals defined in the upstream documents (the Vision Document and the Sixth Development Plan), and after nearly 15 years since the Supreme Leader announced the country's twenty-year vision document in 2024, statistics from international authorities show Iran's weak position among the countries of the region, and on the other hand, no serious pathology has been carried out in this regard. In the Sixth Development Plan, by defining the duties of the government in the form of 5 articles, it is emphasized to establish e-government by the end of 2022 and to achieve the second position in the region in technology, which is considered in the 2024 vision, but the study of Iran's ranking among the countries of the world according to the United Nations report considers the realization of the above vision to be difficult.

2- The second reason refers to the desirable potentials of information technology service management and e-government and its positive effects on various areas of society. Helping to resolve the crisis of public trust in the government through transparency of procedures, demanding facilitation of services and democratization of processes, the emergence of the young and adolescent generation with different characteristics and expectations from previous and current generations, cost savings, the role of e-government in realizing the information society, and the centrality of good governance on the foundations of e-government are among the reasons for the importance of addressing the hidden corners of e-government.

3- The third reason is the lack of a scientific and structured view of the topic of e-government management in the country, an issue that targets the management capacity of government institutions for the implementation and development of e-government. However, due to reasons such as the technological view of e-government in most countries, including Iran, and the lack of attention to the impact of managers' capacity on the success or failure of e-government, no research has been conducted to examine how the beneficial impact of "government managers" on the achievement of e-government goals in the country.

Method

This research is applied in terms of purpose and exploratory in nature, and was conducted using futures research methods. To identify the drivers affecting IT service management (ITSM) with the aim of implementing e-government, two methods of documentary and Delphi studies were used. The Delphi team was selected using a purposive and judgmental sampling method, and criteria such as theoretical mastery, practical experience, willingness and ability to collaborate in research, and access to experts were considered in the selection process. In the Delphi method, the number of participants is usually less than 50 people and often between 15 and 20 people. Accordingly, 15 experts and specialists active in academic and research centers in 2024 were selected as members of the Delphi team for this research.

Table 1. *Demographic characteristics of experts*

Demographic characteristics		Frequency	Percentage
Gender	Male	10	69%
	Female	5	31%
Work experience	Under 10 years	11	75%
	Over 11 years	4	25%
	Total	15	100%

In data processing, the structural interaction analysis method was used in MICMAC software (3). As a result of monitoring variables, 24 primary drivers were identified and clustered based on library studies (Table 2).

Table 2. *Drivers influencing IT Service Management (ITSM) for the purpose of implementing e-government*

Item	Pioneer
C1	Executive Role
C2	Authoritative Role
C3	Transparency Process
C4	ITSM Process
C5	E-Citizenship Interaction
C6	E-Social Interaction
C7	Organizational Interaction
C8	Digital Social Components
C9	Environmental Components
C10	ITSM Application Development
C11	Role of Government Institutions
C12	Role of Private Institutions
C13	Collaboration Complexity
C14	Project Purposefulness
C15	Digital Infrastructure Investment

C16	Data Sharing Management
C17	Digital Attitude Change
C18	Digital Knowledge Transparency
C19	Data Digitization Standardization
C20	Digital Technical Infrastructure
C21	Human Resource Infrastructure
C22	Pioneer
C23	Executive Role
C24	Authoritative Role

Findings

Formation of the received matrix

At this stage, soft operations research methods such as conceptual mapping, causal mapping, or cognitive mapping can be used. However, the appropriate and emphasized method is to form an n×n matrix of the identified indicators. Then determine the relationships of these indicators based on the table below. In the table of mutual effects below, the effect of each variable on the other variable (column effect on row) is determined with a score between zero and three.

Table 3. *Spectrum used*

No effect	Low impact	Medium impact	High impact
Zero	one	Two	Three

Table 4. *Received matrix*

C24	C23	C22	C21	C20	C19	C18	C17	C16	C15	C14	C13	C12	C11	C10	C9	C8	C7	C6	C5	C4	C3	C2	C1	
1	1	0	3	0	0	1	1	3	1	0	0	2	3	2	1	2	1	3	3	2	3	3	0	C1
1	1	1	2	1	0	0	2	2	0	1	3	2	2	1	1	2	1	2	3	2	3	0	3	C2
2	1	2	2	1	2	1	2	2	2	2	2	1	1	0	1	1	1	1	2	3	0	2	1	C3
1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	2	1	0	1	1	1	C4
1	1	2	2	1	1	1	1	1	1	2	3	2	2	1	1	1	1	2	0	2	2	3	2	C5
1	1	0	1	1	1	1	1	2	1	2	2	1	1	1	1	1	1	0	1	1	1	1	1	C6
1	1	0	1	1	1	1	2	2	1	1	1	1	2	1	2	3	0	3	2	3	3	2	3	C7
1	1	1	1	0	1	1	2	2	1	1	1	1	2	1	1	0	1	3	2	2	3	2	2	C8
0	1	1	1	0	0	1	2	2	1	1	2	2	2	2	0	3	2	2	2	3	3	3	3	C9
0	1	1	1	0	1	1	2	1	1	1	2	1	1	0	2	2	2	2	2	2	3	3	3	C10
1	1	1	1	0	0	1	2	2	1	1	2	1	0	1	1	1	1	2	2	2	2	2	2	C11
0	0	1	1	0	0	0	1	2	1	1	3	0	2	1	1	1	1	1	2	1	2	1	1	C12
2	1	2	2	2	2	0	1	1	2	2	0	1	2	1	1	1	1	2	1	1	1	1	1	C13
1	0	1	1	1	1	1	1	1	2	0	2	0	2	0	1	1	0	1	1	1	1	1	1	C14
2	2	2	1	2	1	1	2	1	0	1	2	1	2	1	1	1	0	1	2	1	1	1	1	C15
1	1	1	2	1	1	1	1	0	1	1	1	0	2	1	1	1	1	2	1	2	2	1	2	C16
1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C17
2	1	2	2	2	2	0	2	0	3	3	1	1	2	1	1	1	0	1	1	1	1	1	1	C18
2	1	2	2	2	0	2	1	1	2	2	1	0	2	1	1	1	0	1	1	1	1	1	1	C19
2	2	2	1	0	1	0	0	1	2	2	1	0	1	0	1	1	0	1	1	1	1	1	1	C20
1	1	1	0	1	2	1	1	1	2	2	2	0	2	0	0	0	0	1	0	1	1	1	1	C21
1	1	0	1	1	1	1	1	1	2	2	1	0	1	0	1	1	0	0	1	0	1	1	0	C22
1	0	1	1	1	1	0	1	1	2	2	1	0	1	0	1	1	0	0	1	1	1	0	0	C23
0	1	1	1	2	1	1	1	1	2	2	0	0	2	0	0	1	0	0	1	1	1	0	0	C24

Table 5 shows the results of the interaction effects of the 24 influential components based on the formation of a 24×24 matrix. The results of this table indicate a repetition rate of 2 times and a filling degree of 83%, which indicates that the selected variables have influenced each other to some extent. Of the total 483 evaluable relationships in the matrix, 93 relationships are zero; this value means that the factors do not influence each other or are not affected by each other. 312 relationships with a value of one have a weak effect on each other and 139 relationships with a value of 2 have relatively strong influence relationships. In addition, 32

relationships have a value of 3, which means that the relationships of the key variables are very high and have a high influence and impact.

Table 5. *Initial analysis of matrix data and interaction effects of variables*

Indexes	Amount
Matrix size	24
Repetition for final access	2
Number zero	93
Number one	312
Number two	139
Number three	32
Total	483
Final percentage	83%
Indexes	Amount

The matrix of this research, based on the studied drivers with 2 rotations, has a suitability and optimization of 100%, which indicates the high validity of the questionnaire and its responses (Table 6).

Table 6*. Degree of suitability and optimization of the matrix*

Rotation	Effectiveness	Being Effected
1	97%	97%
2	100%	100%

The degree of direct influence and interdependence of factors on each other

Table 7 ranks the drivers affecting ITSM for the purpose of implementing e-government based on their direct influence. It should be noted that the drivers that score the highest points change their degree of influence and interdependence.

Table 7. *The degree of direct influence of factors on each other*

Components	Driver	No. of columns	No. of lines
C1	Executive role	32	36
C2	Authoritative role	33	36
C3	Transparency process	39	35
C4	ITSM process	35	25
C5	E-citizenship interaction	34	36
C6	E-social interaction	34	25
C7	Organizational interaction	16	38
C8	Digital social components	29	33
C9	Environmental components	24	39
C10	ITSM application development	18	35
C11	Role of government institutions	39	30
C12	Role of private institutions	19	24
C13	Complexity of cooperation	35	31
C14	Project targeting	34	22
C15	Digital infrastructure investment	33	30
C16	Data sharing management	32	28
C17	Digital attitude change	31	21
C18	Digital knowledge transparency	19	32
C19	Data digitization standardization	22	29
C20	Digital technical infrastructure	21	23
C21	Human resource infrastructure	32	22
C22	Financial infrastructure	27	19
C23	International aspect	22	18
C24	National aspect	26	19

Evaluation of the influence and influence plan of variables

Evaluation of the influence and influence pattern of variables shows that the way they are dispersed in the dispersion plane can indicate the degree of stability or instability of the system. In the analysis of interaction/structure effects performed using the MICMAC software, two types of dispersion patterns are defined: stable systems and unstable systems. In a stable system, variables are dispersed in an L-shaped pattern; in such a way that some

variables have a high influence and others show a high influence. In contrast, unstable systems are more complex; in this pattern, variables are mainly dispersed around the diagonal axis of the plane and often have an intermediate state of influence and influence that makes it difficult to identify key variables. In examining the dispersion status of drivers affecting the future of Information Technology Service Management (ITSM) with the aim of implementing e-government, an unstable system was observed. In this system, most of the variables are scattered near the diagonal axis of the plate. Except for a limited number of variables that have a high impact on the system, the other variables are in almost the same position relative to each other, which indicates the complexity and difficulty of identifying key factors in such a system (Figures 1 and 2).

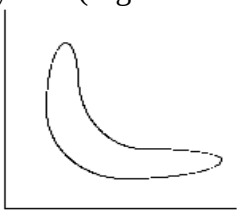

Figure 1. *Stable system*

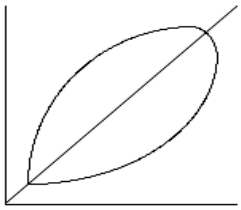

Figure 2. *Unstable system*

Figure 3 shows the IT Service Management (ITSM) fragmentation pattern for the purpose of implementing e-government. This fragmentation pattern generally represents the state of an unstable system (Figure 3).

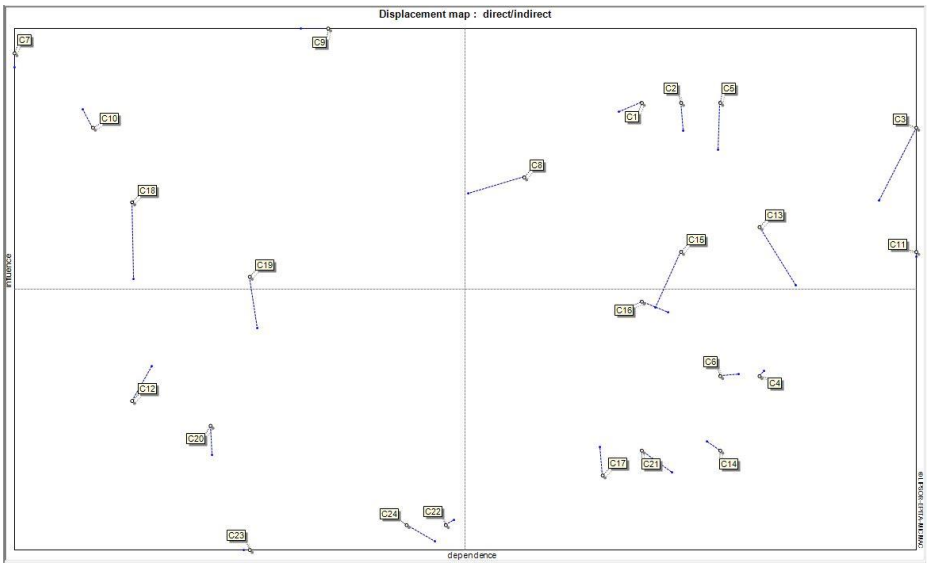

Figure 3. *Scatter pattern of factors affecting ITSM for e-government implementation*

Category of factors affecting the future of ITSM for e-government implementation

Determining or influencing factors are variables that play a major role in the formation of the system, because they are more influential and less influenced by other factors. These variables, which are located in the northwest part of the scatter diagram, are of great importance because system changes are strongly dependent on them. Controlling and managing these factors is considered a key aspect for maintaining the stability and efficiency of the system. In addition, these variables act as the main inputs of the system and determine its performance path. In this study, which examined 24 factors, a number of factors have been identified as key drivers affecting the research model. These factors include organizational interaction, environmental components, ITSM application development, and digital knowledge transparency, which fall into this category and play a decisive role in the research model.

"Bimodal" factors: These factors have a very high impact and impact at the same time and are located in the northeastern part of the scatter diagram. The main feature of these factors is their instability, because any change or action related to these variables directly affects other system factors and will result in reactions. The factors in this area include the executive role, the authoritative role, transparency procedures, e-citizenship engagement, and investment in digital infrastructure. Given their high importance and sensitivity, these variables require careful and strategic management in order to maintain the balance of the system and prevent unexpected reactions. The two-dimensional factors consist of two parts: risk and goal drivers:

Risk factors: These factors are located above the diagonal line in the northeast area of the figure, as shown in the figure, and have a great potential to become key players in the system. The executive role and the authoritative role are located in this part.

Goal factors: These factors are located in the lower part of the diagonal axis located in the northeast area of the scatter diagram. These variables act as the evolutionary outcomes of the system and represent the potential goals that a system can achieve. By making changes and making amendments to these factors, it is possible to guide the system towards evolution and achieving the desired goals. In this study, components such as transparency procedures, e-citizenship interaction, and investment in digital infrastructure are located in this part, which indicates their importance in achieving the evolution and progress of the system.

"Affectable" factors or, better put, "outcome" drivers: These factors are located in the southeastern part of the scatter diagram and have the characteristics of low impact and very high impact. For this reason, they are strongly affected by the changes and evolution of the influencing and bimodal factors and play the role of the output of the system. The sensitivity of these variables to changes in other parts of the system has made them dependent and result-oriented factors. In this study, factors such as ITSM practice, electronic social interaction, the role of government institutions, collaboration complexity, project purposefulness, data sharing management, digital attitude change, human resource infrastructure, and financial infrastructure are located in this area. These factors indicate the final results and impacts of the system in response to changes in the drivers.

Independent or excluded factors: These factors have low impact and impact and are located in the southwestern part of the scatter diagram. These variables do not seem to be directly related to the system, as they neither hinder the functioning of the main factors nor play a role in the development and evolution of the system. In this study, factors such as the role of private institutions, digital standardization of data, digital technical infrastructure, international and national aspects are included in this section. However, even in this group, special attention should be paid to two specific types of drivers that may affect the system under certain conditions.

"Discrete" factors: These factors are located near the origin of the coordinates in the diagram. It is understood that the evolution of these variables is not related to the dynamics of the current system and they can be removed from the system. There is no discrete factor in this study.

"Secondary leverage" factors: These drivers, although they operate completely independently, are more influential than influenced. These factors are located in the southwestern part of the diagram and above the diagonal line and can be used as criteria for measurement and evaluation. In this study, variables such as the role of private institutions and the standardization of data digitization are identified as secondary levers.

"Moderating" factors: These factors are located near the center of gravity of the diagram. They can act sequentially as "secondary levers", "weak targets" and "secondary risk drivers", in this study no moderating driver was identified. The following figures show the graphical representation of the drivers that affect. In these figures, the direct and indirect effects of the drivers on other drivers in the system are specified. How the drivers affect each other is

described as the strongest impact, strong impact, medium impact, weak impact and weakest impact.

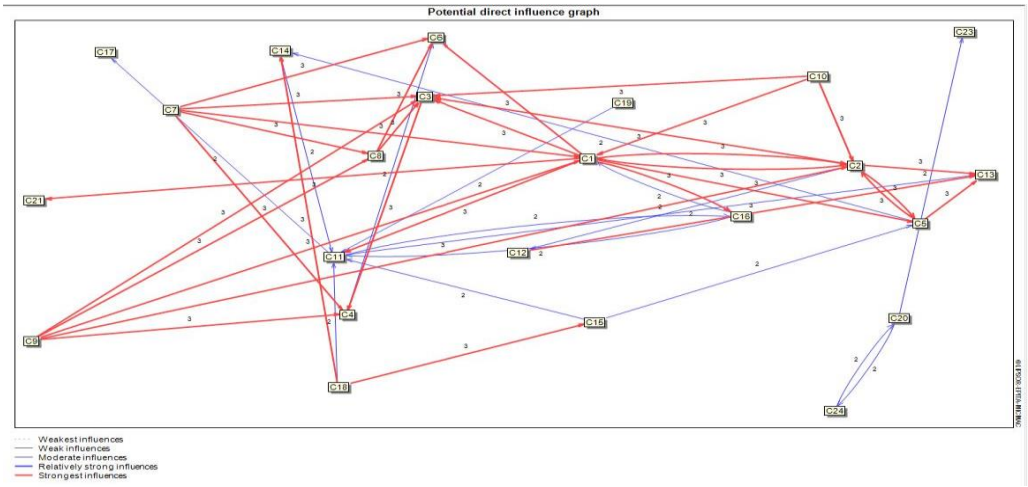

Figure 4. *Diagram of direct effects of factors (strongest effect)*

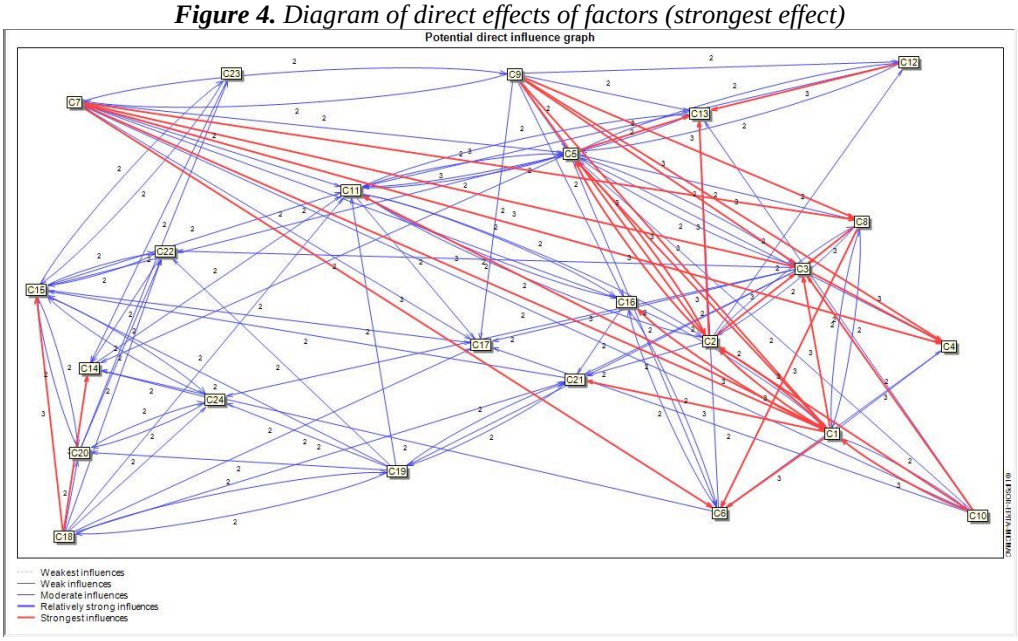

Figure 5. *Diagram of direct effects of factors (strong effect)*

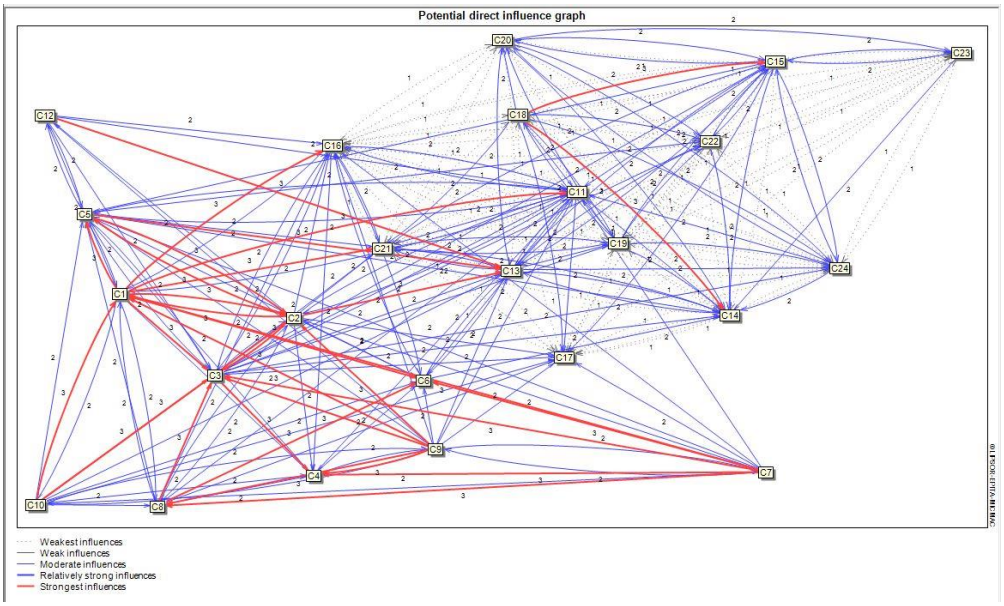

Figure 6. *Diagram of direct effects of factors (medium effect)*

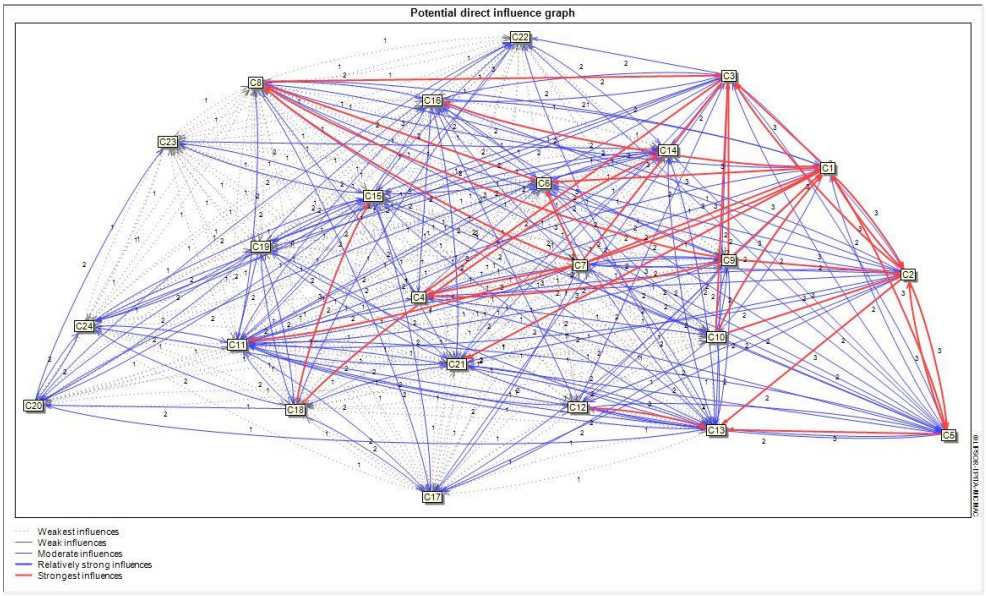

Figure 7. *Diagram of direct effects of factors (weak effects)*

Among the 24 drivers examined in this study, 4 key drivers have been selected as having an impact on the future. The most significant key drivers identified are those related to the future, which are considered to be the most effective and key drivers of the system (Table 6).

Table 8. *Key drivers affecting the future of IT service management (ITSM) for the purpose of implementing e-government (direct and indirect)*

Rank	Symbol	Direct Impact	Symbol	Direct Effected	Symbol	Indirect Impact	Symbol	Indirect Effected
1	C9	568	C3	568	C9	604	C11	561
2	C7	553	C11	568	C7	578	C3	548
3	C1	524	C4	510	C10	549	C13	518
4	C2	524	C13	510	C1	547	C4	507
5	C5	524	C5	495	C2	534	C6	498
6	C3	510	C6	495	C5	521	C5	491
7	C10	510	C14	495	C8	492	C14	487
8	C8	481	C2	481	C3	486	C2	479
9	C18	466	C15	481	C11	448	C21	475
10	C13	451	C1	466	C18	433	C16	473
11	C11	437	C16	466	C13	429	C15	469
12	C15	437	C21	466	C15	414	C1	456
13	C19	422	C17	451	C16	411	C17	449
14	C16	408	C8	422	C19	400	C8	402
15	C4	364	C22	393	C12	374	C22	397
16	C6	364	C24	379	C4	371	C24	391
17	C12	349	C9	349	C6	368	C9	343
18	C20	335	C19	320	C14	323	C19	328
19	C14	320	C23	320	C17	319	C23	323
20	C21	320	C20	306	C20	313	C20	312
21	C17	306	C12	276	C21	301	C12	290
22	C22	276	C18	276	C22	269	C18	284
23	C24	276	C10	262	C24	255	C10	266
24	C23	262	C7	233	C23	249	C7	241

Discussion

The study examined the future of IT service management research with the aim of implementing e-government with a reciprocal effects approach. The drivers affecting IT service

management (ITSM) with the aim of implementing e-government were categorized in this study. These drivers are: executive role, authoritative role, transparency practice, ITSM practice, e-citizenship interaction, e-social interaction, organizational interaction, digital social components, environmental components, ITSM application development, the role of government institutions, the role of private institutions, collaboration complexity, project purposefulness, digital infrastructure investment, data sharing management, digital attitude change, digital knowledge transparency, data digitization standardization, digital technical infrastructure, human resource infrastructure, financial infrastructure, international aspect and national aspect (Castro et al, 2025). Based on the Mikmak analysis, four categories of criteria were identified, the most influential of which in this study are ITSM practice, e-social interaction, the role of government institutions, collaboration complexity, project purposefulness, data sharing management, digital attitude change (Kouladoum, 2023), human resource infrastructure and financial infrastructure. In this regard, key components such as ITSM practices (Sarwar et al, 2023), e-social engagement, the role of government agencies, the complexity of collaboration, project targeting, data sharing management, digital transformation, and human and financial infrastructure play a fundamental role. To illustrate this, future scenarios are presented in four key situations.

Scenario 1: Comprehensive digital transformation and widespread adoption

In this scenario, digital transformation is implemented comprehensively and all government agencies use ITSM practices. ITSM practices are integrated and standardized as part of the core IT service management system across all government agencies, and this standardization has led to service delivery processes being carried out efficiently and without the need for manual intervention. In this situation, e-social engagement has become very fluid and pervasive, such that citizens can easily receive the services they want through e-government platforms without having to go in person. Government institutions act as facilitators and coordinators in managing these processes and have been able to improve their human and financial infrastructures in line with the needs of e-government. The complexity of collaborations is controlled at a desirable level and data sharing is successfully managed between different government institutions. E-projects are defined with a targeted and measurable results-based approach. The digital transformation has occurred at all levels of government and society, and the human and financial infrastructures have reached a level that can support these changes. As a result, e-government is fully implemented with high quality and citizens and businesses benefit from efficient and flawless services.

Scenario 2: Limited progress due to cultural and structural challenges

In this scenario, the adoption of ITSM practices and digital transformation is slow and some cultural and structural barriers have prevented the project from being fully operational. As a result, government agencies face difficulties in using ITSM and providing e-services. These challenges are also evident in the area of changing digital attitudes, as government employees and even citizens are distrustful of e-interactions and continue to rely on traditional methods. E-social interaction is slow due to lack of necessary training and public distrust, and people face technical and security problems in using e-services. Government agencies are unable to effectively advance digital projects due to lack of human and financial infrastructure, and coordination between them is also weak. Data sharing management is slow due to lack of inter-agency coordination and legal and technical complexities. As a result, e-government faces problems such as delays, inefficiencies, and user confusion, and the goals of e-government are not fully achieved.

Scenario 3: Digital Innovation with Advanced Data Management and Collaboration

In this scenario, government agencies have taken an innovative approach to adopting ITSM and data management. Electronic social interaction has been improved through platforms based on new technologies such as blockchain and artificial intelligence. These technologies help governments optimize data sharing management and prevent problems arising from the complexity of collaboration. In this situation, government agencies play an active role in changing the digital mindset and promoting a culture of using new technologies. The

targeting of projects has also been defined in a way that ensures productivity and efficiency results. Human resource infrastructure has been updated with specialized training and government employees have the necessary skills for electronic collaboration and interaction. Also, the financial infrastructure has been developed in a way that can provide the investments needed to develop new technologies. As a result, this scenario improves the quality and speed of e-services and e-government reaches a level of efficiency that increases public satisfaction.

Scenario 4: Crisis of Inefficiency and High Complexity

In this scenario, the complexity of inter-organizational collaboration and the lack of proper management of ITSM procedures have led to fundamental problems. Government institutions face many obstacles in implementing ITSM procedures and data management is carried out in an inconsistent and fragmented manner. Electronic social interaction does not work properly due to security and technical problems, and citizens are confused and distrustful when faced with e-government systems. Government institutions are unable to manage projects effectively, and the complexity of collaboration has caused numerous delays and inefficiencies. The lack of purpose in projects and the lack of attention to changing digital attitudes have caused digital transformation to fail and citizens to be dissatisfied with inefficient electronic services. Human and financial infrastructures are also not up to the task of supporting this level of complexity, which increases costs and reduces productivity. Each of these scenarios reflects different futures for implementing e-government. These scenarios highlight the importance of ITSM adoption, e-social interaction, the key role of government agencies, the complexity of collaboration, project targeting, data sharing management, digital transformation, and the role of human and financial infrastructures in the success or failure of this transformation. To achieve the desired scenario, there is a need for careful planning, coordination between government agencies, and the development of the necessary infrastructure so that governments can provide efficient, fast, and reliable services to citizens.

Conclusion

The future of Information Technology Service Management (ITSM) in the context of e-government implementation in Iran requires a strategic and forward-looking perspective that goes beyond traditional operational considerations. The findings of this study, based on a cross-impact analytical approach, demonstrate that ITSM does not evolve in isolation; rather, it is influenced by a complex network of technological, organizational, managerial, and socio-political factors. As Iran continues its digital transformation journey, the ability to understand and manage these interdependencies becomes essential. The insights generated here highlight that ITSM maturity, digital infrastructure, user-centric service design, and regulatory coherence are among the most critical drivers shaping the future trajectory of e-government. These elements interact dynamically and must be aligned to ensure sustainable and integrated public-sector service delivery.

Furthermore, the research emphasizes that the successful implementation of ITSM within e-government frameworks depends on the synchronization of long-term policy planning with technological advancements. The cross-impact analysis revealed that elements such as cybersecurity readiness, data governance, interoperability standards, and managerial capabilities exert significant mutual influence. In particular, cybersecurity and trust-building mechanisms form the backbone of future digital service ecosystems, where citizens increasingly expect secure, transparent, and efficient interaction with government institutions. Strengthening the regulatory foundation and institutionalizing risk management practices emerge as central steps toward reducing systemic vulnerabilities. The study also underscores the importance of developing human capabilities, as the implementation of advanced ITSM models necessitates both technological literacy and managerial competence across the public sector.

Additionally, the results show that the evolution of ITSM for e-government in Iran will depend heavily on how effectively public organizations embrace innovation and digital culture. The transition from traditional bureaucratic systems to agile, service-oriented, and data-driven models requires not only technical upgrades but also organizational transformation. The cross-impact approach illuminated that factors such as resistance to change, lack of integrated planning, insufficient stakeholder collaboration, and fragmentation between agencies could significantly impede progress if not managed proactively. Therefore, fostering cross-organizational synergy, integrating ITSM practices into national digital governance strategies, and promoting continuous improvement mechanisms will be essential. A future-ready ITSM framework must be adaptive, resilient, and capable of addressing evolving citizen expectations in an era of rapid technological disruption.

In conclusion, this study provides a comprehensive future-oriented perspective by identifying the most influential and sensitive factors shaping the development of ITSM for e-government in Iran. The cross-impact method enabled a deeper understanding of dynamic interactions among technological, organizational, regulatory, and socio-cultural dimensions, offering valuable insights for policymakers and practitioners alike. The results confirm that ITSM, when strategically integrated, can significantly accelerate digital governance, enhance public trust, improve service quality, and strengthen institutional efficiency. Ultimately, the future of e-government in Iran will rely on the country's ability to cultivate a coordinated, innovative, and resilient ITSM ecosystem—one that proactively anticipates future challenges and leverages emerging opportunities to deliver inclusive, efficient, and citizen-centric digital services.

-Establish a unified framework that connects ITSM practices across ministries, agencies, and provinces, ensuring interoperability, coordinated planning, and consistent service standards.

-Prioritize advanced security infrastructure, clear data regulatory frameworks, and continuous training programs to strengthen digital trust and enhance the professional competencies of public-sector employees.

-Create formal mechanisms for inter-organizational cooperation, support experimentation with new digital tools, and adopt agile methodologies to reduce resistance to change and foster a culture of continuous improvement.

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Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

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