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Data-Driven Decision-Making Under Uncertainty: Investigating OLAP's Mediating Role to Leverage Business Intelligence Analytics for Entrepreneurship

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Abstract. This research empirically investigates the enabling role of online analytical processing (OLAP) in leveraging business intelligence and analytics (BIA) for entrepreneurial decisions. A survey analysis of 262 telecom managers in Jordan evinces OLAP's mediating effect in indirectly linking BIA to entrepreneurship outcomes. The study advances scholarly comprehension of how analytics translation through multidimensional modelling bolsters data-driven decision-making under uncertainty. Additionally, the applied insights on synergizing BIA with online data interpretations assist practitioners seeking to optimize entrepreneurial initiatives through intelligent systems integration. The findings of the current study confirmed that all the hypotheses were supported.

Keywords: Business intelligence and analytics, entrepreneurship, OLAP, Telecommunication companies, Jordan.

1. Introduction

The global pandemic caused by the coronavirus outbreak posed dramatic changes to how business is conducted. Entrepreneurship is one of these areas that has witnessed changes that present new challenges and opportunities. Entrepreneurship as a concept is built on risk-taking. This is due to the high uncertainty that is related to unexplored paths. Therefore, created a need for a suitable tool to handle and minimize the effect of entrepreneurship-related risks (Oche, 2021; Ratten, 2021).

Business intelligence is known for its ability to provide data-driven decision-making. The ability to integrate intelligence applications using the appropriate management styles boosts the chances of companies' success (Alarabiat & Eyupoglu, 2022). Furthermore, due to technological advancements which shorten business life-cycle financial institutions are required to exercise intelligent decision-making if they want to remain ahead of their competition (Kalyani, 2019). Business intelligence proved to be effective in supporting strategic intelligence and decision-making processes (Awamleh & Bustami, 2022b).

The business intelligence and analytics, thereafter BIA system is the tool to identify, collect and store data from the business's internal and external environment. Data analysis, on the other hand, is in charge of analyzing and manipulating the data that business intelligence gathers (Turban, 2011). Online analytical processing (OLAP), is an online analytical tool that is used by companies to make sense of their data and to provide valuable input for business intelligence systems that can handle vast amounts of data. The analyzed data provides a suitable base for predicting the effect of the risk factors that are surrounding entrepreneurship (Queiroz-Sousa & Salgado, 2019).

The current literature on entrepreneurship is gaining attention (Al AQasrawi & Alafi, 2022a; Awawdeh et al., 2022a). However, the link between BIA, OLAP technologies, and entrepreneurial decision-making remains empirically underexplored, warranting closer investigation. Therefore, this study addresses this literature gap by examining the intersection of business intelligence, online analytics, and entrepreneurship in the context of Jordanian telecom companies. The study context was selected due to the robust IT infrastructure and talent. Hence, it allows the companies to operate business intelligence and analytics applications. Furthermore, Jordanian telecommunication companies are known for their cutting-edge entrepreneurship initiatives (Al AQasrawi & Alafi, 2022a; Al-Okaily et al., 2022; Awamleh & Bustami, 2022b; Bany Mohammad et al., 2022). Henceforth, it gives credibility to the suitability of this study's context.

The remainder of this manuscript is formulated as follows: the literature review of the study concepts, followed by the Methodology. Then, results and discussion where the results, implications, and future research will be presented. Finally, the conclusion.

2. Literature Review

2.1. Business Intelligence and Analytics

Business intelligence and data analytics are two important parts of today's way of doing business. They go hand in hand to tackle one of the pressing matters in the business lifecycle which is data-driven decision-making (Andoh-Baidoo et al., 2022). On one hand, the business intelligence system is a tool to collect and store data while on the other hand, data analysis is about analyzing, understanding, and reporting the results (Hurbean et al., 2023).

Undoubtedly, companies by optimizing business intelligence and analytics desire a competitive edge over their competitors. As Wang et al., (2022) put it, business intelligence and analytics are data-driven approaches that take decisions proactively. Business intelligence collects and stores data so it can be analyzed. Data analysis, on the other hand, is used to capture trends and patterns within the stored data. Also, it is used to understand the foundation of the collected data. This is to support the decision-making process (Bany Mohammad et al., 2022). Another function of data analysis is to predict outcomes using data models, which is essential for future planning and strategic decision-making (Ajah & Nweke,

2019).

The literature on business intelligence and data analytics expanded significantly. Researchers addressed data collection, data storage, data cleaning, data analysis, and data visualization. However, the empirical research on business intelligence and analytics is very limited (Hurbean et al., 2023). Telecommunication companies depend on business intelligence and analytics systems to analyze the data from inside and outside the organization, to aid the companies' real-time decision-making (Kumar, 2012). Business intelligence and data analytics were found to have a positive direct impact on digital transformation and transforming capability in the telecommunications sector in Jordan. As a result, it works hand in hand with the decision-making process (Ahmad & Mustafa, 2022). To fully unlock the potential of business intelligence and analytics, companies should think about planning technical capabilities, management and human resource capabilities (Mohammad et al., 2022).

Due to its role in handling complex data structures and fast retrieval ability, OLAP is connectable with BIA. OLAP and BIA together provide users with the ability to analyze data from different dimensions and perspectives. This functionality allows managers to capture a holistic view of their data and identify trends, outliers, and correlations (Al-Okaily et al., 2023). By leveraging OLAP, business intelligence systems can provide deeper insights, enhance decision-making, and drive better business outcomes (Al AQasrawi & Alafi, 2022b). Furthermore, combining OLAP with BIA managers can get the full potential of their data and gain a competitive edge in the market (Patel & Sharma, 2020). For instance, OLAP allows for ad-hoc querying and interactive analysis, enabling users to explore data and drill down into specific dimensions to gain insights.

Business intelligence and analytics (BIA) have been the subject of limited attention within the realm of entrepreneurship research. Nevertheless, there is an increasing acknowledgement of the potential impact that BIA can have on entrepreneurship (Bosman et al., 2022). However, the literature on BIA and entrepreneurship research might cross paths on how entrepreneurship initiatives can utilize and advance AI-based technologies. Another intersection of the two research streams is the utilization of AI-based research methods like big data techniques or AI-based forecasting methods to advance entrepreneurship. These methods can unearth groundbreaking discoveries in the entrepreneurial process (Awawdeh et al., 2022b).

2.2. OLAP

OLAP, as a definition, is a collection of rules that provide a dimensional framework that backs the decision-making process (Hamoud et al., 2020). It is also an approach to instantly providing answers to multidimensional analytic queries (Queiroz-Sousa & Salgado, 2019). Moreover, OLAP enables users to gain an in-depth consideration and familiarity with different aspects of their corporate data through fast, systematic, collaborative access to a varied diversity of possible views of the data. It allows the user to view corporate data in such a way that it is a better model of the true dimensionality of the enterprise (Hamoud et al., 2020; Maulana & Wulandari, 2019).

OLAP applications are common for data mining. Different databases are available for OLAP such as aggregated, chronological data, and multi-dimensional schemas (Shelest & Holub, 2020). The ultimate use of OLAP is to measure the tasks that are related to data warehouse systems, data analysis and decision-making (Hamoud et al., 2020; Mathur et al., 2021). In developed countries, the first appearance of the use of computerized audits, and dynamic online analysis processing based on the creation of information systems showed a good social effect (Bo & Ye, 2011). The author of the relational data model E.F. Codd (1993) was the first to mention the OLAP systems to carry out the analysis of various processes. It is an analytical system that has a visual interface and a research nature that allows users to manipulate large amounts of information. A few years back, OLAP systems were used to recognize patterns within economic process development and establish strategies of change and transformation, then the practice has been extended throughout the developed countries (Yanjun, 2013). Due to the suitability of the functionality between OLAP and business intelligence, they have been tied

together in several studies (Fitriana & Djatna, 2011; Maulana & Wulandari, 2019a).

OLAP can help boost entrepreneurship via its ability to support real-time data-based decision-making. The ability to analyse complex data sets from the business environment would give a comprehensive edge to the manager to undertake entrepreneurship decisions (Al AQasrawi & Alafi, 2022b). However, more research is needed on how OLAP helps entrepreneurship advance. Especially, a robust model that can help forward-push the literature. As for the intermediating role of OLAP in the relationship between BIA and entrepreneurship, there is a lack of studies that address this matter and this is one advantage of the current study.

2.3. Entrepreneurship

Undoubtedly, entrepreneurship generated economic growth by creating more jobs and exhilarating research and development. It has proved to be a source of Gross demand production. Also, it has a footprint in creating the technological advancement that we are enjoying today. Entrepreneurship is behind creating new opportunities and establishing new markets and new business models (Wong et al., 2005).

Entrepreneurship has been gaining more attention. Recently researchers have addressed topics such as innovation, job creation, and entrepreneurial mindset and emotions. This is to fulfil the demand created by the increased number of such startups. It is influenced by the success stories of Amazon, Tesla, and Apple (Guerrero & Urbano, 2019a; Lichtenthaler, 2018). The definition of entrepreneurship consists of two main characteristics. The first one is a new business venture and the other one is risk involvement. Entrepreneurs who can handle the risk can harvest the fruit of creativity and innovation. Hence, it paved the road for a new line of opportunities that addressed worldwide matters (Hoogendoorn et al., 2019).

Entrepreneurs and self-employed personnel have to deal with different stress generators such as uncertainty, the shortcomings of transactions, reputational threats, disloyalty, and serious sickness. Personality characteristics described by the entrepreneurship model embrace risk propensity, innovativeness, stress tolerance, and achievement motivation. Up to now, it might be assumed that entrepreneurs lacking these characteristics are more likely to suffer from stress. One way to ease the stress is to manage the risk and deal with uncertainty. This is via optimizing business intelligence tools and data analysis (Tarek & Adel, 2016).

There are recognized research trends that can be spotted in the literature. Especially, in the Arab world such as gender entrepreneurship, youth entrepreneurship, entrepreneurship behaviour and orientation are the three main categories influencing perspectives on entrepreneurship (Aljuwaiber, 2020). Entrepreneurship literature needs empirical studies that take into consideration the role of business intelligence, small data analysis, the Internet of things, and big data analytics, as it is enablers for new business models that are suitable for the post-pandemic era of business (Sharma et al., 2022). Specifically, to extend our understanding of how these technologies will enable entrepreneurship as it did with new business models, operational efficiency, competitive advantages, and sustain the growth of businesses. Several studies attempt to address business intelligence's role in supporting entrepreneurship (Al AQasrawi & Alafi, 2022a; Awawdeh et al., 2022a). However, the current study differs in terms of the perspective of business intelligence and its analytical side and how it affects entrepreneurship both directly and indirectly.

2.4. Hypothesis scenery

Figure 1 shows the study's theoretical framework which illustrates the hypothetical linkage between, business intelligence and analytics, OLAP, and entrepreneurship. The model was developed based on the recommendations of previous research. Ultimately, it intends to contribute to the literature by proposing a model that can expand our understanding of the relationship between "business intelligence and analytics", online analytical processing, and entrepreneurship.

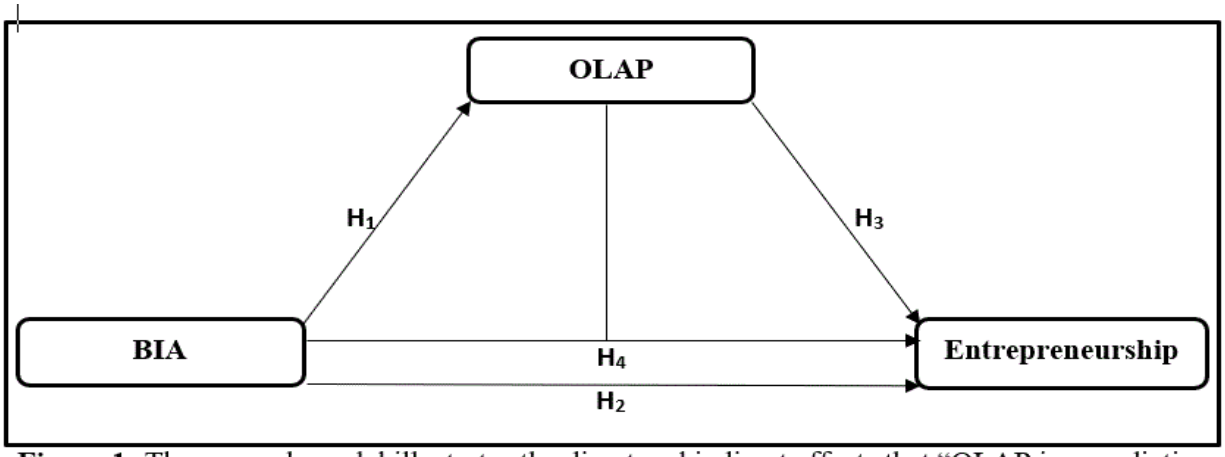

Figure 1: The research model illustrates the direct and indirect effects that "OLAP is a mediation effect between BIA and Entrepreneurship"

2.5. Hypothesis Development and Theoretical Linkages

Data analytics has become more complex due to challenges in databases, leading traditional analyses to struggle with processing information efficiently, resulting in slow and basic outputs. In contrast, OLAP, acting as a visual wizard, has shown exceptional efficiency in analyzing data swiftly and addressing complex issues. It caters well to senior management and stakeholders, providing high efficiency in data retrieval and analysis. This enables timely reporting to stakeholders, facilitating informed decision-making by decision-makers. (Hamoud et al., 2020a; Maulana & Wulandari, 2019a).

Business intelligence and analytics is the application of a data analysis program to take advantage of the results in extracting wise management decisions (Božič & Dimovski, 2019). What is interesting is that the use of business intelligence to analyze data via OLAP helps corporates to deal with massive information technology and that prevents exposure to theft or data loss. In other words, the ability to retrieve information quickly and salvage it from loss creates a competitive advantage and continuity for companies (Awawdeh et al., 2022a; Oche, 2021). Based on the above concrete arguments, the study set out the hypothesis as follows:

H1: "Business intelligence and analytics" has a positive association with OLAP.

Organizations in the current era face rapid and unpredictable changes, such as challenges and competition within the work environment that put organizations in more danger of withdrawing from the competitive environment. Entrepreneurs were called upon to initiate innovations that help predict the future, as a way to gain success and continuity. The use of business and analytical intelligence is an inventory of data and a redirection from raw quantitative materials to a quantitative quality that can be measured and predicted to produce optimal strategic decisions (Morais et al., 2021).

Commitment to the application of entrepreneurship in business intelligence is a necessary model for organizations that strive to enhance it and adapt to the supply chain, and the essence of management's task has become to use logic and scientific prediction instead of chaos. Business intelligence is now seen as the primary key to success and acquiring a competitive advantage for enterprises and penetrates all factors of organizational success.

Business intelligence supports entrepreneurs with the ability to deeply analyze competitors, the ability to monitor their business, and the ability to analyze the needs of respondents, which gives a distinct competitive position that helps seize opportunities and avoid threats from the external environment surrounding the work environment. Business intelligence systems use historical data in a chronological sequence that helps to understand market movements and fluctuations sequentially from

the past to the present, which makes predicting the future easier and more accurate than companies that do not have a digital background with this prediction, which makes them more dangerous to lose competitive value and withdraw from the work environment (Maulana & Wulandari, 2019a). Based on the above solid arguments, the study came out with the hypothesis as follows:

H2: "Business intelligence and analytics" has a positive association with Entrepreneurship.

The OLAP software is used in several matters, such as controlling manufacturing processes, planning, inventory control, and systems for dealing with customers, and this increases innovation and entrepreneurship. A study by Bratucu et al., (2020), proved that the use of a model for entrepreneurship by using the OLAP cube helps to include a huge database that helps to catch everyone who has an interest in the educational institution such as investors, customers, and potential collaborators.

The role of entrepreneurship can be improved through the use of modern computer systems that help invention and creativity (Guerrero & Urbano, 2019b). One of the most important technologies is OLAP programs, as it helps to convert quantitative data into qualitative, which helps predict future trends. OLAP technology is used by using large business intelligence bases to issue reports and improve them periodically and continuously in terms of using hierarchical data instead of regular tables, which gives decision makers the ease of thinking with more flexible brainstorming that helps redirect sound decisions. This base also allows simulation systems to address the future, which represents a real solution for future situations. The OLAP cube is based on collecting big data and comparing them in a good manner. Based on the above solid arguments, the study set out the hypothesis as follows:

H3: OLAP has a positive association with Entrepreneurship.

Business intelligence and analytics is a smart software that scans raw data assets and sources to turn them into valuable information that assists management in rational strategic planning, resulting in breakthroughs in the field of entrepreneurship. Business intelligence also makes use of modern and fast technologies, such as OLAP software, which uses many methods to analyze and solve data faster and with less complexity than traditional analyses, increasing control over knowledge management using big data and redirecting it with high-quality efficiency, and increasing organizational awareness in entrepreneurship that is less risky and closer to accuracy in Strategic execution. (Al Aqasrawi & Alafi, 2022; Mathur et al., 2021; Maulana & Wulandari, 2019b).

Furthermore, data analysis for business intelligence using the OLAP cube has a vital role in having a flexible and rapid response to administrative strategies in a complex and rapidly changing environment to keep pace with progress and technology and exploit it in its ideal form, which increases the competitive position sought by the modern concept of entrepreneurship (Hamoud et al., 2020b; Mathur et al., 2021). Based on the above solid arguments, the study came out with the hypothesis as follows:

H4: OLAP has a mediating effect on the relationship between "Business intelligence and analytics" and Entrepreneurship.

3. Methodology

3.1. Design

This study was designed as cross-sectional, descriptive, and analytical research. It is founded on a critical analysis and in-depth study of the previous literature to develop a model that can bridge the gap in the current literature. The questionnaire method is then used to collect data from the population. Afterwards, the responses were used to test the model and present the results as a contribution to the knowledge. To ensure accurate results, the study sample was selected based on the random probability method (Sekaran & Bougie, 2016).

A pilot study of a sample of 28 administrative staff from Jordanian Telecommunications companies has been conducted to ensure the fitness of the study tool and its ability to collect data from the study sample.

3.2. Sample

The study setting is the Jordanian Telecommunications sector. Three major companies were selected to represent the study population namely, (Orange, Zain, and Umniah). The study sample comprises a random sample of 262 managers and heads of departments. The responses were valid and fit to perform the analysis. The data collection questionnaire was developed based on recent studies (Abdellatif et al., 2011; Awamleh & Bustami, 2022b; Bany Mohammad et al., 2022; Khalil & Belaissaoui, 2023; Vendrig et al., 2021). Hence, it is previously validated and tested which ensures the validity and reliability of the data collection instrument. Moreover, Jordanian telecommunication companies have been accredited due to their adoption of entrepreneurship development centres that depend on intelligent systems to aid their innovation initiatives.

3.3. Measure

The study instrument has been developed based on adopted measurements from the aforementioned studies. Thus, guaranteeing the credibility and reliability of the questionnaire questions. The total number of questions was 38 questions with a credibility of 0.95 for all items of the study. The questionnaire sections are detailed as the following:

BIA was measured using a tool according to (Awamleh & Bustami, 2022b; Bany Mohammad et al., 2022). The adopted scale was formed of 16 questions based on a five-point Likert scale, ranging from "5 strongly agree" to "1 strongly disagree".

Entrepreneurship was measured with 15 questions divided into the following four dimensions (Entrepreneurial Attitude with 4 questions, Management Skills with 3 questions, Entrepreneurial Resilience with 5 questions, and Financial Health with 3 questions), with a 5-point Likert scale, starting from "5 strongly agree to 1 strongly disagree". The scales developed based on the work of (Vendrig et al., 2021).

The study questions were reformulated based on the following studies (Abdellatif et al., 2011; Khalil & Belaissaoui, 2023). Moreover, factor analysis was used to ensure that the questions were in their ideal form, the factors were analyzed, and 7 questions were found suitable for the current study. The credibility and reliability of the selected questions that fit the study objectives were proven. A 5-point Likert scale was adopted, starting from "5 strongly agree to 1 strongly disagree", respectively.

3.4. Procedure

Quantitative research methods were used throughout the survey. This is done by distributing manual questionnaires to the targeted sample that is managers and heads of departments in Jordanian telecommunications companies. Cross-sectional study design that targeted managers who have entrepreneurial qualities in decision-making.

3.5. Statistical analysis

Out of the total data collected, 262 questionnaires were completed and were suitable in terms of the reliability, validity, and normality analysis stage. The analysis of the collected data has been done using "SPSS 25". Firstly, the demographic characteristics of the participants were calculated. Followed by, a test of reliability, normality, summary statistical averages, and validity. Then, a multiple linear correlation test was executed to examine the relationship between the study's variables as well as examine the hypothesis and answer the study's questions. Finally, the PROCESS Macro v3.5 has been used to measure the direct and indirect effect of the mediating effect of the study's variables.

3.6. Results

Table 1 shows the summary statistics of the internal validity of bivariate correlations. The internal validity as indicated by Pearson correlation coefficient scores proves the absence of similarity between the variables. Hence, it indicates that the study variables are significantly correlated at ($p<.01$ & $p<.05$) which improves the degree of correlation and independence among the study variables (Sekaran & Bougie, 2016). Particularly, it proves the absence of a weak relationship between BIA and

entrepreneurship. This is due to the score of all study variables being more than 20%. Finally, it is concluded that there is no data overlap between study variables as there is no correlation above 90%. Accumulatively, the internal validity of BIA and entrepreneurship was verified.

Table 1: Summary statistics of the internal validity.

Variable	BIA	ES	OLAP
BIA	1.00		
ES	.782**	1.00	
OLAP	.612**	.851**	1.00

** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed), N= 262.
BIA Business Intelligence and Analytics; ES= Entrepreneurship, OLAP= Online Analytical Process.

Table 2 summarizes the results of Reliability, Normality, Multicollinearity, and Descriptive statistics. The Cronbach's alpha score for Business Intelligence and analytics is (α=0.90), entrepreneurship (α=0.84), OLAO is (α=0.93), and overall reliability is (α=0.95). Hence, the reliability scores for all items are greater than 70% which indicates a very high degree of reliability (Hair et al., 2014). As for the test of normality, business intelligence and analytics, entrepreneurship, and OLAP are distributed naturally due to the test of normality statistics being between (±2.58) (Hair et al., 2014). The test of multicollinearity statistics VIF is less than (5) which indicates the study's variables are free of Multicollinearity (Sekaran & Bougie, 2016).

The descriptive analysis has been utilized to measure the impact level of the study questions on the responses of the managers in Jordanian Telecommunications companies. In addition, to identify areas that have the highest impact level on the study variables. The descriptive mean for all variables is between 3.43 and 3.74. The Standard Deviation for the 5-point Likert scale of all variables is (SD=0.52 & 0.57) which indicates the high-medium level arithmetic of the variables. These results were based on the point of view of the research sample.

Table 2: Tests of Reliability, Normality, Multicollinearity, and Descriptive Statistics.

Variables	BIA	ES	OLAP	Total
N. of item	16	15	7	38
Alpha (α)	.90	.84	.93	.95
Skewness	-.217-	-.743-	-.957-	Er = .150
Kurtosis	-.242-	.342	.954	Er = .300
VIF	2.33	3.60	3.65	VIF < 5
Tolerance	.41	.22	.38	T< 1.00
Mean	3.43	3.66	3.74	M&H Level
SD	.56	.52	.57	M&H Level

Alpha (α) >= 70; Skewness & Kurtosis = ±2.58; VIF = < 5; Mean & SD = Medium & High level (HL).
BIA Business Intelligence and Analytics; ES= Entrepreneurship, OLAP= Online Analytical Process.

Based on the above results, the data was found to be suitable to answer the study questions and test the study's hypotheses. Table 3 shows the result of the linear regression analysis.

Model 1 shows the R square value for the BIA (R-square = 0.38) from OLAP. Also, the Durban-Watson value is within the acceptable level (D.W= 1.71) indicating that the research model's variables are free of auto-correlation. The F-test value is F (155.45) which guarantees that the model is significant at (p =< 0.01). Moreover, the value of the beta coefficient for BIA increases by (β = 0.61) for every

point of OLAP, which confirms that BIA is closely related to OLAP (Kumari & Yadav, 2018).

Finally, model 2 shows the R square value for the BIA (R-square = 0.61) from Entrepreneurship. Also, the Durban-Watson value is within the acceptable level (D.W= 1.95) thus, indicating that the research model's variables are free of auto-correlation. The F-test value is F (408.52) which guarantees that the model is significant at (p =< 0.01). Moreover, the value of the beta coefficient for BIA increases by (β = 0.78) each by one point against Entrepreneurship, which confirms that BIA is closely related to Entrepreneurship. (Kumari & Yadav, 2018).

Model 3 shows the R square value for the OLAP (R-square = 0.73) from Entrepreneurship. Also, the Durban-Watson value is within the acceptable level (D.W= 1.62) indicating that the research model's variables are free of auto-correlation. The F-test value is F (685.61) which guarantees that the model is significant at (p =< 0.01). Moreover, the value of the beta coefficient for OLAP increases by (β = 0.85) each by one point against Entrepreneurship, which confirms that OLAP is closely related to Entrepreneurship (Kumari & Yadav, 2018).

In summary, the decision "Supported" suggests that the models are considered statistically significant based on the provided analysis. Durbin-Watson statistics for all models are within the acceptable range. Out of the three provided models, Model 2 has the highest R-squared value and F-statistic, indicating the best fit and overall significance

Table 3: Linear regression analysis.

Model	**variables**	**R Square**	**D.W**	**β**	**F**	**Decision**
Model1	BIA ⟶ OLAP	0.38	1.71	0.61	155.45	Supported
Model2	BIA ⟶ ES	0.61	1.95	0.78	408.52	Supported
Model3	OLAP ⟶ ES	0.73	1.62	0.85	685.61	Supported

Regression is significant at p ≤ 0.01; * Regression is significant at p ≤ 0.05.
BIA Business Intelligence and Analytics; ES= Entrepreneurship, OLAP= Online Analytical Process.

The PROCESS macro is broadly used in the research community. It was developed by a reputable researcher (Andrew F. Hayes). Its methodology is based on established statistical techniques for mediation and moderation analysis. The PROCESS macro permits the analysis of both moderation and mediation effects within a single framework. It provides estimates for direct and indirect effects, allowing researchers to investigate complex relationships in their data.

Table 4 shows the direct and indirect relationship using PROCESS Macro v3.5, where the distance of the direct and indirect periods indicates that the LLCI equation does not pass through zero, which indicates that it is a statistically significant value in both cases. In addition, the direct effect was equal to 0.38, on the other hand, the indirect effect increased the relationship by 0.34, which improves the value of the total effect so that the full effect becomes 0.72, which raises the value of the mediator variable as a powerful technology that creates a competitive advantage that helps organizations to take advantage of market opportunities and deal efficiently with the market potential threats.

Table 4: PROCESS Macro v3.5 (Direct & Indirect effect).

The total effect of X on Y					
Effect	se	t	p	LLCI	ULCI
0.72	0.04	20.21	0.00**	0.65	0.79
The direct effect of X on Y					
Effect	se	t	p	LLCI	ULCI

0.38	0.03	13.02	0.00**	0.33	0.44
Indirect effect(s) of X on Y: OLAP					
Effect	BootSE	t	p	BootLLCI	BootULCI
0.34	0.03	12.47	0.00**	0.27	0.40

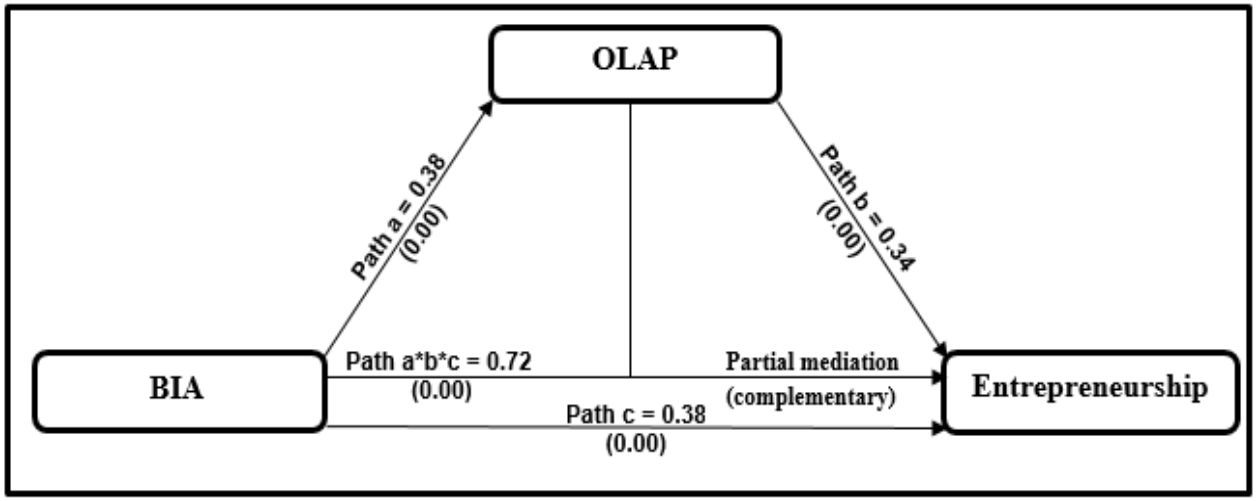

Figure 2: The structure model illustrates the direct and indirect effects that "OLAP is a partial (complementary) mediation between BIA and Entrepreneurship"

NB.

Indicates direct effect (path c)

Indicates indirect effects (path a*b*c)

4. Discussion

Companies gain competitive advantages by incorporating intelligent technologies with IT capabilities (Awamleh & Bustami, 2022a). A study by AlQasrawi & Alafi, (2022), recommends developing innovative projects using business intelligence and analytics applications for entrepreneurial organizations. Specifically, these are finding difficulties in predicting changes in the business environment. This is to give them value that enables them to seize market opportunities and avoid targeted technological risks. In this regard, the integration of intelligent systems is proven to support strategic decision-making (Awamleh & Bustami, 2022b). The role of business intelligence and analytics in collecting, storing, and manipulating data to create valuable bases that support traditional decision-making and leverage the new form of data-driven decision-making is yet to be fully explored. Therefore, the results of this study add to the current literature a model that proves the indirect effect of business intelligence and analytics on entrepreneurship decision-making via OLAP which is in agreement with the aforementioned study (Al AQasrawi & Alafi, 2022).

Business intelligence and analytics aid the success of entrepreneurship initiatives in light of the scarcity of resources and the conflict environment to stay in the market (Gikandi & Njuguna, 2021). The current study supports the notion of the argument proposed by (Gikandi & Njuguna, 2021). Online data reliance by OLAP has become one of the requirements of business intelligence because of its ability to use huge data analysis in multiple ways that help entrepreneurs make rational and quick decisions (Debnath et al., 2020). This is in line with this study's findings that OLAP is playing a mediating role in the relationship between BIA and entrepreneurship.

Recently, entrepreneurship initiatives are facing new challenges such as sustainability, supply chain disruption and innovation (Lew et al., 2023; Sturm et al., 2023; Tien et al., 2023). The result of this study could provide a way to overcome these challenges. Integration of the BIA and OLAP enables businesses that have entrepreneurship initiatives to leverage other technologies such as international performance indicators that might pave the way to achieving sustainable development.

Regarding innovation and supply chain disruption, BIA and OLAP can link blockchain business model innovation (BBMI) with entrepreneurship to deal with the problems of supply chain disruption and business model innovation. The findings of this study are related to similar studies that addressed these concerns (Guo et al., 2020; Lew et al., 2023).

In this regard, BIA using the OLAP cube has a vital role in having a flexible and rapid response to managerial decision makers that are in charge of entrepreneurship in a complex and rapidly changing environment to keep pace with progress and technology and exploit it in its ideal form, which increases the competitive position sought by the modern concept of entrepreneurship. This is relevant to the findings of another study (Sturm et al., 2023).

4.1. Implications

The current literature examined business intelligence and analytics in different settings. Also, it looks into online data analysis within complicated models and concepts other than business intelligence and entrepreneurship. The direct effect of the two principles is missing, principally in evolving markets such as Jordan. The purpose of this study is to examine the direct and indirect effects of business intelligence and analytics on entrepreneurship. This study entails academic implications that encourage further studies to test the applicability of the research model in several industries and markets. ideally, developed economies.

This study provides evidence of the support that business intelligence and analytics provide for entrepreneurship systems, especially in optimising decision-making. The study finding contributes to the current literature by providing a tested model that quantifies the interrelationship of BIA, OLAP and Entrepreneurship. It sheds light on how OLAP act as a bridge in leveraging business intelligence and data analysis to aid entrepreneurial decision-making. Furthermore, this study provided evidence from a very important sector that telecom companies in Jordan.

In terms of practical applications, this study shed light on the benefits that business intelligence and analytics can provide for firms in improving their entrepreneurship via enhancing decision-making efficiency. In other words, managers can use business intelligence and analytics capabilities to manipulate the available data and turn it into useful patterns and trends that support the rational decision-making process. The findings of this study help managers to understand the relationship dynamic of the business intelligence data collection tools, data analysis capabilities as data analysis tools, and their output which is the basis of intelligent decision making. This understanding will help managers to build on this relationship and employ it in a wider context. Furthermore, managers may utilize BIA to improve the practice of available data in businesses. Decision-makers might integrate intelligence systems to adjust the use of data to adapt to external environment elements and strategic planning which in turn serve the purpose of the entrepreneurship initiatives.

The position of the OLAP as a mediator could give managers clues on its role in manipulating complex data. Therefore, they could integrate it with other concepts to tackle the matter of ambiguous data sets and hidden patterns. Nevertheless, managers could look into the study result and seek to apply the BIA integration with OLAP to make sense of unstructured data that seems difficult to analyse.

4.2. Limitations

Several factors might limit the study’s findings from being generalized. This study has taken place in a developing market namely Jordan which might be limiting the generalizability of the study's findings. However, it does not affect its contribution to the current literature by providing evidence of how BIA influence entrepreneurial decision-making. Moreover, this study presents a standalone framework that measures the effect of BIA and OLAP on entrepreneurship.

4.3. Future Research

The current study provides a quantitative model that would help future studies to apply it in

multicultural and multi-sector settings. This study shed light on the analytical capabilities of BIA by using OLAP and its support for entrepreneurship which will help further studies to put it into more complicated models and even go one step further and study the integration of the intelligent system in the organizations.

5. Conclusion

By elucidating OLAP's mediating mechanism, this study furthers academic understanding of business intelligence realization for entrepreneurship management. The findings contribute robust empirical evidence and an actionable framework for harnessing analytics in strategic decision-making contexts marked by risk and constrained resources. Additionally, the applied perspectives equip practitioners to derive fuller value from organizational data assets by dynamically modelling environments to guide entrepreneurial opportunity pursuit. While the research provides useful pilot evidence from Jordan, future efforts can enrich generalizability by testing variations across sectors, countries and integrator tools. Overall, the research underscores both scholarly and practical potential in blending analytics with online platforms to systematize entrepreneurial decision efficacies.

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