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RESEARCH ARTICLE - MANAGEMENT

The Impact of Information Technology Integration on the Decision-Making Process

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Abstract

In the last decade, information technology tools have witnessed enormous development. Nowadays, they are used in all daily human tasks. Organizations and companies have recently started using information technology tools in all sectors. For example, the decision-making process is an essential task in all organizations. By using information technology components, companies can create a decision-making system that produces more accurate results with less time, effort, and cost. In this paper, the authors describe the role of information technology tools in the decision-making process. The impact of using information technology in the decision-making process was studied at a telecommunications company in Iraq. The authors use a descriptive-analytical method to describe this impact. They adopt a questionnaire to collect information and answer it. The analysis of the answers is done using SPSS. The findings indicate a link between using information technology tools and making sound decisions.

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Keywords: Decision-Making; Information Technology; Problem-Solving; Problem Diagnostic Network; Communication Tools.

1. Introduction

In the last decade, Information technology (IT) has witnessed massive and quick developments during a short period. It is vital in many sectors, such as the economy, healthcare, banking, and education. The Organization for Economic Co-operation and Development (OCDE) defined information technology as a set of tools and techniques that allow the collection, storage, processing, and sharing of information in the form of sounds, data, and images. Information Technology may include hardware and software components [1].

Using IT components, humans can perform their daily tasks and obtain more accurate results with less time, effort, and cost. Nowadays, IT affects the world profoundly. It has recreated a massive part in the enormous development in trade and commerce that the world is presently experiencing. Modernizing IT infrastructure develops creative answers that permit companies and organizations to work with full power. IT components can vary from Infrastructure as a Service (IaaS) and high-speed Internet to cloud computing [2].

In business, the decision-making process can be considered as a set of steps taken by directors in a company to define the planned path for business ambitions and to develop specific actions in activity. Instead, business decisions are based on examining accurate facts, assisted by using business intelligence (BI) and analytics tools. Integrating technology for better decision-making can provide numerous benefits and reduce the possibility of making wrong decisions. Moreover, technology allows the director to better collaborate with their teams in executing tasks. This collaboration will help the company improve the quality and speed of the decision-making process. Organizations use communication technology to update employees on business decisions and ensure the right people implement those decisions [3].

This study examines the effect of using Information technology tools in decision management in the business sector. A descriptive-analytical methodology will be used. Thus, a questionnaire is prepared to collect the opinion of staff in the business sector on the effect of using IT tools in the decision-making process. The telecommunication companies in Iraq (Asia cell and Zain Iraq) are considered as the society of this study. Therefore, the main objectives of this paper are:

- Study the effect of a good decision-making model in the business sector,
- Study the role of using information technology in the decision-making process,
- Study the relationship between information technology dimensions (Hardware and software) and decision management and its dimensions (Problem diagnostic, solution finding, and decision implementation).

This paper is organized as follows. First, the IT tools are described in Section 1. Then, in Section 2, the decision-making process is represented. Then, the research questions are illustrated in Section 4. Next, the conceptual framework and hypothesis are described in Section 5, followed by the procedure and the study sample size. Afterward, Section 7 illustrates the results with a significant discussion. Finally, this study is concluded.

Nomenclature & Symbols			
IT	Information Technology	IaaS	Infrastructure as a Service
OCDE	Organization for Economic Co-operation and Development	BI	Business Intelligence
DM	Data Mining	MIS	Management Information System

2. Information Technology

Information technology (IT) is a set of tools, methodologies, processes, and equipment used to collect, process, and store information. It is a mixture of electronic computers and various means of communication, such as optical fibres, satellites, and film technologies. There are many types of Information Technology [2].

- Computing includes all activities that demand the creation of computer systems, contains the examination of processing algorithms and the development of hardware and software, and encloses scientific, engineering, and tons of social elements.
- The software contains a set of data and instructions grouped into programs. These programs work on computers or other types of hardware to determine specific tasks.
- The platform is a combination of hardware and software systems, is created according to specific applications, and is defined as where the software must be executed.
- Networks represent the primary communication media. It can be described as a set of connected devices that share data and resources. They work according to a set of predefined rules, called communication protocols, to transmit information via physical or wireless media.
- Data: A portion of the information has been decoded in a valuable form to be processed. It can be classified as singular or multiple subjects.
- A database represents a set of structured data, is held electronically in a computer or other storage device, and is managed later by the Database Management System (DBMS).
- Data Storage consists of hardware that holds information and makes it accessible when needed.
- Artificial intelligence consists of building systems that act like a human. Such systems imitate human behavior and can learn from experience and collected data to choose the best action.
- Cloud computing: It is composed of three main elements [4].
- Cloud-based software represents computer-based systems that employ the Internet to provide digital means and save documents, data, and digital files on distant servers or computers in other data centers. These systems are called software as a Service (SaaS) [5].
- Cloud-based Infrastructure represents remote computers or data centers where tasks are performed, including computing, storage, and sharing data on a pay-as-you-go basis.
- Cloud-based platforms are commonly utilized to produce, examine, deploy, manipulate, and modernize software used in business. These platforms are generally founded in a remote data center.
- Communications technique is a primary component of IT systems. It includes any communication machine like a telephone, smartphone, tablet, computer, network hardware, and many more. It also contains additional services that are associated with these devices.
- Cybersecurity includes all required software and hardware to protect internet-connected systems from viruses, malware, and unauthorized access.
- The Internet of Things, called IoT, is the collection of intelligent connected devices with software that allows communication between these devices [6].
- Machine Learning is a branch of artificial intelligence and computer science that allow the system to learn from experience and perform tasks without human intervention [7].

2.1. Decision-Making

Decision-making is the essence of the administrative process. It is considered an essential function that a manager can perform in the organization. This process aims to choose the best alternatives from a set of available solutions for the individual to reach the organization's desired goal. It is a conscious mental process and a kind of organized thinking that seeks to identify the problem that is the subject of the decision and to identify possible solutions now and in the future to achieve the goal at the lowest cost in time and effort [8].

The four main substantial advantages of making good decisions are presented as follows:

- Stay longer: Usually, no need to reconsider a decision that was made using a well-thought-out strategy. Sometimes, a good decision lasts the whole lifespan of an organization.
- Weigh internal and external factors: In a good decision process, a decision-maker should think about the company holistically. It should not have one part of the business succeed at the outlay of another. Both internal and external elements can influence the decision and the company's road map.
- Eliminations of conflicts of interest. With clarity and stakeholder buy-in during the decision-making methodology, questions or troubles after the fact become less likely. The advantages of this process are maintaining the organization on track and concentration and reducing churn.
- Good decisions work better in solving the initial issue.

2.1.1. Types of decision-making model

In the business sector, decision-making is conceivably the most critical element of a manager's activities. It constitutes an essential function in the planning process. Indeed, when managers schedule a set of tasks, they select the order of these tasks based on many issues, such as what goals their organization will seek, what resources they will employ, and who will accomplish each required task. A decision-making process is a sequence of steps handled by a person to select the best option or action to meet his needs [9]. There are four main types of decision-making models [10] (see Table 1).

Table 1. Types of decision-making model

Model Type	Appearance (in Time New Roman)
Rational decision-making [11]	It is the most widespread type, based on listing all possible alternative solutions with their advantages and disadvantages. Afterward, it establishes weighing decision criteria, collecting all related information, analyzing the situation, developing a variety of options, assessing all options and assigning a value to each one, deciding which option is best, implementing the decision, and evaluating the decision.
Intuitive models [12]	In this model, the process is conducted by inner knowledge- or instinct- about the right choice. However, intuitive models are not solely based on feelings. They consider pattern recognition, similarity recognition, and the importance of the possible alternatives.
Recognition-primed models [13]	It is a combination of Rational and intuitive models.
Creative models [14]	In this model, users gather information and senses about the problem. They create some primitive ideas for solutions. After that, the decision maker documents a gestation period where they do not energetically think about the options. Instead, they allow their unconscious to take over the function and finally show them a completion and answer, which they can test and complete.

2.1.2. Decision-making process

Decision-making is making a move or selecting a value from a set of alternatives. Each alternative can lead to different results. In real problems, some results are more suitable than others, based on the equity of the decision maker [15]. This procedure is illustrated in Fig. 1.

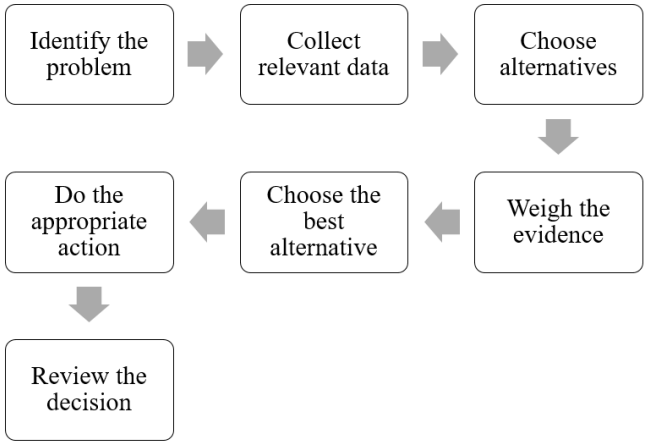

Fig. 1. The decision-making process is categorized into seven steps, starting with problem identification and ending with reviewing the decision

2.1.2.1. Identify the problem

The first step of decoding any situation is to define the real problem. This step can be performed by identifying the actual knowledge about the situation and by finding the answer to the following questions [16].

- What are the observations associated with the problem?
- What is the state where the problem occurred?
- Is this a single or a symptom of other problems?
- What is the required information?
- What are the solutions that have been tried to resolve this problem before?

2.1.2.2. Collect relevant data

After the identification of the problem, relevant data should be collected. These steps can be performed by an internal assessment, noticing if the organization has succeeded or failed in areas related to the decision. Also, relevant information can be gathered from external sources, like marker research and studies [17].

2.1.2.3. Choose alternatives

Usually, the actions that should be performed to address the situation are clear. However, it is imperative to identify these actions (called alternatives). An alternative can be defined as one of the possible available actions that can be performed to resolve a problem. Without alternatives, no decision can be made. Good alternatives should be selected to make a good decision. An alternative is considered good if it exists [18].

- Under control
- Wildly different from others
- Feasible
- Potentially attractive

Identification of all possible alternatives constitutes the creative side of problem-solving. Brainstorming can be an exceptional tool for identifying the most likely alternatives. It can be done as follow (Dos Santos, et al., 2019):

- Find as many possibilities as required.
- Write these thoughts on paper even if they look moderately impossible.
- People often pass fast to choose without thinking deeply about all the options. Indeed, consuming more time exploring all possible alternatives can be very effective.

2.1.2.4. Weigh the evidence

After selecting all possible alternatives, the decision maker should evaluate each to notice how they help resolve the problem. This step can be performed using these factors [19]:

- Impact of each alternative on the company
- Impact of each alternation on the public relations
- Impact of each alternation on employees' satisfaction and engagement
- The cost of executing each alternative
- The ethics of actions related to each alternative
- Whether each alternative is legal
- Whether each alternative can be used to choose or select another alternative

2.1.2.5. Choose the best alternative

It is the core of the decision-making process, where the decision-maker makes the decision. It can be done by choosing the alternative with a higher weight or eliminating the alternatives based on specific criteria. Researchers have developed many tools that help decision-makers in this step, like decision trees [20], fishbone diagrams [21], and the Five Whys [22].

2.1.2.6. Do the appropriate action

In this step, a plan to make the decision tangible and possible should be created [23].

2.1.2.7. Review the decision

After performing the actions associated with the selected alternative, the result should be reviewed. Indeed, these results can provide a helpful recommendation about the decision-making process [24].

2.2. Information Technology in the Decision-Making Process

In the digital age, it is evident that IT components are widely used in all sectors and industries [25]. Therefore, IT components are widely used to improve decision-making processes. In dynamic business circumstances, businesses must respond fast to changes in demand, competition, and client requirements. Thus, there is an essential need to build a system that permits organizations to make easy and fast decisions with minimal variance. In this section, the role of IT components in decision-making is reviewed.

Data Mining (DM) is a branch of Artificial Intelligence. It has been widely used in response to organizations' need to take advantage of the big data stored in their databases and repositories [26]. Indeed, traditional methods cannot manage big data to take helpful information. Therefore, organizations start recently to use data mining techniques. Based on intelligent inferential algorithms, this technology transforms massive raw data into meaningful information and new knowledge commonly used to support decision-making.

Data mining techniques were used to create a decision-making model adopted in Dubai airports [27]. In their study, Pasha et al. (2021) proved that data mining tools search for hidden relationships, trends, and patterns in databases, to be used in building prediction models, exploring the behaviour of individuals, and determining their general trends. This technology's systematic and organized use makes the organization an integrated and interconnected information system that provides accurate and fast information, which improves the decision-making process, especially about how to increase profits or reduce costs.

Recently, cloud services were classified as having special system requirements for a business organization. They were represented by cloud computing architecture layers like Infrastructure, platform, or Software as a service. Indeed, adopting a cloud computing system can bring businesses outstanding achievements and development. A decision-making model can use a cloud computing system. The authors in [28] analyzed critical variables in a hierarchical structure of decision areas such as technology and environment. The authors have proposed several necessary factors for using a cloud computing system:

- Top management support
- Competitive pressure
- Compatibility.

The management Information system (MIS) provides information for the administrative activities of digital companies. Recently, MIS has been used in decision-making in digital companies; the importance of management information systems in decision-making was deeply discussed in his study [29]. The author used the descriptive-analytical approach; the idea was examined and defined in a precise methodology with analysis [29]. As a result of this study, the authors advise using a more operative system (MIS) to help more decision-making. A successful MIS should have the following:

- Collected Data should be relevant and accurate according to the need of the organization.
- MIS should be flexible to changes in its operation and environment.
- The decision should be built according to the available information.
- Simple to use and maintain by non-skills users.
- The cost should be affordable.
- The MIS depends on the requirement of the organization.

- The MIS should protect the stored information.
- The MIS can recover stored data in case of the occurrence of any disaster.
- An authorization level should be present to prevent access to inappropriate users.

The increasing development of digital accounting systems has increased their impact on decision-making quality. The authors in [30] aimed to assess the impact of the success factors of digital accounting systems on improving the quality of decision-making in Jordanian banks. The study sample was 187 decision-makers who are actual users of digital accounting systems in Jordanian banks. The authors adopted a quantitative research approach to test the proposed research model based on partial structural equation modelling of least squares. The results revealed that the quality of data and information significantly impacted the quality of decision-making in general with digital accounting systems.

In contrast, the quality of the system did not significantly impact it. Thus, information quality mediated the relationship between data, system quality, and decision-making quality. Finally, the culture of analytical decision-making has modified the relationship between the quality of information and the quality of decision-making. It provided attractive implications and recommendations for practitioners, accounting managers, and decision-makers on evaluating the impact of digital accounting systems on improving the quality of decision-making in Jordanian banks.

Artificial Intelligence and its branches are widely used in many sectors, such as power generation and intelligent cities. In the last decade, many companies and educational centres started integrating AI tools into their decision-making systems.

Shrestha [31] proposed a hybrid human–AI decision-making method. In this system, managers should evaluate the particularity of the five dimensions:

- Decision search space,
- Interpretability of the process and result,
- Number of alternatives,
- Speed,
- Replicability of decisions.

Table 2 summarizes a comparison between human decisions and AI-based decisions [31].

Table 2. AI vs. human decision-making process

Decision-making conditions	Human decision	AI-based decision
Search space	A loosely defined decision search space is well accommodated.	A well-defined decision search space with specific objective functions is required.
Process and Results Interpretability	The process and results are efficiently interpreted.	The functional part is complex. Therefore, the interpretation of the process and results is difficult.
Number of alternatives solutions	A limited number of alternatives can be achieved.	A massive number of alternatives can be performed.
Speed	Slow	Fast
Outcomes Replicability	Replicability is susceptible to inter- and individual factors such as differences in experience, attention, context, and the decision maker's emotional state.	Because of standard computational procedures, the decision-making process and outcomes are highly replicable.

Therefore, managers guide the decision-making process; thus, the AI's ability to filter alternatives and produce high-accuracy outcomes increases. Organizations can use machine learning to create systems that can learn from experience and choose business patterns. Indeed, one of the main advantages of using ML in decision-making is that these tools can produce an intelligent decision-making model that evolves [32].

The ML technique can train decision-makers from past answers for a particular problem. Therefore, an organization can reduce decision-making errors. Despite the ability to automate the decision-making process, ML has its weaknesses [33]. Indeed, to get better decision-making using ML, the following points should be verified:

- Quality of data: if inaccurate data is used, the ML system may give the wrong result. Therefore, the collected data should be cleaned and validated before being used in the ML system [34].
- Structure of data: Data should be stored in an appropriate structure using the database system before being used in the ML system [35].

Appropriate technique: The most appropriate technique in ML should be used to get the best result. For this reason, the company must use an expert to build the ML system [36].

2.3. Research Questions

The primary question to be addressed in this paper is as follows:

- What is the role of technology and information systems in decision management?

The above question is answered after addressing the coming questions:

- What is a decision-making model?
- What are the main steps of the decision-making process?
- What is the relationship of impact and correlation between the components of information technology and its impact on administrative decisions?
- How does information technology, through its components, enhance and strengthen administrative decisions?
- What is hypothesis testing? How does it improve the decision-making process?
- How are the information technology components used in telecommunications companies in Iraq?

2.4. Conceptual Framework and Hypothesis

Fig. 2 illustrates information technology's impact on decision management. Consequently, in this study, information technology is represented as the independent variable; whereas decision management is considered the dependent variable.

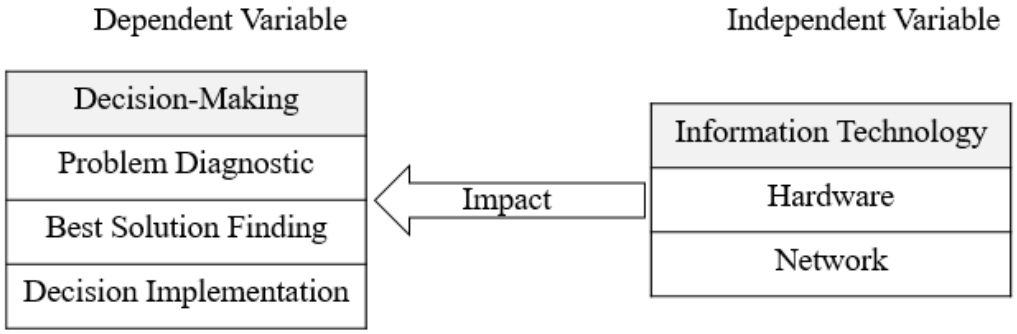

Fig. 2. The conceptual framework, shows the impact of information technology (independent variable) on decision-making (dependent variable)

Based on Fig. 2, the following hypothesis is identified:

- H0: There is an impact of information technology on decision-making.

From H0, the following hypotheses are derived:

- H01: There is an effect of the information technology hardware on the decision-making problem diagnostic.
- H02: There is an effect of the information technology hardware on the decision-making best solution finding.
- H03: There is an effect of the information technology hardware on the decision-making decision implementation.
- H04: There is an effect of the information technology network on the decision-making problem diagnostic.
- H05: There is an effect of the information technology network on the decision-making best solution finding.
- H06: There is an effect of the information technology network on the decision-making decision implementation.

3. Methodology

This study is based on a descriptive-analytical method to describe the impact of information technology on the decision-making process. To achieve the methodology of this study, the following tools and data sources will be used:

- Related research studies from scientific libraries and online resources
- Interviews and visits to companies working in this field
- A questionnaire to gather information to study the impact of information technology on decision-making
- SPSS program to evaluate the impact of the independent variable on the dependent variable

3.1. Procedure

To study the impact of IT on decision management in business, the authors use a descriptive-analytical method. A questionnaire of 18 questions was prepared. This questionnaire is composed of two parts:

- Information Technology (Paragraphs (1-8) measure the independent variable): It contains 8 questions concerning Hardware and network.
- Paragraphs (9-18) were devoted to measuring decision management, and it consists of three dimensions (problem, choosing the best alternative, and implementing the decision).

3.2. Sample

The telecommunication companies in Iraq were chosen as the society of this study. The authors distributed 350 questionnaires to the employees and managers of Zain Iraq and Asia cell companies. Only 247 responses were collected. Table 3 represents the distribution of the study sample according to the certificate, age, gender, experience, and training.

Table 3. Distribution certificate variable

No	Variants	Class	Number	Ratio (%)
1	Certificate	Ph.D.	2	1
		Masters	20	8
		Higher Diploma	4	2
		Bachelors	172	70
		Technical Diploma	49	19
2	Age	19-24	21	9
		25-30	14	6
		31-36	172	70
		37-42	34	14

		Above 42	6	2
3	Gender	Male	224	91
		Female	23	9
4	Service Length	1-6	61	25
		7-12	63	25
		13-18	93	38
		Above 18	30	12
5	Training Courses Number	None	70	28
		1-5	148	60
		Above 5	29	12

As illustrated in Table 3:

- Most of the respondents are holders of a bachelor's degree, with a percentage of (70%), followed by holders of a technical diploma, with a percentage of (19%), while the percentage of holders of a master's degree was recorded as (8%), then a higher diploma (2%). As for holders of a Ph.D. degree percentage is (1%), which means that the study sample has the ability and competence to adopt modern administrative concepts and foundations.
- Most of the respondents' ages fall within the age group (31-36) as percentage reached (70%) followed by the age group (37- 42) with a percentage of (14%) and the third rank comes with the age group (19 - 24) with a percentage of (9%) while the age group (25 – 30) its percentage ranged from (6%). Finally, the last category (over 43) ranged in percentage (2%), indicating that reliance was on the category of young people who possess modern, developed, and flexible ideas in the field of work and can bring about change toward the development of work.
- The majority of the respondents are males, as their percentage reached (91%) which is equivalent to (224) individuals, while the percentage of females reached (9%) which is equivalent to (23) individuals, and this indicates that communication companies prefer males in positions Admin.
- Percentage of (38%) of the respondents whose work period in the company ranges between (13-18) years, while the work period was (1-6) and (7-12) years, i.e. by (25%) equally for each of them. The third place is occupied by those who have a work period of (over 19) Percentage (12%).
- Most of the study sample were those who received (1-5) training courses with a percentage of (60%), followed by those who did not attend a training course (none) with a percentage of (28%), and finally, those who got (over 5) Record a percentage (12%), and this is a negative indicator that the company should pay attention to and work to involve its employees in technical development courses that help increase the experience of workers and keep abreast of all recent developments.

The five-point Likert scale was used in this study. To calculate the weights of those answers, Table 4 was used:

Table 4. Questionnaire weights

Category	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Degree	1	2	3	4	5

The reliability of the questionnaire was verified using Cronbach's alpha scale. Cronbach's alpha is a static tool used to measure the internal consistency of a questionnaire. It verifies how closely related a set of items is as a group. It is a measure of scale reliability. Table 5 shows the possible values of Cronbach's alpha with their meaning.

Table 5. Cronbach's alpha value

Alpha Value	Meaning
Less than 0.5	Unacceptable internal consistency
0.5 – 0.6	Poor internal consistency
0.61 – 0.7	Questionable internal consistency
0.71 – 0.8	Acceptable internal consistency
0.81 – 0.9	Good internal consistency
Above 0.9	Excellent internal consistency

Table 6 shows Cronbach's alpha for the questionnaire of this study. As illustrated in this table, Cronbach's alpha value for all questions is equal to 0.959. This value verifies that there is an excellent internal consistency between all items of the questionnaire.

Table 6. Cronbach's alpha result showing reliability status

Cronbach's Alpha	Number of Items
0.959	18

4. Results and Discussion

To study the impact of information technology on decision-making, the authors use several SPSS statistical tools, including the standard deviation, mean, and Pearson correlation.

4.1. Standard deviation and mean

Table 7 shows the standard deviation and mean of all questions associated with the independent variable (IT). The mean represents the average of all answers. However, the standard deviation is the amount by which the answer differs from the mean. To discuss the results of the mean, the following range will be used:

- A mean value between 0.01 to 1.00 stands for strongly disagree;
- A mean value between 1.01 and 2.00 stands for disagree;
- A mean value between 2.01 and 3.00 stands for neutral
- A mean value between 3.01 and 4.00 stands for agreeing;
- A mean value between 4.01 and 5.00 stands for strongly agree

Table 7. Standard deviation and mean for information technology questions

Variable	Statement	Code	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Standard deviation
Network	The presence of a company website on the Internet.	S1	46	32	19	57	93	3.48	1.54
	All branches of the company are connected in one network that contributes to monitoring and controlling the daily operations.	S2	59	29	15	37	107	3.42	1.67
	There is an electronic link between the company, customers, and suppliers.	S3	46	32	19	57	93	3.48	1.546
	The company is keen to provide network security to protect information and data and maintain its confidentiality.	S4	57	28	16	40	106	3.45	1.65
Hardware	The company owns a sufficient number of computers, printers, and communications equipment.	S5	46	32	19	57	93	3.48	1.54
	The devices and equipment used in the company are technologically advanced.	S6	59	29	15	37	107	3.42	1.67
	The company is committed to the periodic maintenance of its equipment and devices.	S7	46	32	19	57	93	3.48	1.54
	The company is constantly updating and developing devices and equipment for information and communication technology.	S8	57	28	16	40	106	3.45	1.65
	General Average							3.457	1.600

As illustrated in the first part of Table 7, the means of items related to network dimension is between 3.42 and 3.48. Thus, the sample agrees that the use of network tools may improve the decision-making process. The lower value of the mean is corresponding to the item “All branches of the company are connected in one network that contributes to monitoring and controlling the daily operations.” Indeed, a common network is essential for sharing and exchanging information. Therefore, it has a great impact on the decision-making process. The best answer belongs to:

- S1: That demonstrates the importance of the website for telecommunication companies.
- S3: That verifies that a network between the company, customers, and suppliers is very important.

The second part of Table 7 shows the means of the items associated with the dimension Hardware. The mean is between 3.42 and 3.48. The lower value is associated with the item "The devices and equipment used in the company are technologically advanced”. This is mean that a part of the sample does not agree that their companies used advanced tools. The higher means are associated with items:

- S5: This question shows that telecommunication companies in Iraq started by adopting IT tools and devices in all their tasks.
- S7: The result of this question demonstrates that the maintenance of IT devices is a very important task in a telecommunication company in Iraq.

Table 8 shows the standard deviation and mean of all questions associated with the dependent variable (decision-making).

The first part of Table 8 shows the items associated with the problem diagnostic dimension. As illustrated in this table the mean of the first item is 2.78. It bellows to the neutral range. Therefore, the sample is neutral concerning the importance of contacting all parties to identify the problem. However, the mean of the second item “Information technology helped to identify the problem, understand it, simplify it, and show its strengths and weaknesses” is 3.49. It belongs to the range “agree”. Thus, the sample agrees that information technology tools help in identifying the problem.

The second part of Table 8 shows the items associated with the dimension “Finding solution”. The minimum mean is associated with the item “Does the selection of the optimal alternative depend on the individual personal intelligence of the administration.”. It is equal to 2.74 and belongs to the range “neutral”. Therefore, the sample is neutral concerning the role of personal intelligence in the selection of the optimal

solution. The higher mean belongs to the item "The information technology used helps in quickly selecting the optimal alternative from all the existing alternatives.". The value is 3.57 (agree). Thus, the sample agrees that Information technology tools may help in choosing the best solution.

The result in the third part of Table 8 shows the means of items of dimension "Solution implementation". All means falls into the answer "Agree". This result demonstrates that the employees of the communication companies agree that the IT components facilitate the implementation of the solution in the company. The best phrase is S18. Therefore, a communication network is essential to gather all information to correctly implement the solution. The lowest value is for statement S17 with a value of 3.49.

Table 8. Standard deviation and mean for information technology questions for the decision-making process

Variable	Statement	Code	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Standard deviation
Problem	To identify the parties to the problem and its dimensions, get to know them by contacting all parties.	S9	64	73	17	42	51	2.78	1.515
	Information technology helped to identify the problem, understand it, simplify it, and show its strengths and weaknesses.	S10	55	26	15	44	107	3.49	1.63
Alternatives	The administration relies mainly on the database in choosing the best alternative.	S11	50	29	16	57	95	3.48	1.57
	Does the selection of the optimal alternative depend on the individual personal intelligence of the administration.	S12	74	66	16	34	57	2.74	1.57
	The information technology used helps in quickly selecting the optimal alternative from all the existing alternatives.	S13	51	26	17	37	116	3.57	1.6**3**
	Choosing the best alternative is built according to predetermined objective criteria, facts, and considerations.	S14	53	27	18	40	109	3.51	1.6**3**
Implementation	administration takes into account accuracy in implementing the decision.	S15	60	29	13	42	103	3.40	1.6**7**
	The information technology used helps the administration in implementing the decision quickly by the employees.	S16	47	27	17	44	112	3.60	1.5**9**
	Management takes into account flexibility and quality when implementing the decision taken.	S17	55	30	15	34	113	3.49	1.**66**
	Dialogue meetings with employees increase the effectiveness of implementing the decision.	S18	49	26	16	38	118	3.61	1.61
	General Average							3.36	1.600

4.2. Pearson correlation

Before studying the relationship between variables of the study, a test of the linearity was performed using the:

- Histogram to verify the normal distribution of the data (Fig. 3 (a))
- P-P plot to test the linearity of the model (Fig. 3 (b))

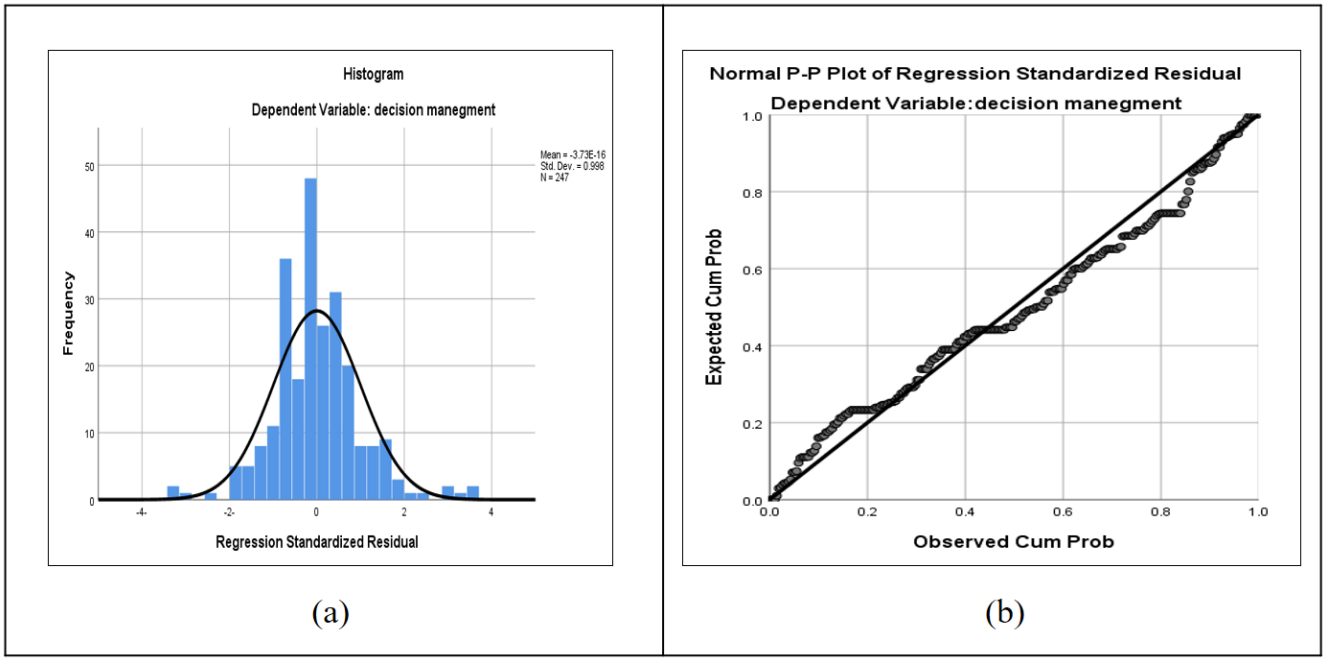

Fig. 3. Linearity test of the model

Based on Fig. 3, the model is linear and Pearson correlation can be used to test the relationship between variables.
The Pearson correlation coefficient is the most familiar tool for measuring a linear correlation. It is a value that can vary between –1 and 1. It estimates the power and direction of the relationship between two variables. The value of the Pearson correlation can be interpreted as shown in Table 9.

Table 9. Direction and strength of the relationship of the variables

Pearson correlation coefficient (r) value	Strength	Direction
Greater than .5	Strong	Positive: variables change in the same direction
Between .3 and .5	Moderate	Positive: variables change in the same direction
Between 0 and .3	Weak	Positive: variables change in the same direction
0	None	No relationship between variable
Between 0 and –.3	Weak	Negative: variables change in the opposite direction
Between –.3 and –.5	Moderate	Negative: variables change in the opposite direction
Less than –.5	Strong	Negative: variables change in the opposite direction

Table 10 illustrates the Pearson correlation between IT and the decision-making process. All Pearson correlation values are positive. Thus, there is a positive relationship between IT and decision-making. In addition, these variables change in the same direction.

Table 10. Pearson correlation between information technology variables and decision-making variables

Variable	Measurement	Network	Hardware	Information technology
Identify Problem	Pearson Correlation	.712**	.705**	.714**
	Sig. (2-tailed)	.000	.000	.000
Choose best alternatives	Pearson Correlation	.749**	.741**	.750**
	Sig. (2-tailed)	.000	.000	.000
Implement decision	Pearson Correlation	.785**	.780**	.786**
	Sig. (2-tailed)	.000	.000	.000
Decision-making	Pearson Correlation	.800**	.793**	.797**
	Sig. (2-tailed)	.000	.000	.000

** Correlation is significant at the 0.01 level (2-tailed)

This table also verifies the hypotheses of this study:

- The Pearson correlation between Information technology and Decision-making is equal to 0.797. It is greater than 0.5. This value confirms the validity of the main hypothesis H0. The value is positive. Thus, Decision-making and Information technology change in the same direction. Therefore, the increase of using Information Technology tools may improve the decision-making process.

- The Person correlation between “Hardware” and “Identify problem” equals 0.705. It is greater than 0.5. This value confirms the validity of the main hypothesis H01. The value is positive. Thus, the process of identifying the problem and the hardware change in the same direction. This can be explained by the fact that using smart devices and telecommunication channels may help identify the problem.
- The Person correlation between “Hardware” and "Choose the best alternative" is equal to 0.741. It is positive and greater than 0.5. This value confirms the validity of the main hypothesis H02. Therefore, there is a significant impact between the Hardware dimension and choosing the best solutions.
- The Person correlation between “Hardware” and “Decision implementation” is equal to 0.780 (positive and greater than 0.5). This value confirms the validity of the main hypothesis H03. Thus, there is a positive significant impact between the Hardware dimension and the solution implementation process.
- The Person correlation between “Network” and “Identify problem” is equal to 0.712. It is positive and greater than 0.5. This value confirms the validity of the main hypothesis H04. Indeed, many software helps gather the required information to better identify the problem.
- The Person correlation between "Network" and "Choose the best alternative" is equal to 0.749. It is positive greater than 0.5. This value confirms the validity of the main hypothesis H05. The network helps in sharing the required information for choosing the best solution
- The Person correlation between “Network” and “Decision implementation” is equal to 0.785. It is positive and more significant than 0.5. This value confirms the validity of the main hypothesis H06. This is logical. Indeed, a network helps communicate and exchange information useful in implementing the solution.

5. Conclusion

With the considerable development of information technology tools, humans can efficiently perform their daily tasks. Many organizations and companies have recently started using information technology tools in their jobs. In this paper, the authors described all information technology components. After that, they define the decision-making process and present the different decision-making models. Then, the authors presented the role of information technology components in the decision-making process. They focused on three main components of information technology: Artificial Intelligence, machine learning, and data mining. In addition, they performed a small comparison between AI-based decision-making systems and human decision-making.

In addition, the authors studied the impact of using IT components on the decision-making process in telecommunication companies in Iraq. For this reason, a questionnaire was built to collect answers. The answers were analyzed using SPSS. The authors used standard deviation, mean, and Pearson correlation to verify the impact. The result shows that there is an impact between using IT and making a good decision. Indeed, the efficiency of decision-making and its success depend on the availability of information that must be carefully selected. And this step can be performed effectively using IT components. Also, the use of networks in communication processes greatly assists in the transfer of information quickly. Therefore, they help in taking faster decisions in organizations. However, telecommunication companies in Iraq should start using more recent IT tools such as Machine learning, Artificial Intelligence, and the Internet of Things. Also, they should pay attention to the development courses for the engineering cadres in the organization. This development helps the employee to get knowledge and experience. Therefore, they can perform administrative work more effectively. Below are some recommendations to improve decision-making in telecommunication companies in Iraq:

- The need to increase decision-makers' efficiency in communication companies in Iraq by using information technology of all kinds and at all administrative levels. (The number of PhD holders in the sample is two only).
- The need to increase the number of software development courses to develop electronic applications for workers in communication companies in Iraq.
- The need to conduct studies and scientific research in information technology and decision management.
- Establishing information technology departments in communication companies specialized in transferring modern technology to all aspects of the organization to help the organization stand on all the advantages and disadvantages of the organization

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