

IMPACT OF ARTIFICIAL INTELLIGENCE APPLICATION ON STRATEGIC ENTREPRENEURSHIP: AN APPLIED STUDY IN BANKS IN THE HASHEMITE KINGDOM OF JORDAN

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Abstract: *The current study aims to investigate the impact of Artificial Intelligence (AI) applications on Strategic Entrepreneurship (SE) within the banking sector in the Hashemite Kingdom of Jordan. The questionnaire was distributed to the administrators of banks in Jordan, and employees were selected through a Proportional Random Stratified Sample. The samples consisted of 486 workers from different banks in Jordan. This study was based on the assumption that AI, such as expert systems, neural networks, and genetic algorithms, positively affects the SE in its different dimensions, such as Entrepreneurial Leadership, Entrepreneurial Culture, and Creativity throughout the Jordanian banks. The current study's findings revealed the positive impact of AI applications on SE. In addition, a significant association between the bank categories and the impact of AI on SE factors ($P=0.038$) has been found.*

Moreover, it was also found that there is a significant association between bank types and the uses of AI in different departments of Jordanian banks ($P=0.025$). Although, AI doesn't strongly correlate with entrepreneur culture, creativity, and leadership regarding the bank types in Jordan and employees' bank functions. Therefore, the study recommends that banks must expand the usage of AI applications and have more training for employees in the AI field because, in this way, banks can achieve desired superior strategic outcomes.

Keywords: *Artificial Intelligence (AI), Strategic Entrepreneurship (SE), Banks in the Hashemite Kingdom of Jordan*

Introduction

Numerous industries, including the banking industry, are being transformed by artificial intelligence (AI). Near all types of banks increasingly use AI applications to improve customer service, streamline operations, and speed up strategic decision-making. The simultaneous pursuit of opportunities and advantages is called strategic entrepreneurship (SE), which enhances corporate performance (Ireland et al., 2003). Innovative use of technological opportunities, especially AI, could be the tool for better corporate work. A relatively quicker and more accurate strategic decision-making can be achieved by AI systems when the manager's only responsibility is to review and confirm choices (Harris & Davenport, 2005)(Intezari & Gressel, 2017). Interdisciplinary studies have revealed that the nature and capacities of people and machines differ significantly (David & David, 2017), which is why most academics believe that people and robots have complementary roles (Jarrahi, 2018). Although AI adds numerous benefits in the banking sector, a detailed review also indicates that AI adoption brings unique cyber risks and privacy concerns. Financial stability issues could also arise concerning the robustness of the AI algorithms in the face of structural shifts and increased interconnectedness through widespread reliance on few AI service providers (Boukherouaa et al., 2021).

The corporate world is experiencing a SE revolution because of AI, particularly in the banking

sector. Banks use AI to streamline business processes, improve client interactions, and gain a competitive edge. AI-powered algorithms assist banks in risk management, fraud detection and prevention, and in providing individualized goods and services to their clients. For example, an AI program may complete tasks that would typically take hours or days in the fight against money laundering in a matter of seconds. The AI's capacity to quickly extract useful information from massive data sets may benefit banks. To provide better service to a larger audience, AI bots, online payment advisors, and biometric fraud detection techniques are used (Ghodselahe & Amirmadhi, 2011). As a result, many companies have started employing AI algorithms to check the legality of their client's credit card transactions in real-time by comparing them to the prior ones in terms of value and location (Hughes et al., 2019), (Hu & Krishen, 2019). Zighan et al. (2022) have reported that the entrepreneurial approach significantly impacts the financial success of Small and Medium Enterprises in Jordan (Zighan et al., 2022). Additionally, they proposed that AI moderates the effect of entrepreneurial orientation on the success of businesses in SMEs in Jordan (Abdallah, 2020; Zighan et al., 2022). It has also been a well-established fact that AI significantly impacts the risk management of information systems and positively enhances risk management practices for information systems (Saeidi et al., 2019).

Information system and risk management practices are crucial for fostering corporate entrepreneurship, and improving institutions' financial performance (Lee, 2020). Clients in the Jordanian banking industry require AI equally; thus, there should be an ideal balance between virtual and human agents depending on their needs and preferences. Additionally, the current study will discover practical applications of AI in banking, especially those pertaining to Jordanian customers' perceptions (AL-ARAJ et al.). It is becoming evident that almost every business, from deposit taking and lending to investment banking and asset management, depends on AI applications because of how the modern corporate environment is structured. As a result, autonomous data management without human involvement may be very beneficial to banks to increase speed, accuracy, and efficiency (Ballestar et al., 2019). As discussed earlier, AI can automate data management tasks, enhance credit scores, and spot possibly fraudulent activities (Duan et al., 2019).

Furthermore, by enabling seamless, round-the-clock interactions with customer care agents, AI may help banks enhance their clients' experiences. However, the uses of AI in banking go far beyond conventional retail banking. AI may indeed be advantageous to the middle and back offices of investment banking and other financial services (Moro Visconti, 2016). It was discovered that using expert systems, artificial neural networks, genetic algorithms, and fuzzy logic combined with AI significantly reduced cybercrime in various types of banks in Jordan. Additionally, there were statistically significant variations in cybercrime and genetic algorithms that might be attributed to the employment variable, favoring those who worked in the IT sector (Salameh & Lutfi, 2021). The current study will evaluate the impact of AI applications on SE using quantitative methodology within the banking sector in the Hashemite Kingdom of Jordan.

1. Research methodology

2.1. Population and Sample Study

A quantitative methodology was employed to carry out this study. A questionnaire, administered through an electronic survey, was distributed to a sample of senior and medium-level administrators (including Directors, Deputy Directors, and Heads of Departments) employed in the diverse types of banks present in Jordan, such as central, commercial, digital, international/foreign, and Islamic banks. The participants were selected using a proportionate Random Stratified Sample method. In total, 486 workers from various banks in Jordan constituted the sample size for this study Sample.

2.2. Measures

In order to ensure a representative sample, the research employed a stratified random selection method to choose the sampling area from various cities in Jordan. Additionally, random sampling was utilized to include employees from diverse departments within the selected regions. Before participation, all individuals provided verbal consent to participate in the study. The questionnaire used in the research consisted of 28 questions, encompassing demographic information and five dependent variables. Respondents were asked to rate their agreement or disagreement on a 5-point Likert scale for each variable.

The implementation of a stratified random selection technique aimed to enhance the validity of the research findings by capturing a diverse range of participants from different cities in Jordan. The study sought to ensure a comprehensive workforce representation by including employees from various departments. Verbal consent was obtained from all participants to adhere to ethical considerations and ensure their willingness to be involved in the research.

The questionnaire, comprising 28 questions, was carefully designed to gather relevant data. It encompassed demographic information and five dependent variables, allowing for a comprehensive understanding of the research topic. In addition, the participants were asked to rate their level of agreement or disagreement on a 5-point Likert scale, enabling a nuanced assessment of their perspectives.

2.3. Statistical Analysis

The data were coded numerically for statistical analysis using the Statistical Package for the Social Sciences (SPSS ver. 17.0). To assess the factor structure of the scales, a series of tests were conducted. Initially, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test were employed to examine collinearity among the variables, indicating potential correlations between independent and dependent variables. Furthermore, a Rotated Component Matrix (RCM) test was performed to explore the factor structure of the scales. This analysis helps determine the relationship between a single variable and other variables. Additionally, the reliability of the data was assessed by analyzing internal consistency using Cronbach's alpha. In addition to the factor structure tests, preliminary analyses were conducted, including examining the variables' means, standard deviations, skewness, and kurtosis. These measures provide valuable insights into the data's central tendencies, variability, and distributional characteristics.

3. Results and discussion

3.1. Data Description

In this study, a total of 486 participants were involved. Frequency statistics revealed that the highest percentage of participants fell within the age range of 37-43, while the lowest number was observed in the age range of 16-23. In addition, most participants were affiliated with

commercial banks, while the representation of participants from central banks was negligible. These demographic statistics further indicate that a significant proportion of participants held managerial positions, with the "Enterprise Services/Facilities Management" sector being predominant, as shown in **Table 1**.

Table 1. Employees' demographics.

Parameters	Groups	No. (%)
Age (years)	16-23	39(8.0 %)
	24-29	66(13.6 %)
	30-36	86(17.7 %)
	37-43	205(42.2 %)
	44-50	90(18.5 %)
Bank Types	Central	36(7.4%)
	Commercial	207(42.6%)
	Digital	31(6.4%)
	Foreign	83(17.1)
	Islamic	129(26.5%)
Job Functions	Portfolio Manager	40(9.5 %)
	Head Trader/Trader	41(8.4 %)
	Risk Officer	38(7.8 %)
	Research/Analyst	52(10.7%)
	Trading Technology	41(8.4%)
	Trade Support	44(9.1%)
	Developer	56(11.5%)
	Compliance	46(9.5%)
	Management	94(19.3%)
	Other	34(7.0%)
Bank Departments	Accounting/Finance.	27(5.6 %)
	Administrative/Clerical.	47(9.7 %)
	Credit/Lending.	41(8.4 %)
	Customer Service.	63(13.0 %)
	Enterprise Services/Facilities Management.	109(22.4 %)
	Human Resources.	51(10.5 %)
	Information Technology.	84(17.3 %)
	Investment Banking & Markets.	64(13.2 %)

3.2. Reliability Statistics

Reliability statistics were employed to ensure the trustworthiness of the data in this study. All components underwent rigorous testing, with the exception of one. **Table 2** presents the results of the Kaiser-Meyer-Olkin (KMO) and Bartlett's Sphericity tests, widely acknowledged measures of sample adequacy for statistical analysis in academic research. The KMO test assesses the suitability of the dataset for factor analysis by examining the case-to-variable ratio.

Typically, a KMO value between 0 and 1 is considered acceptable, and in this study, a KMO value of 0.847 was obtained, indicating a high level of adequacy. Furthermore, the global index surpasses the recommended threshold of 0.6, affirming the suitability of the data for analysis. In addition to the KMO test, Bartlett's Test of Sphericity was conducted to evaluate the significance of the study and the relevance of the responses to the problem under investigation. A significance level below 0.05 is typically required to recommend factor analysis. Remarkably, this test yielded a significance value of less than 0.001, well below the threshold, indicating optimal analysis conditions.

These results demonstrate the robustness of the data used in this research, as confirmed by the KMO and Bartlett's Test of Sphericity. In addition, the high KMO value and the significantly low p-value provide strong evidence for the responses' reliability, validity, and applicability to address the research problem.

Table 2. The measure of Sampling Adequacy.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.847
Bartlett's Test of Sphericity	Approx. Chi-Square	10205.140
	df	190
	Sig.	0.000

The eigenvalue is the number of extracted factors, and the sum of these factors should equal the number of objects being factored. It provides a list of analysis components and their corresponding eigenvalues. In this analysis, the Initial Eigenvalues and Extracted Sums of Squared Loadings were exclusively examined and interpreted. To identify the factors and selected variables, eigenvalues greater than 1 were considered significant. For instance, in **Table 3.** below, the eigenvalues for the 1st, 2nd, 3rd, 4th, and 5th components are 9.813, 2.060, 1.182, 1.089, and 1.019, respectively. As all these values are more significant than 1, it can be concluded that the set of 20 variables represents five components.

Furthermore, the extracted sum of squared loadings % of variance reveals each factor's proportion of variance accounted for. The first factor explains 49.064% of the observed variance, the second factor explains 10.302%, the third factor explains 5.912%, the fourth factor explains 5.447%, and the fifth factor explains 5.097%. Therefore, these five components effectively capture all the characteristics or components highlighted by the 20 variables mentioned.

Table 3. Loadings extractions of the required variables for data evaluation.

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	9.813	49.064	49.064	9.813	49.064	49.064
2	2.060	10.302	59.366	2.060	10.302	59.366
3	1.182	5.912	65.278	1.182	5.912	65.278

4	1.089	5.447	70.724	1.089	5.447	70.724
5	1.019	5.097	75.821	1.019	5.097	75.821
6	0.835	4.174	79.996	-	-	-
7	0.775	3.877	83.873	-	-	-
8	0.731	3.655	87.528	-	-	-
9	0.493	2.466	89.994	-	-	-
10	0.445	2.223	92.217	-	-	-
11	0.409	2.045	94.262	-	-	-
12	0.270	1.351	95.613	-	-	-
13	0.247	1.234	96.847	-	-	-
14	0.216	1.079	97.926	-	-	-
15	0.180	0.902	98.828	-	-	-
16	0.075	0.377	99.204	-	-	-
17	0.045	0.227	99.431	-	-	-
18	0.044	0.220	99.651	-	-	-
19	0.040	0.201	99.852	-	-	-
20	0.030	0.148	100.000	-	-	-

Extraction Method: Principal Component Analysis.

Cronbach's alpha values for all 20 variables, shown in **Table 4**, are to be statistically significant, indicating that the data are internally consistent at levels greater than 0.6.

Table 4. Sample's reliability of all the factors.

Reliability Statistics	
Cronbach's Alpha	No. of items
0.781	20

3.3 Factors Affecting AI's Impact on SE

The various factors that influence the impact of AI on SE within Jordanian banks have been assessed. The study analyzed the average effects of these factors, examined the correlation between bank type and SE, and evaluated the relationship between the utilization of AI and the different departments within Jordanian banks. Several factors were considered to determine the extent of AI's impact on SE in Jordanian banks. These factors were thoroughly examined to understand their influence on the overall effectiveness of AI implementation. In addition, the correlation between bank type and SE has been investigated. By examining the diverse types of banks present in Jordan, such as central, commercial, digital, international/foreign, and Islamic banks, the research aims to identify any variations in the impact of AI on SE across different banking sectors. This analysis has shed light on the specific dynamics in each bank type and contributed to a comprehensive understanding of AI's influence on SE in the Jordanian banking industry.

3.3.1. Bank's Type Association with the Impact of AI in Different Jordanian Banks.

The results of **Table 5**. show a significant association between the bank categories and the

impact of AI on SE factors, as the p-value=0.038. Furthermore, Phi and Cramer's V tests show the strength of association between the variables, as Phi's score is $0.237 > 0.25$, and Cramer's V is $1.18 > 0.25$. Finally, the post-hoc test was applied, showing a significant p-value=0.002.

Table 5. Chi-Square Test of the Impact of AI in Different Jordanian Banks.

Chi-Square Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.295a	16	0.038
Phi	0.237	-	0.038
Cramer's V	0.118	-	0.038

3.3.2. The Uses of AI in Different Departments of Jordanian Banks.

Table 6. shows the association between the uses of AI in different departments with bank types as the p-value=0.025. The Phi and Cramer's scores are $0.232 > 0.15$ and $0.164 > 0.25$, respectively. Finally, the post-hoc test was applied, showing a significant p-value=0.002.

Table 6. Chi-Square Test of the Uses of AI in Different Departments of Jordanian Banks.

Chi-Square Test	Values	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.099a	14	0.025
Phi	0.232	-	0.025
Cramer's V	0.164	-	0.025

a. 10 cells (41.7%) have an expected count of less than 5, and the minimum expected count is 0.44.

3.3.3. Bank Type Association with different variables

Table 7 shows all the insignificant values from the test, showing no dependency of variables on each other.

Table 7. Bank-type association with different variables.

Bank Type Variable	Values	df	P-values
Use of AI in Jordanian Banks	7.426	8	0.491
AI and entrepreneurial culture	24.201	16	0.85
AI and entrepreneurial creativity	15.481	16	0.490
AI and entrepreneurial leadership	17.144	16	0.376

3.3.4. Departments wise association with different variables

Table 8. Departmental association with different variables.

Department Variable	Value	df	P-values
AI and SE	30.765	28	0.328
AI and entrepreneurial culture	30.520	28	0.339
AI and entrepreneurial creativity	22.690	28	0.748

AI and entrepreneurial leadership	30.060	28	0.360
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3.2 Discussion

The results of the study showed that the assumption that AI, such as expert systems, neural networks, and genetic algorithms, positively affects the SE in its different dimensions, such as Entrepreneurial Leadership, Entrepreneurial Culture, and Creativity throughout the Jordanian banks. The current study's findings revealed the positive impact of AI applications on SE. In addition, a significant association between the bank categories and the impact of AI on SE factors ($P=0.038$) has been found.

Moreover, it was also found that there is a significant association between bank types and the uses of AI in different departments of Jordanian banks ($P=0.025$). Although, AI doesn't strongly correlate with entrepreneur culture, creativity, and leadership regarding the bank types in Jordan and employees' bank functions.

Conclusions

The current study has investigated the effect of AI applications on SE in the Jordanian banking sector. The authors conducted empirical research employing a survey questionnaire distributed to Jordanian bank employees in which most respondents were from the age group of 37-43 and belonged to the management department. This survey aims to evaluate the level of AI application in Jordan's banking sector and its influence on SE. The survey results indicate that AI is utilized extensively in Jordanian banking (**Table 6**), particularly in foreign and digital banks (*List of All Banks in Jordan Official Information, 2022*). However, the study has analyzed and discovered a significant association between AI applications and SE, suggesting that AI can facilitate SE in the financial industry. As Jordan is a developing country, integrating AI into the corporate sector takes some time (Kamiya, 2023). Although Cramer's and Phi show significant association, the post-hoc (**Table 5**) indicates that most employees from customer services do not use AI in their department. It can be proclaimed based on data statics that AI doesn't have a strong correlation with entrepreneur culture, creativity, and leadership regarding the bank types in Jordan, and a weak relationship has been found between AI and SE, e.g., entrepreneurial culture, creativity, and administration regarding employee bank functions (**Table 7**). Furthermore, the authors suggest that Jordanian banks should continue to invest in AI and new applications that promote SE (Jarrahi, 2018). In addition, policymakers have been recommended to devise regulations and guidelines to ensure the ethical and accountable use of AI in the banking industry.

This research article contributes significantly to the literature on AI and SE, particularly in Jordan's banking industry. The study provides empirical evidence of a positive relationship between AI applications and SE, highlighting the potential benefits of AI for companies in this industry. However, the study also stresses the need for organizations and policymakers to consider AI's ethical and responsible application.

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