

The Impact of Artificial Intelligence on the Effectiveness of Decision-Making at Private Banks in Yemen

Abdolkareem K. Alsyaghi¹, Akram M. Alarshani²

¹Faculty of Commerce and Economics Sana'a University –Yemen

²Sana'a University – Yemen Sana'a- Yemen

Abstract

This paper aims to clarify the impact of artificial intelligence on the effectiveness of decision-making at the private banks in Yemen. The quantitative approach was employed, utilizing both descriptive and analytical methods. The population consisted of leaders from the main branches of private banks in the capital, Sana'a. A questionnaire was the primary data collection tool. 231 questionnaires were distributed, and 219 valid questionnaires (92% response rate) were collected for analysis. Data were analyzed using appropriate statistical methods within the SPSS v26.

The paper concluded that artificial intelligence has a positive impact on the effectiveness of decision-making at the private banks in Yemen.

Keywords: Effectiveness of Decision-making, Artificial Intelligence, User, Systems, Devices, Private banks

أثر الذكاء الاصطناعي على فاعلية القرارات الإدارية في البنوك الأهلية في اليمن

عبد الكريم قاسم السياغي¹، أكرم محمد العرشاني²
قسم إدارة الأعمال-كلية التجارة والاقتصاد-جامعة صنعاء
² مركز إدارة الأعمال- جامعة صنعاء

1a.alsayaghi@su.edu.ye
2a.alarshani.cba@su.edu.ye

الملخص

هدفت الدراسة إلى توضيح أثر الذكاء الاصطناعي على فاعلية اتخاذ القرار في البنوك الخاصة في اليمن مستخدمة المنهج الكمي بأسلوبيه الوصفي والتحليلي، حيث تكون مجتمع الدراسة من قادة الفروع الرئيسة للبنوك الخاصة في العاصمة صنعاء، وكانت الاستبانة الأداة الرئيسة لجمع البيانات. تم توزيع 231 استبانة، واسترداد 219 استبانة صالحة (نسبة الاستجابة 92%) للتحليل، حيث تم تحليل البيانات باستخدام الطرق الإحصائية المناسبة ضمن برنامج SPSS v26. توصلت الدراسة إلى وجود أثر إيجابي للذكاء الاصطناعي على فاعلية اتخاذ القرار في البنوك الخاصة في اليمن.

الكلمات المفتاحية: فاعلية القرارات الإدارية، الذكاء الاصطناعي، المستخدم، الأنظمة، الأجهزة، البنوك الأهلية.

1.0. Introduction

1.1. Problem Statement

The banking sector has become, like all other sectors, in dire need of employing modern concepts; the most important of these is artificial intelligence because it is considered one of the most important techniques for enhancing organizational performance, especially in decision-making. Artificial intelligence is currently experiencing rapid expansion, with recent advancements in technologies such as machine learning, reasoning, planning, and thinking capabilities.

Furthermore, the involvement of AI agents in organizational decision-making is rapidly increasing. These agents offer advantages in decision-making processes due to their objectivity, efficiency, and superior information processing abilities, devoid of human shortcomings like fatigue or self-interest. Employee perception of artificial intelligence leaders within organizations, however, can be less positive because of their perceived lack of fairness and justice.

Decision-making is widely acknowledged as a fundamental concept in management theory and practice. Managers need to make the right decisions, but also need to make these decisions quickly. They face uncertain situations or face threats that need decisions while conducting their daily activities. Thus, making decisions is essential in all organizational processes and managerial activities (Omotola, 2012). In addition, effectiveness and efficiency are often considered synonymous for many, but the concept of efficiency has been linked in economic thought to the economic problem of how to allocate the limited resources available to everyone. Therefore, efficiency can be defined as the optimal way to use resources, while effectiveness is defined as high productivity and the ability of organizations to adapt with the environment as well as the ability to stability and innovation, or it is the extent to which the establishment achieves the goals set according to standards that are determined in advance. A facility that can achieve its goals can also be described as an effective facility.

Digital innovations in the modern banking landscape are no longer subject to the discretion of

financial institutions; Instead, they have become essential for financial institutions to cope with an increasingly competitive market and changing customer expectations (Santini, 2018; Eren, 2021; Hua et al., 2019; Rajaobelina and Ricard, 2021; Valsamidis et al., 2020). In the era of modern banking, many new digital technologies have been driven by artificial intelligence (AI) as the main driver (Dobrescu, 2018), leading to innovative disruptions in banking channels (e.g. ATM, online banking, mobile banking mobile), services (such as check imaging, voice recognition, and chatbots) and solutions (such as AI investment advisors and AI credit locators).

For the banking sector in Yemen, banks have to deal with the development of artificial intelligence in a very quick way to face the different challenges that war has caused. Economic Studies and Forecasts, a unit of the Ministry of Planning and International Cooperation, reported in 2018 that economic losses in Yemen exceed the average losses witnessed in conflicts within the region and the world. These losses can be attributed to the war, which was accompanied by the closure of some air and land ports, the restriction of the movement of foreign trade, the faltering of oil and gas production, which represented the lifeblood of the national economy, and the complete cancellation of the national economy. Moreover, there is a severe liquidity crisis in the financial system and the public budget, which has been worsened since 2016. This crisis has led to most state employees not receiving their salaries, as well as the failure of public service initiatives and the cessation of public services and many economic projects. According to the monthly exchange rate data issued by the Central Bank of Yemen (2018), the dollar exchange rate in the parallel market witnessed a noticeable increase from about 215 riyals/dollar in March 2015 to 485 rials/dollar in April 2018, which led to a cumulative change rate of 6.125%. This increase is primarily due to factors such as flow restrictions, the depletion of Yemen's foreign exchange reserves, and the subsequent division of monetary authority. Exchange rate volatility rose by 61% between September 2016 and March 2018, compared to 41% between March 2015 and September 2016,

when foreign reserves were depleted and central bank activities and operations were transferred to Aden. While the recent \$2 billion deposit played a crucial role in stabilizing exchange rate fluctuations, maintaining the benefits of this deposit requires additional donor support, the resumption of exports, and the unification of the Central Bank of Yemen.

Based on the above discussion, the problem issues were clarified, and gaps were identified. In response to the recommendations of previous studies, this paper aims to identify the impact of artificial intelligence on the effectiveness of decision-making in private banks in Yemen.

1.2. Objectives of the study

This study aims to verify the impact of artificial intelligence (user-systems-devices) on the effectiveness of decision-making in the private banks in Yemen.

1.3. Questions of the study

In light of the discussion outlined in the problem statement and previous studies, this paper aims to address the following questions:

1. Is there a statistically significant impact of artificial intelligence (user-systems- devices) on the effectiveness of decision-making (in the private banks in Yemen)? This question is examined by:

- a) Is there a statistically significant impact of users of artificial intelligence on the effectiveness of decision-making in private banks in Yemen?
- b) Is there a statistically significant impact of systems of artificial intelligence on the effectiveness of decision-making in private banks in Yemen?
- c) Is there a statistically significant impact of devices of artificial intelligence on the effectiveness of decision-making in private banks in Yemen?

1.4. Significance of the study

The study's contribution encompasses both theoretical and practical perspectives. From a theoretical standpoint, this study adds to the existing corpus of knowledge for several reasons. Firstly, it proposes an artificial intelligence model consisting of three dimensions (user- systems-devices) for private banks in Yemen. Secondly, it examines the significant impact of artificial intelligence on the effectiveness of decision-making.

Moreover, this study investigates how private banks in Yemen care about the effectiveness of decisions and the development of artificial intelligence.

On the other hand, from the practical perspective, the study assists private banks in Yemen in promptly managing artificial intelligence development. Moreover, decision-makers could utilize the information in the study to implement appropriate communication structures and conduct routine drills. The personnel team in charge of artificial intelligence could be well-informed and prepared to handle artificial intelligence development on all fronts.

2.0. The framework of study and development of the hypotheses

"Artificial intelligence (AI) is the capability of a system to correctly interpret external information, learn from that data, and use that learning to accomplish specific objectives and tasks through flexible adaptation" (Haenlein & Kaplan, 2019, p. 5). The theory was developed in 1956 by the founders of artificial intelligence (AI), Marvin Minsky, John McCarthy, Herbert Simon, Allen Newell, Claude Shannon, and Nathaniel Rochester. According to their definition, artificial intelligence (AI) is the ability of machines to understand, think, and learn in a similar way to human beings, indicating the possibility of using computers to simulate human intelligence (Pan, 2016).

Many studies have examined artificial intelligence in terms of organizations, users, and equipment, and linked it to many variables. Alshehri and Alqahtani (The Impact of Artificial Intelligence on Crisis Management in Banks, 2023) aimed to measure the impact of artificial intelligence on crisis management, in the banks in Asir Province. The main results confirmed the level of banks' adoption of artificial intelligence applications came with an arithmetic mean of (4.13). Neural network technology came first, while "Intelligent Agents" technology came last. As for the level of crisis management in banks, it came with an arithmetic mean of (4.18), and the dimension of being ready for the crisis came first, while the dimension of detecting the crisis came last. The study also found that there is a statistically significant impact at the level of (0.05) of the

applications of artificial intelligence (neural networks, algorithms, intelligent agents, and digital footprint) on all dimensions of crisis management (detecting the crisis, being ready for the crisis, containing the crisis, restoring activity and balance and learning from. Al-Abdlat, (Applications of artificial intelligence and its impact on achieving competitive advantage: A study on Jordanian banks, 2020): aimed to identify the impact of applying artificial intelligence on achieving competitive advantage, and to identify the reality of applying artificial intelligence in Jordanian banks. The study found that banks' expansion of artificial intelligence applications such as (fingerprinting, chat-bots, smart branches that operate with robots, and technologies that work to prevent fraud and manage credit risks) contributes to achieving competitive advantage in its dimensions (cost, quality, and market share) for banks, and there is a disparity in the impact of applications of artificial intelligence in achieving competitive advantage, as the results showed that the customer's fingerprint, Chat banking is the most influential.

Regarding decision making, many studies cast a light on the relationship between artificial intelligence and decision-making. Malin Eriksson and Camran Djoweins' 'Artificial Intelligence's Impact on Management' (2020) looked at how artificial intelligence (AI) might improve management decision-making and leadership abilities. The study focused on how management decision-making and leadership styles have changed as a result of the employment of AI in the workplace. According to the study, using AI to make choices will improve their speed and accuracy provided it is trained on high-quality data. Syed Asad A. Bokhari and Seunghwan Myeong sought to examine the direct and indirect connections between artificial intelligence (AI), social innovation (SI), and smart decision-making (SDM) in their 2022 article, "Use of Artificial

Intelligence in Smart Cities for Smart Decision-Making: A Social Innovation Perspective." Cross-sectional data from South Korea and Pakistan were gathered for this study utilizing a survey design and survey questionnaires. Using SPSS multiple regression, 460 respondents from the public and private sectors were gathered and empirically examined. As expected, the study found that SI had a significant and beneficial mediating influence on the connection between AI and SDM.

According to that, the study hypothesized that:

H: There is a statistically significant impact of artificial intelligence (user-systems-devices) on the effectiveness of decision-making in the private banks in Yemen.

Ha: There is a statistically significant impact of users of artificial intelligence on the effectiveness of decision-making at the private banks in Yemen.

Hb: There is a statistically significant impact of systems of artificial intelligence on the effectiveness of decision-making at the private banks in Yemen.

Hc: There is a statistically significant impact of devices of artificial intelligence on the effectiveness of decision-making at the private banks in Yemen.

3.0. Methodology

3.1. Study design

The purpose of this study was to investigate the impact of artificial intelligence (user- system-devices) on the effectiveness of decision-making in the private banks in Yemen. Therefore, this study applied the quantitative approach because by using the quantitative approach, studies can examine the significance among and between the study's variables and can generalize the results to the whole population.

3.2. Population and sample of the study

The targeted respondents were the employees who are working in private banks in Sana'a which are 17 banks. These banks are shown in the following table.

Table 1. Private banks in Yemen

NO.	Bank's Name	Establishment Date
1	Saba Islamic Bank	1997
2	Yemen Commercial Bank	1993
3	Arab Bank	1972
4	Rafidain Bank	1982

5	Al-Amal Microfinance Bank	2008
6	Yemen Islamic Bank	1995
7	Shamil Bank of Yemen & Bahrain	2002
8	Al-Kuraimi Microfinance Bank	2010
9	Cooperative and Agricultural Credit Bank	1982
10	Qatar National Bank	2007
11	International Bank of Yemen	1979
12	Tadhamon Bank	1996
13	Yemen and Gulf Bank	2000
14	Yemen Bank for Reconstruction and Development	1962

Source: Yemeni Banks Association, <https://yemen-yba.com/>

This study was concerned with the effectiveness of decision-making that is related to artificial intelligence in private banks. Respondents were selected from (General Manager-Assistant General Manager- Sector Manager-Department Manager). The census was conducted with a total of 231 participants. The following table shows the

number of employees occupying the following positions such as General Manager, Assistant General Manager, Sector Manager, and Department Manager in the main branches of private banks in Sana'a, depending on the banks themselves.

Table 2. Number of employees in private banks in Yemen

NO	Banks	General Manager	Assistant General Manager	Sector Manager	Department Manager
1	National Bank of Yemen	-	-	-	-
2	United Bank Limited	-	-	-	-
3	Yemen Commercial Bank	1	2	-	12
4	Arab Bank	1	1	12	-
5	Rafidain Bank	1	-	-	4
6	Al-Amal Microfinance Bank	1	2	-	12
7	Saba Islamic Bank	1	2	2	17
8	Yemen Islamic Bank	1	-	-	7
9	Shamil Bank of Yemen & Bahrain	1	2	2	14
10	Al-Kuraimi Microfinance Bank	1	2	-	12
11	Cooperative and Agricultural Credit Bank	1	2	7	33
12	Yemen Bank for Reconstruction and Development	1	2	2	11
13	Qatar National Bank	1	-	-	5
14	Yemen Kuwait Bank	-	-	-	-
15	International Bank of Yemen	1	2	-	27
16	Tadhamon Bank	1	2	2	9
17	Yemen and Gulf Bank	1	1	-	9
Total		14	18	15	184
Total summation		231			

3.3. Instrument of the study

A survey questionnaire was conducted to collect the data on a seven-point Likert scale. The questionnaire was validated and then administered. The survey asked about the effectiveness of

decision-making, and artificial intelligence. The questionnaire was divided into three sections and each section of the questionnaire has its own items. The first section focuses on demographic and related information about respondents consisting of

six items including, **gender, age, educational qualification, years of service, job title, and workplace bank**. The second section measures artificial intelligence including **users, systems, and devices**, while the third section measures the effectiveness of decision-making. All of the measuring items used in the current study were taken from 25-item investigations. This study, however, adopts questions that have gained a lot of confirmation from other studies. On a seven-point Likert scale, respondents were asked to choose answers ranging from "Strongly Disagree" to "Strongly Agree". This format provides them with multiple options to express their frequency of agreement, offering clearer insights into the variables being studied. A five-point Likert scale may not be sensitive enough to capture a participant's true evaluation during a usability test. In contrast, a seven-point Likert scale is sufficiently nuanced to record a more accurate assessment of an interface while still being relatively compact (Finstad, 2010).

4.0. Findings and discussion

4.1. Respondent profile

According to the **Respondent profile**, the majority of private bank managers were males with a total number of 182 out of 219 accounting for approximately 83.1% while the rest were female with only (16.9%). The most common age of the

respondents was between 30 and 39 years, accounting for 51.1% of the participants. This was followed by respondents aged 45 years and over, which represented 27.9% of the sample. The highest educational level held by top management of private banks was bachelor's degree, accounting for 64.4% of the individuals. This was followed by master degree, (which represented 23.7% of the group). The majority of respondents have occupations other than those specified. Among these occupations, Department Manager is the most common, with 173 respondents, representing 79.0% of the sample. This is followed by Sector Manager, with 26 respondents, representing 11.9%. Among the respondents who are top managers, the majority of participants (53.40%) have more than 15 years of experience in the banking sector. Additionally, 23.7% of the respondents have served between 11 and 15 years. This shows that the majority of survey respondents have an employment history and could be considered experienced with crises. According to workplace affiliation, the most common respondents were from Cooperative and Agricultural Credit Bank representing 39 respondents or 17.8% of the sample. They were followed by 30 respondents working at the International Bank of Yemen representing 13.7%. Table 3 shows the demographic characteristics of the respondents.

Table 3. Demographic characteristics of the respondents

Variables	Items	Frequency	Percentage
Gender	Male	182	83.1
	Female	37	16.9
	Total	219	100.0
Age	Less than 25 years	4	1.8
	25- to 34 years	42	19.2
	35 to 44 years	112	51.1
	45 years and over	61	27.9
	Total	219	100.0
Academic qualification	Diploma or less	19	8.7
	Bachelor's	141	64.4
	M.A.	52	23.7
	Ph.D.	7	3.2
	Total	219	100.0
Years of service in the banking sector	5 years and less	26	11.9
	From 6 to 10 years	24	11.0
	From 11 to 15 years	52	23.7

	More than 15 years	117	53.4
	Total	219	100.0
Job title	General Manager	3	1.4
	Assistant General Manager	17	7.8
	Sector Manager	26	11.9
	Department Manager	173	79.0
	Total	219	100.0
Workplace bank	Yemen Islamic Bank	8	3.7
	Yemen Commercial Bank	14	6.4
	Arab Bank	14	6.4
	Yemen and Gulf Bank	10	4.6
	Al-Amal Microfinance Bank	14	6.4
	Yemen Bank for Reconstruction and Development	14.0	6.4
	Tadhamon Bank	14	6.4
	Al-Kuraimi Microfinance Bank	13	5.9
	International Bank of Yemen	30	13.7
	Saba Islamic Bank	22	10.0
	Qatar National Bank	5	2.3
	Cooperative and Agricultural Credit Bank	39	17.8
	Rafidain Bank	5	2.3
	Shamil Bank of Yemen & Bahrain	17	7.8
	Total	219	100.0

4.2. Alpha Cronbach's (Reliability analysis) for Questionnaire Items

The most popular approach, Cronbach's Alpha coefficient, was employed to determine internal consistency (Sekaran, 2003). Cronbach's Alpha values range from 0 to 1, and a value of 0.7

or below often denotes internal consistency dependability that is less than excellent (Hair et al., 2018). Table 4 displays the Cronbach's Alpha coefficient for each of the variables that were assessed.

Table 4. Summary statistics of reliability analysis

Constructs	Cronbach's Alpha
Artificial intelligence	0.972
Effectiveness of Decision-making	0.958

As shown above in Table 4, the result of Cronbach's Alpha is ranged between 0.958 and 0.972 which is within the recommended value of reliability, according to (Hair et al., 2018). In addition, the study used correlation coefficients between dimensions and variables, and between each item of the questionnaire and its variable.

4.3. Descriptive Analysis

In descriptive analysis, the researcher can get a clear sense of how survey respondents have

answered the survey's questions using the descriptive statistic of variables through mean and standard deviation (Sekaran & Bougie, 2010). The descriptive statistic was used to make sure that the mean and standard deviation of the data were usually as predicted and that no entries were outside the expected range. Table 5 presents the result of descriptive statistics.

Table 5. The result of descriptive statistics

Variables	N	Mean	Std. Deviation
Effectiveness	219	5.21	1.3
User	219	5.16	1.3
Systems	219	4.97	1.25

Devices	219	5.35	1.45
AI	219	5.16	1.25

According to the results shown in Table 5, all variables have high means. The effectiveness of decision-making has the highest mean value of 5.21 and a standard deviation value of 1.3. The next highly rated factor from the perspective of top managers in private banks in Yemen is AI. The AI variable has a very high mean with a value of 5.16, amongst all other factors, and a value of 1.25, for standard deviation. This result of mean suggests that top management of the private banks in Yemen are highly emphasized and given more attention to the AI. The standard deviation for the AI variable is 1.25, indicating that the respondents' ratings of AI have relatively no spread or dispersion to a certain extent. According to the dimensions of AI, the device dimension has the highest mean with a value of 5.35, amongst all other dimensions and a value of 1.45, for standard deviation. On the other hand, the Systems dimension has the lowest mean with a value of 4.97, above the mid-point of 4.40 amongst all other dimensions and values of 1.25, for standard deviation.

In conclusion, the results indicate that the participant's evaluation of the variables of the current study is above average, indicating positive perceptions of the measures being examined. Furthermore, the outcome demonstrates that all of the standard deviation values for the variables are adequate. The sample data is more reliable, in particular, if the standard deviation is smaller than the mean values (Sekaran & Bougie, 2010). The sample data is therefore significant for achieving the objectives of the current investigation.

Table 6. The total dimensions of artificial intelligence to achieve decision-making

Variable	B	T Test	R	R ²	F
Artificial Intelligence	.868	Value	Sig	.828a	0.686
		20.96	.000		

a. Dependent Variable: Effectiveness

b. Predictors: (Constant), Artificial Intelligence

It is clear from Table 6 that the effectiveness of decision-making is explained by the value of (R^2), which is equal to (0.686) of artificial intelligence, which means that the dimensions of the independent variable of the study (artificial intelligence) achieve 68.6% of the effectiveness of decision-making in

4.4. Testing the validity of the hypothesis

Hypothesis (H) states that **There is a statistically significant impact of artificial intelligence (user-systems-- devices) on the effectiveness of decision-making in the private banks in Yemen. The hypothesis has three sub-hypotheses which are:**

Ha: There is a statistically significant impact of users of artificial intelligence on the effectiveness of decision-making in private banks in Yemen.

Hb: There is a statistically significant impact of systems of artificial intelligence on the effectiveness of decision-making in private banks in Yemen.

Hc: There is a statistically significant impact of devices of artificial intelligence on the effectiveness of decision-making in private banks in Yemen.

Through this part, the study aimed to test the study hypothesis using regression analysis, as follows. The main hypothesis was tested through the sub-hypotheses emerging from it, as a simple linear regression analysis test was conducted (Simple Regression Analysis), to find out the effect of the dimensions of the independent variable on the dependent variable. To determine the significant impact of artificial intelligence (user-systems-devices) on the effectiveness of decision-making, a multiple linear regression analysis was used. Table 6 shows the value of the correlation coefficient (R) and the coefficient of determination (R^2) for the total dimensions of the independent variable (artificial intelligence) to achieve the dependent variable (decision-making):

private banks in Yemen. For that, the main hypothesis was proven correct: **there is a statistically significant impact of artificial intelligence (user- systems- devices) on the effectiveness of decision-making at the private banks in Yemen.**

To understand the impact of the dimensions of artificial intelligence on the effectiveness of decision-making at the private banks in Yemen, the contribution of each dimension of artificial

intelligence has been explained through the following table, which shows the multiple linear regression analysis.

Table 7. The dimensions of artificial intelligence to achieve decision-making.

Variable	B	T Test		R	R2	F
		Value	Sig			
User	0.824	20.72	.000	.825a	0.681	429.35
Systems	0.736	14.32	.000	.711a	0.505	205.005
Devices	0.714	18.73	.000	.797a	0.636	350.700

a. Dependent Variable: Effectiveness

b. Predictors: (Constant), Artificial Intelligence (User, Systems, Devices)

Referring to the correlation and identification coefficients in the previous table, it is clear that the dimensions of artificial intelligence that mostly contribute to impact the effectiveness of decision-making is the first dimension which is the user, with a rate of (68%), followed by the third dimension, which is the hardware or devices dimension, with a rate of (63%), while the second dimension of artificial intelligence- Systems- is the last at a rate of (50%). It can be said that the greatest role of the first dimension, represented by the user, comes from the extreme importance of training and qualification in the use of artificial intelligence, and the extent of its importance and contribution to improving decision-making. Despite this, we rarely find institutions that give the user attention that is consistent with his extremely influential role in improving the administrative process. In general, and its contribution to the effectiveness of administrative decisions in particular

The result obtained through applying simple linear regression analysis using SPSS v26, illustrates that artificial intelligence in terms of user, systems, and devices has a significant impact on the effectiveness of decision-making according to the result shown in Table 10. Thus, the objective has been achieved. This confirms that the effect is statistically significant and the hypothesis H is accepted.

The importance of artificial intelligence programs and their connection to the effectiveness of administrative systems for managing human resources were among the results made by AI-

Azzam (2020). The results of this study corroborated those of Eriksson & Djowein (2020), who discovered that the use of AI will improve decision-making speed and accuracy if it is trained on high-quality data.

5.0. Conclusion

5.1. Implications of the study

This study has made significant contributions to the field of effectiveness of decision-making from various perspectives, including theoretical advancements and valuable managerial insights. These contributions are elaborated in detail in the following subsections.

5.1.1. Theoretical implications

This study provides further theoretical implications related to decision theory. Artificial intelligence has been confirmed to be related to the effectiveness of decision-making in private banks in Yemen. This result is considered an extension of the theory, given the study's limitations in the field of decision-making.

In particular, the influence of organizational artificial intelligence on decision-making is still not enough and has not been fully addressed (Noizet & Weber, 2018). Therefore, this study combined those factors and examined the effect on decision-making, which is considered an extension of the theory.

Another theoretical implication of this study is the confirmation of the important role of AI in assessing the private banks in Yemen to reduce uncertain situations and consequences. The result of the present study approves the relationship

between AI and DM, which is considered a confirmation of the argument made by Noizet & Weber (2018) who stated that the selection of AI is important to confront the decision and to protect the continuity of organizations. Additionally, AI which was approved to have a direct relationship with decision making is introduced in this study. Therefore, this study provides insights into the significant role of AI in DM in private banks in Yemen, making it a valuable theoretical contribution to the body of knowledge in the field of DM.

Overall, the results of this study provide significant evidence regarding the factors that directly enhance DM and indirectly through the incorporation of AI. Consequently, this study contributes additional empirical evidence to the existing body of knowledge in the area of DM, and the findings can serve as a foundation for future studies in the field of DM.

5.1.2. Practical implications

The study framework is developed to assess CM in private banks in Yemen. The private banks and private sector in Yemen as a whole are considered crucial drivers of economic growth in Yemen, directly impacting job creation and reducing unemployment (AGSIW, 2016). However, during crises, it becomes vital for leaders in the private banks in Yemen to understand the factors that influence CM and leverage them effectively to prevent or mitigate the consequences of the crisis. Hence, this study offers practical contributions and several implications for practice, outlined as follows.

Firstly, the results of this study suggest that the adoption of AI is extremely important, particularly in the context of DM. The utilization of AI in terms of users, systems, and devices has been found to have a positive relationship with CM in private banks in Yemen. Thus, stakeholders should take note of the significant implications of using AI, particularly in terms of Signal detection and learning from previous crises. This can greatly assist in containing the damage caused by the crisis in Yemen banks and, as a result, safeguard their reputation. This study demonstrates that the inclusion presence of AI as a crucial mediator

highlights the significance of DM in explaining the role of leadership (Vroom, 1977) in effectively enhancing CM. In simple terms, AI plays a vital role in enhancing and shaping DM processes for successful CM. This implies that the effectiveness of DM is crucial for promoting CM, as it is directly linked to the quality and acceptance of decisions. Without effective DM, CM cannot be achieved optimally. Additionally, employing AI applications to streamline business procedures and DM in Yemeni private banks, guided by the expertise of banking and credit professionals, and providing training to credit staff on utilizing these systems, all contribute to making more accurate decisions while also reducing costs, effort, and time for the banks. In terms of DM, the banks should pay more attention to:

1. The available information should be accurate.
2. The banks have to make their decisions promptly.
3. A large number of suitable alternatives should be available to decision-makers.
4. There should be a complementarity between the decisions that banks make.
5. The bank's management participates in decision-making with employees and experts.
6. The decisions that should be taken depend on an information network that includes all departments and sections of the Bank.
7. There should be a unit in the bank that provides decision-makers with appropriate and accurate information.

Secondly, the study suggests that bank managers can take into account the role of AI in terms of users, systems, and devices to enhance the proactive impact of CM, particularly in signal detection and damage containment. These dimensions are considered crucial during crises. Furthermore, AI in terms of users, systems, and devices in private banks in Yemen has also been approved to enhance DM and thus lead to effective CM. This finding enriches the knowledge of the role of DM for effective CM in private banks in Yemen. In terms of AI, the banks should pay more attention to:

1. The banks should provide search and indexing capabilities for data attractively for users/customers.
2. The banks should provide the banking service channel as the secure means of correspondence between the bank and the customer.
3. The banks always should grant a Visa card to companies and individuals.
4. The banks should perform electronic transfers daily.
5. The customer should easily issue a checkbook through the bank's electronic channel.
6. IVR should be always available.
7. The Banks should always offer the Platinum MasterCard to their customers.

Overall, the ongoing crisis in Yemen is leading to a practical deterioration in the economy practically, particularly impacting private banks as reported by both government and non-government organizations. Thus, this study has developed a framework that includes the important factors that approved to have a relationship with CM and hence, assist the private banks in Yemen cope with the crisis. In practice, private banks in Yemen need to implement sound decisions and advance the integration of AI. This can serve as a platform for successful CM within private banks. Significantly, the adoption of this knowledge is likely to play a significant role in mitigating the consequences of crises in Yemeni private banks.

5.2. Suggestions and recommendations

After the goals of this paper have been successfully achieved, there are several recommendations as follows: Firstly, this study focused on analyzing the conceptual framework for artificial intelligence in private banks in Yemen specifically during the ongoing challenges. To enhance the generalizability of this study, future studies could consider including individual private banks as separate entities within the study. Furthermore, it is important to acknowledge that, the effectiveness of decision-making, and artificial intelligence may be perceived differently within each private bank, as these factors can vary across different organizations. The results of this study cannot be generalized in a wider context across the organizations in Yemen or other countries since the

data collected for this study were limited to private banks in Yemen. Different cultures and different educational environments may furnish different impact of exogenous to endogenous variables. A highly recommended avenue for further study, particularly within the same sector as this study, would be to investigate the same variables from the perspective of subordinates' opinions.

Secondly, in terms of methodology, this study adopted a cross-sectional design. It is important to note that a cross-sectional approach captures a snapshot of the research variables at a specific point in time. However, changes in artificial intelligence practices and experiences may vary over time as leaders accumulate artificial intelligence-related knowledge and experience. Moreover, the questionnaires do not contain qualitative data hence; the interviews of the sampled managers in the organizations would have improved the study quality to achieve a more comprehensive overview of the assessed interactions in this research, future research studies should include both quantitative and qualitative information. This will provide a more holistic understanding of the topic.

Thirdly, it is important to note that other organizational factors or contingency factors would also play significant mediating roles in the relationship between decision-making and artificial intelligence. Hence, future studies should consider incorporating other factors as mediators or moderators, such as fuzzy logic, to provide a more comprehensive analysis. Therefore, it is recommended to examine artificial intelligence as an independent variable that will enhance knowledge in the decision-making field.

Finally, regarding the R-squared value, the predictors in the study model accounted for 40% of the total variance in artificial intelligence as an endogenous variable. This implies that the model can explain 40% of the variance, while the remaining 60% could be attributed to other factors. Therefore, future studies could consider this recommendation for further exploration.

References

1. A. Mellit, S.A. Kalogirou, Artificial intelligence techniques for photovoltaic applications: a review, *Prog. Energy Combust. Sci.* 34 (5) (2008) 574–632
2. Al-Abdlat, Abdel-Fattah (2020). Applications of artificial intelligence and their impact on achieving competitive advantage: a study on Jordanian banks. *Mu'tah Research and Studies, Humanities and Social Sciences Series, Mu'tah University, Issue 5, Volume 35,*
3. Alkhawlan, Mohammed (2020), factors influencing crisis management in Yemeni organization; the mediating effect of decision making. Doctor of Philosophy. University Utara, Malaysia.
4. Alshehri Seham Dhafer and-Mohammad Alqahtani, (2023). *The Impact of Artificial Intelligence on Crisis Management in Banks.* Al-Reyadah Journal of Business Economics, Volume 09.
5. Awang, Zainudin, 2016. Structural Equation Modeling Using Amos, <https://www.researchgate.net/publication/299440807>
6. Blenko, M.W., Mankins, M.C. and Rogers, P., 2010. The decision-driven organization. *Harvard Business Review*, 88(6), pp.54-62.
7. Caron, M.S. 2019. The transformative effect of AI on banking Industry. *Banking & Finance Law Review* 34 (2):
8. Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches:* California: Sage Publications.
9. De Oliveira Santini, F., W.J. Ladeira, C.H. Sampaio, and M.G. Perin. 2018. Online banking services: A meta-analytic review and assessment of the impact of antecedents and consequents on Satisfaction. *Journal of Financial Services Marketing* 23 (3)
10. Digalaki, E. 2022. The impact of Artificial Intelligence on banking Sector & how AI is being used in 2022. <https://www.businessinsider.com/ai-in-banking-report?r=US&IR=T>
11. Dobrescu, E.M., and E.M. Dobrescu. 2018. Artificial intelligence (Ai)-the technology that shapes the world. *Global Economic Observer* 6 (2): 71–81.
12. Eren, B.A. 2021. Determinants of customer satisfaction in chatbot Use Evidence from a banking application in Turkey. *International Journal of Bank Marketing* 39 (2)
13. Finstad, K. (2010). Response Interpolation and Scale Sensitivity: Evidence Against 5-Point Scales. *Journal of Using Experience*, 5(3), 104-110.
14. H. Salehi, R. Burgueno, Emerging artificial intelligence methods in structural engineering, *Eng. Struct.* 171 (2018) 170–189, <https://doi.org/10.1016/j.engstruct.2018.05.084>
15. Haenlein, M., & Kaplan, A. (2019). A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence. *California Management Review*, 61(4), 5-14. doi: 10.1177/0008125619864925
16. Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. (2010). *Multivariate Data Analysis (7thEd).* Englewood Cliffs, NJ: Prentice Hall.
17. ILO. (2016). Yemen's damage and needs assessment crisis impact on employment and labor market. Retrieved from <https://www.ilo.org/wcmsp5/groups/public/arabstates/robeirut/document/publication/wcms>
18. J. S. Chou, M. Y. Cheng, and Y. W. Wu, "Improving classification accuracy of project dispute resolution using hybrid artificial intelligence and support vector machine models," *Expert Systems with Applications*, vol. 40, no. 6, pp. 2263–2274, 2013, doi: 10.1016/j.eswa.2012.10.036]
19. Kanaan, Nawaf, (2009). *Administrative decision-making between theory and practice.* House of Culture for Publishing and Distribution, Amman-Jordan.
20. Klee, R. (1999). (Ed.). *Scientific inquiry: Readings in the philosophy of science.* NewYork: Oxford University Press
21. Lyon, D.W., Lumpkin, G.T. and Dess, G.G., 2000. Enhancing entrepreneurial orientation research: Operationalizing and measuring a key strategic decision-making process. *Journal of Management*, 26(5)
22. Malali, A.B., and S. Gopalakrishnan. 2020. Application of artificial intelligence and its powered technologies in the Indian banking And financial industry: An overview. *IOSR Journal of Humanities And Social Science* 25 (4): 55–60.
23. Mehrotra, A. (2019, April). Artificial Intelligence in Financial Services–Need to Blend Automation with Human Touch. In 2019 International Conference on Automation, Computational and Technology Management (ICACTM IEEE).
24. Michell, J. (1997). Quantitative science and the definition of measurement in psychology. *British Journal of Psychology*, 88, 355–386.
25. Noizet, Guillaume, Pia Weber (2018). Artificial Intelligence is an approach for decision-making in crisis management. Master's Thesis in Business Administration. Department of Business Administration, UMEA University.
26. Pan, Y. (2016). Heading toward artificial intelligence 2.0. *Engineering*, 2(4), 409-413.
27. Russell SJ, Norvig P (2016) *Artificial intelligence: a modern approach.* Pearson Education Limited, London
28. Saaty, T.L., 2008. Decision-making with the analytic hierarchy process. *International Journal of Services Sciences*, 1(1), pp.83-98.
29. Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building* Tarafdar, M., C.M. Beath, and J.W. Ross. 2019. Using AI to enhance Business operations. *MIT Sloan Management Review* 60 (4):

30. The Central Bank of Yemen, monthly exchange rate data (2018).
31. The Ministry of Planning & International Cooperation. (2016). Yemen Socio-Economic Update: Overall Socioeconomic Developments (Situation Report No. 20). Retrieved from https://reliefweb.int/sites/reliefweb.int/files/resources/yseu20_english_v8_fin l.pdf
32. The Ministry of Planning and International Cooperation Sector of Economic Studies and Forecasts (2018), Issue (34) June.
33. UNDP. (2013). Multi-dimensional Livelihoods Assessment in Conflict-Affected Areas. Retrieved from http://www.ye.undp.org/content/yemen/en/home/library/crisis_prevention_and_recovery/multidimensional-livelihoods-assessment-in-conflict-areas inyem.html.
34. UNDP. (2015). Rapid Business Survey Impact of the Yemen crisis on the private sector. Retrieved from <https://www.humanitarianresponse.info/en/operations/yemen/document/rapid-business-survey-impacts-yemen-crisis-private-sector-activit>.
35. Valsamidis, S., Tsourgiannis, L., Pappas, D., & Mosxou, E. 2020. Digital banking in the New Era: Exploring customers' attitudes. In Business Performance and Financial Institutions in Europe (pp. 91–104). Springer, Cham.
36. Van Riel, A.C., Lemmink, J. and Ouwersloot, H., 2004. High-technology service innovation success: a decision-making perspective. *Journal of Product Innovation Management*, 21(5), pp.348-359.
37. Wilson, L., Abaja, P. O., & Waiganjo, M. (2012). The influence of strategic factors on effective crisis preparedness. *Asian Journal of Business and Management Sciences*, 2(11), 25-41.
38. Wooten, L. P., & James, E. H. (2008). Linking crisis management and leadership competencies: the role of human resource development. *Advances in Developing Human Resources*, 10(3), 352-379.
39. Yu, C. H. (2006). *Philosophical foundations of quantitative research methodology*. Lanham, MD: Rowman and Littlefield.