International Journal of Computing and Digital Systems
ISSN (2210-142X)
Int. J. Com. Dig. Sys. 15, No.1 (Mar-24)

http://dx.doi.org/10.12785/ijcds/150197

The Interplay between Intellectual Capital, Business Intelligence Adoption, and the Decision to Innovate: Evidence from Jordan

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Received 14 Jan. 2024, Revised 27 Feb. 2024, Accepted 8 Mar. 2024, Published 15 Mar. 2024

Abstract: This research explores the dynamic interplay among intellectual capital, the intention to adopt business intelligence (BI) technology, and the decision to innovate within the industrial landscape of Jordan. Using a quantitative approach, the study employs bootstrapping and Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze data from participants familiar with their companies' technological and innovation orientations. The findings reveal a noteworthy positive correlation between human capital and structural capital with the intention to adopt BI technology. Additionally, human capital demonstrates a significant positive association with the decision to innovate. The research further validates a positive relationship between the intention to adopt BI technology and the decision to innovate. The practical implications of these findings extend to decision-makers and managers in Jordan's industrial sector, underscoring the pivotal role of adopting business intelligence technology in fostering innovation. Significantly, by concentrating on innovation orientation in the Jordanian context, this paper contributes to the expanding body of research in developing countries.

Keywords: Decision to Innovate; Business Intelligence; Intellectual Capital; Industrial Sector.

1. Introduction

The COVID-19 pandemic has significantly influenced businesses worldwide, leading to economic contraction and decreased consumer spending [1]. This has resulted in job losses in sectors like tourism, hospitality, and entertainment [2], [1]. Governments have taken steps to alleviate the burden, but long-term consequences remain unknown [3]. The pandemic has highlighted the need for flexibility and resilience to withstand future shocks [4]. A sustainable recovery requires collaboration from all sectors [1], [4].

The pandemic significantly influenced the industrial sector, leading to supply chain disruptions and decreased output [2]. This led to a decline in consumer spending, job losses, and product demand [5]. To develop sustainable economies, firms embraced new technologies and investments in healthcare, biotechnology, and renewable energy [6]. It is crucial for the industrial sector to innovate and adapt as the world recovers from the epidemic.

Innovation is crucial for organizations, particularly in the industrial sector, to remain competitive and relevant in a rapidly changing market [7]. Businesses must constantly research new creative solutions and ideas to stay relevant and uphold their position [8]. Failure to innovate can lead to market share losses to rivals who can respond to consumer demands and trends faster [9]. A culture that promotes creativity, risk-taking, and investment in R&D is necessary for innovation to materialize as new technologies and business models [8], [9].

Modern economic growth is significantly influenced by business intelligence, which utilizes technology and data analysis tools to guide decisions and gain knowledge [10], [11]. Making decisions based on data is essential for businesses to have a competitive advantage in a fast-paced environment of business [12]. It helps identify market trends, understand customer behavior, optimize operational efficiency, and improve overall performance [13], [10]. By leveraging business intelligence, businesses can identify areas for improvement and develop new strategies to stay ahead of the curve.

Technology supports value-creating activities but cannot replace human decision-making [14], [15]. Effective business intelligence requires a skilled workforce to interpret and analyze data and make informed decisions [16], [17]. Adopting modern technology, including business intelli-

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gence, drives economic growth and development while maintaining competitiveness in a rapidly changing business landscape.

Intellectual capital is crucial for industrial organizations to achieve sustainable growth and competitiveness [18]. Human capital, including employees' knowledge, skills, and expertise, drives innovation, improves productivity, and develops new products and services [19]. Structural capital, including technology, systems, and processes, facilitates the efficient utilization of human capital [20]. Relational capital, including relationships with stakeholders, builds trust, cooperation, creativity, and knowledge sharing [21]. Integrating all three types of intellectual capital is essential for enhancing performance, innovation, and competitiveness [22]. Leveraging intellectual capital enables organizations to respond to changing market conditions and overcome challenges during crises, resulting in sustained growth and success [23].

The research gap within the Jordanian industrial sector becomes apparent in the limited understanding of the intricate correlation between Business Intelligence (BI) adoption, intellectual capital, and the decision to innovate. While existing studies underscore the pivotal role of these factors in fostering innovation and enhancing competitiveness, as evidenced by Buenechea et al.'s work [24], the specific dynamics of their interaction within the context of Jordan as a developing country remain underexplored. Prior research has predominantly focused on internal organizational factors such as structure and workforce agility [25], overlooking the potential influence exerted by intellectual capital and the utilization of business intelligence tools. The global pandemic has further underscored the imperative for process innovation as a means to sustain organizations. Addressing this research gap becomes paramount, offering an opportunity to gain valuable insights into how intellectual capital and BI adoption can be harnessed to effectively drive and promote innovation within the unique landscape of Jordan's industrial sector.

The objective of this study is to explore the dynamic relationship among the adoption of business intelligence, intellectual capital, and the decision to innovate within the Jordanian industrial sector. This research makes significant practical and theoretical contributions to the field. By exploring an emerging nation and its industrial sector, this study provides valuable insights often overlooked in existing literature. It sheds light on the key drivers and barriers to industrial sector performance, particularly during unforeseen crises, thereby expanding the body of knowledge and contributing academically to the advancement of the field.

The research provides economic guidance for policymakers, managers, and business owners in the Jordanian industrial sector and other developing nations. It provides information for strategic decision-making, allowing stakeholders to select cutting-edge technology and hire intellectual capital with knowledge. Significant social benefits from this study include the creation of jobs, the improvement of skills, and societal well-being. Businesses may provide job opportunities, lower unemployment rates, and promote innovation and entrepreneurship while harnessing intellectual capital, all of which have a beneficial influence on society.

2. Theoretical Framework and Hypotheses Development

A. *Intellectual Capital and Intention to adoption BI Technology*

Human capital is crucial for firms' performance in the industrial sector [19], [26], [27], as it enables efficient use and integration of BI technology. The intention to use BI technology refers to employees' preparedness to accept new technologies and implement them into their work [28].

Human capital has a favorable influence on the intention for adopting business intelligence technologies. Investing in staff training programs and educational opportunities can increase understanding and awareness [10], [29]. Employees with higher human capital feel competent and confident, and are more open to innovation, increasing their propensity to adopt new technologies like BI [30]. Employees who are enthusiastic about implementing new technologies are more likely to seek training and educational opportunities [31]. This enthusiasm encourages experimentation and innovation, supporting an organizational culture of learning and development [30], [32]. As a consequence, this research proposes the following:

H1a: A statistically significant and positive association is observed between human capital and the intention to adopt BI technology.

Business intelligence integration is crucial for industrial sector growth and development, as it is a vital economic pillar [10]. Effective structural capital management, including systems, procedures, and intellectual property, is essential for better decision-making, innovation, and competitive advantage [33], [34], [20]. This management improves collaboration, knowledge sharing, and process optimization [35]. Establishing a reliable technical infrastructure is crucial for BI technology adoption [36].

Additionally, structural capital positively impacts the industrial sector's intention to adopt BI technology [33], [34]. Effective management of structural capital increases the adoption of BI technology, fostering innovation and change [33], [37]. Well-structured processes and systems are essential for creating a favorable environment [38], [39]. Industrial enterprises can utilize intellectual property and data assets, increasing value for all parties involved [40], [41]. As a consequence, this research proposes the following:

H1b: A statistically significant and positive association is observed between structural capital and the intention to adopt BI technology.

Relational capital is crucial for corporate growth and profitability, especially in the industrial sector [42]. It is essential for building and sustaining a favorable climate for BI technology adoption [34]. Industrial firms must examine the link between relational capital and the aim to implement BI technology [34]. Building strong connections with stakeholders, including suppliers, consumers, and business partners, is crucial for success in adopting new technologies like BI [43]. Strong relationships with suppliers and consumers help businesses understand their needs and offer focused solutions [42]. Establishing supportive and collaborative atmospheres with business partners can facilitate the deployment and uptake of new technologies [10].

Relational capital is essential for industrial enterprises to overcome obstacles like resistance to change, technical knowledge, and financial shortages when adopting BI technology [44]. Strong relationships with stakeholders provide access to skills, funding, and knowledge transfer, while customers help develop tailored solutions [34]. Building and maintaining strong relationships with stakeholders improves the intention to adopt BI technology and overcomes challenges during the adoption process [45]. As a consequence, this research proposes the following:

H1c: A statistically significant and positive association is observed between relational capital and the intention to adopt BI technology.

B. Intellectual Capital and the Decision to Innovate

Human capital significantly impacts industrial sectors' innovation orientation [46], [47], [48]. A skilled workforce is crucial for companies to remain competitive and innovative in the global economy [46]. Investment in human capital development enhances innovation capacity by adapting to changing business environments through training programs and upskilling initiatives [48]. This builds a strong human capital base, enabling organizations to create and implement innovative ideas, products, and services, leading to sustained growth and profitability [48].

Recruiting workers from diverse backgrounds and experiences can promote the industrial sector's decision to innovate by offering fresh perspectives, creative solutions, and a diverse culture [49]. This approach boosts the ability to find and develop new goods and services, fostering growth and development in the industrial sector [50]. As a consequence, this research proposes the following:

H2a: A statistically significant and positive association is observed between human capital and innovation orientation.

Structural capital plays a crucial role in innovation orientation in the industrial sector, as it influences processes, systems, and intellectual property rights [51], [47]. Prioritizing structural capital development leads to more inventive organizations with resources and tools for new ideas and innovations [52]. It also supports knowledge sharing and transmission, fostering an atmosphere that supports innovation and creativity, resulting in high-quality goods production [53], [54], [20].

Furthermore, structural capital is crucial for industrial sector knowledge management, enabling infrastructure, tools, and procedures for knowledge storage, transmission, and dissemination [52]. It promotes innovation by fostering knowledge exchange and cooperation among employees [51], [55]. Additionally, it supports the acquisition and deployment of new technology, enhancing the decision to innovate and competitiveness by equipping organizations with the necessary tools to design and develop new goods and services [54]. As a consequence, this research proposes the following:

H2b: A statistically significant and positive association is observed between structural capital and innovation orientation.

Relational capital refers to the value generated through connections and partnerships between a company and its external stakeholders [21]. The decision to innovate in the industrial sector is influenced by the quality of these connections [56]. Strong supplier relationships lead to efficient supply chains, easier access to raw materials, and valuable customer information [57]. Collaborations with academic institutions and research centers provide access to cutting-edge science and technology, fostering innovation in the industrial sector [58]. Firms that prioritize establishing and maintaining strong relationships with external stakeholders are more likely to have an innovative culture [59].

Innovation orientation is influenced by relational capital [45], as it involves working with external partners to develop new ideas and sell goods and services [60]. Collaboration leads to efficient and effective innovation [60]. Organizations with strong relationships with external stakeholders are better positioned to capitalize on innovation opportunities and be more innovative overall [59]. Prioritizing the development and maintenance of strong relationships with external stakeholders is crucial for supporting the decision to innovate [45]. As a consequence, this research proposes the following:

H2c: A statistically significant and positive association is observed between relational capital and innovation orientation.

C. Intention to adoption BI Technology and the Decision to Innovate

The intention to adopt BI technology plays a crucial role in fostering the decision to innovate in the industrial sector [61], [62]. It helps organizations gather, analyze, and interpret data, providing insights into market trends, consumer preferences, and competitor strategies [63]. This information can then be used to identify areas for improvement, develop innovative products and services, and create more effective business strategies [64]. A workplace that is more creative and open to new ideas may be fostered by the use of BI technology, as employees are better able to share ideas and information [61]. [65] cite the aim to use BI technology as one of the most crucial elements in promoting the decision to innovate.

The link between intention to adopt business intelligence technology and the decision to innovate is further influenced by company culture, leadership style, and employee attitudes [66]. Leadership is essential in fostering the decision to innovate because it sets objectives, makes resources available, and fosters a culture that encourages testing and taking risks [67]. Employee technological views can also affect how open they are to embracing innovation and new technologies [61]. The intention to adopt BI technology may be strengthened by having a positive attitude regarding technology and being open to experimenting with new tools and procedures [67]. For businesses wanting to foster innovation and preserve a competitive edge in the industrial sector, knowing the link between the intention to adopt business intelligence and the decision to innovate is critical. As a consequence, this research proposes the following:

H3: A statistically significant and positive association is observed between the intention to adopt BI technology and innovation orientation.

D. Research Model

The model for the study is made to look at the complex relationships between intellectual capital, business intelligence technologies, and the decision to innovate and how these affect the industrial sector in Jordan, as illustrated in Figure 1. The proposed model is anticipated to offer useful insights into the variables affecting the industrial sector's adoption of business intelligence technology and innovation orientation, as well as contribute to the creation of efficient strategies and policies to improve the sector's performance and competitiveness in Jordan.

3. Research Methodology

A. Research Design and Sampling

The study employed a quantitative methodology, utilizing survey questionnaires as the primary data collection tool. The sample comprised Jordanian industrial companies listed on the Amman Stock Exchange, and participants were chosen based on their roles as company managers, financial managers, heads of accounting departments, and IT department staff, ensuring a comprehensive understanding of their company's technological and innovation orientations. A total of 33 industrial firms were selected for this research, and 195 questionnaires were distributed to eligible participants. The study achieved a response rate of 62%, with 121 respondents completing the survey. After excluding 10 partial replies, the final dataset consisted of 111 valid responses, representing a 57% contribution to the overall study.

Table I presents a detailed overview of the demographic characteristics of 111 study participants, highlighting their qualifications, job titles, and years of experience. The majority hold undergraduate degrees (69.37%), with subsequent distributions including master's degrees (18.92%), diplomas (9.91%), and a small percentage with Ph.D. qualifications (1.80%). Job titles encompass a varied representation, with Company Managers (18.02%), Financial Managers (19.82%), Heads of Accounting (27.93%), and IT Department Staff (34.23%). The breakdown of years of experience reveals a significant concentration within the 10 - 15 years category (53.15%), followed by those with 5 - 10 years (22.52%), more than 15 years (19.82%), and less than 5 years (4.50%). This comprehensive breakdown provides valuable insights into the diverse qualifications, roles, and experience levels of the 111 participants, offering a thorough understanding of the study's demographic composition.

To ensure the reliability and quality of the data, the structured questionnaire was rigorously prepared in terms of the wording of items, variable categorization, coding, and overall presentation. The study attempted to evaluate hypotheses established during its early stages and utilized a quantitative technique to analyze the links between research factors. The basic data gathered from the survey were examined using relevant statistical methods to test the hypotheses established. As advised by [68], [37], the study design and sample technique were acceptable for achieving the research targets. In summary, the study's methodology and analysis technique were thorough and well-suited to answering the research questions.

B. Measures

Our study used a questionnaire that included items gathered from previous research, including works by [69], [66], [62], [47], [70], with suitable adjustments made to fit our research environment. With the exception of the demographic section, all items were scored using a five-point Likert scale to assure consistency in answers. The examination of multicollinearity and common method bias (CMB) is vital to assuring the validity of our study's findings. We utilized the PLS Marker Variable technique and Harman's One Factor Test [71] to decrease CMB. According to the results of our study, the variance described by a single component fell below the 50% criterion for CMB [71] at less than 29.6%. A minimal relationship between the marker variable and a dependent variable is evidenced by the marker variable's positive correlation with all other variables appearing less than 0.30.

Additionally, we used the variance inflation factor (VIF) test suggested by [29], [72] to look at multicollinearity amongst constructs. According to Table II, we discovered that the VIF stayed below 3.3 throughout the constructions, indicating no serious multicollinearity problems. As a result, our findings are reliable and relevant for both future studies and real-world applications.

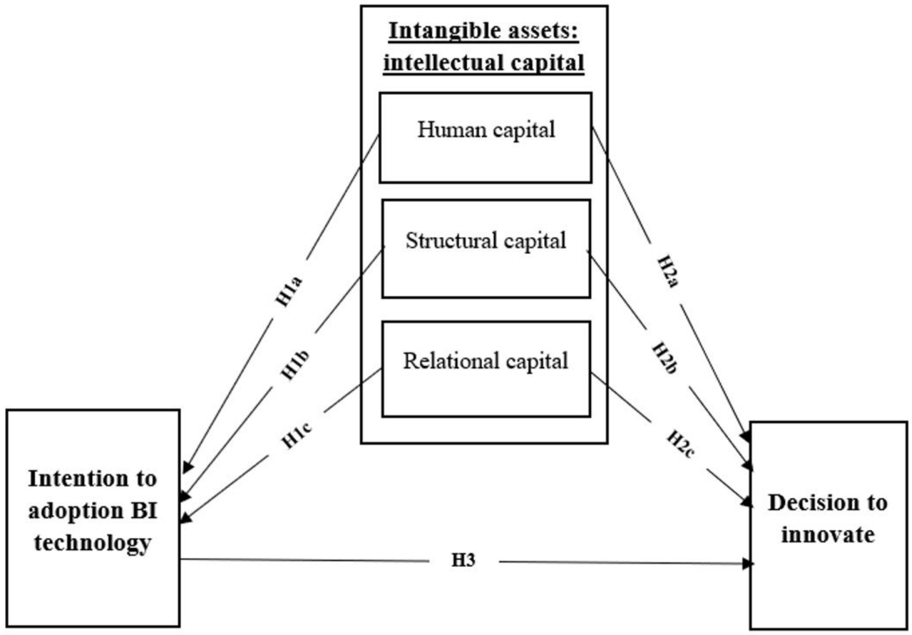

Figure 1. Proposed Model

TABLE I. Demographic Characteristics of Participants.

	#	Type	Number	Percentage
Qualification	1	Diploma	11	9.91%
	2	Undergraduate Degree	77	69.37%
	3	Master Degree	21	18.92%
	4	PhD	2	1.80%
		Total	**111**	**100%**
Job title	1	Company Managers	20	18.02%
	2	Financial Managers	22	19.82%
	3	Heads of Accounting	31	27.93%
	4	IT Department Staff	38	34.23%
		Total	**111**	**100%**
Years of Experience	1	<5 years	5	4.50%
	2	5 - 10 years	25	22.52%
	3	10 - 15 years	59	53.15%
	4	>15 years	22	19.82%
		Total	**111**	**100%**

4. Data Analysis and Results

This study utilized the PLS-SEM technique to explore the link between BI adoption, intellectual capital, and the decision to innovate. The best methodology for this study was PLS-SEM since it has high statistical power and can handle models with small sample numbers. Additionally, it can assess measurement and structural models, both of which are crucial for PLS-SEM analysis [29], [73]. [74] pointed out that SEM is the best method for estimating models with latent variables. The program produced reliable data that made it possible to examine how the study structures interacted, giving insights into the variables that affect the decision to innovate in the industrial sector.

A. *Evaluation of the Measurement Model*

In the sections that follow, we analyze the measurement model data in great detail to assess the validity and reliability of the measurements. Internal consistency reliability, item loadings, and convergent and discriminant validity measures are all evaluated as part of our evaluation [75].

Item loadings and internal consistency reliability. PLS-SEM was used to measure the strength of the relationship between the items. The analysis's findings, which are presented in Table II and Figure 2, reveal that all item loadings were greater than the proposed threshold value of >0.70 [75]. Additionally, to test the internal consistency and reliability of the 25 items included in the analysis, both Cronbach's alpha (α) and composite reliability (CR) metrics were applied. Both metrics are above the proposed cutoff value of 0.70 [75], showing a high degree of internal consistency and reliability across the items.

Convergent validity. Assessing convergent validity is an important component of evaluating the quality of a statistical model since it validates that measurements of related constructs have a positive association. According to [76], [29], the average variance extracted (AVE) serves as a critical indicator in assessing convergent validity. The analysis shown in Table II suggests all AVE values surpass the required threshold of 0.50, indicating that the constructs tested in this study showed convergent validity.

Discriminant validity. The discriminant validity of the study items was assessed using three tests: the Heterotrait-Monotrait (HTMT) criterion, Fornell and Larcker's criterion, and cross-loadings, as proposed by [62]. According to our research, each item loaded more strongly on its specific construct than on any other construct, as seen in Table III, where the loadings are highlighted by boldface type. These findings support the research constructs' discriminant validity.

The assessment of discriminant validity was carried out using [77] criterion. This criterion states that discriminant validity is considered satisfactory when the squared values of the AVE surpass the shared variance between the AVE squared values of each construct and those of other constructs. To satisfy the recommendation by [78], a matrix was established, incorporating the correlation coefficient values between the value of each construct and the squared AVE values. As evident from the correlation and squared AVE values in Table IV, the statistical model achieved discriminant validity at the construct level, with higher squared AVE values on the diagonal than off-diagonal values.

A novel technique for assessing discriminant validity is the HTMT ratio, introduced by [79]. This approach measures the correlation between two distinct latent variables, and a ratio above 0.85 indicates insufficient discriminant validity [79]. In our research, all HTMT ratios were below the recommended threshold, affirming the satisfactory discriminant validity of the model, as shown in Table V.

B. Evaluation of the Structural Model

To evaluate the structural model, we utilized the inner PLS model, which provided insights into the explained variance, variable importance, and relationship significance between the hypothesized variables. The evaluation of the model's explanatory power, factor correlations strength, and the existence of multicollinearity adhered to core metrics recommended by [75]. These metrics encompassed the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2).

Table VI indicates that a considerable amount of the variance in the correlation between intellectual capital and intention to adopt business intelligence technology may be accounted for by the model predictors that have been suggested. In particular, the R^2 and adj. R^2 values indicate that the model predictors account for 35.2% and 34.1%, respectively, of the variation in this relationship. These values demonstrate the model's ability to describe the occurrence, but it's important to note that the model's complexity, the predictor factors, and the sample size can all have an impact on how big these values are.

The explanatory power of the suggested model in the relationship between intellectual capital, intention to adopt BI technology, and the decision to innovate was further examined using R^2 and adj. R^2 values. The results indicated that 45.1% and 43.7%, respectively, of the variation in this relationship can be explained by the model predictors, showing a large amount of the phenomenon is accounted for. Moreover, [75] acknowledge these values as suggestive of an appropriate model for describing the phenomena.

Overall, the results demonstrate that the suggested model effectively elucidates the connection between the industrial sector's intention to innovate, its intention to adopt BI technology, and its intellectual capital. However, it is imperative to recognize the limitations of the model and the possible impact of unexamined factors.

The impact of suggested predictors on the variance of the dependent factor was gauged through an analysis of effect size values (f^2), ranging from 0.004 to 0.163. These values denoted medium-level impacts of each predictor in the model, with higher f^2 values suggesting a more substantial role for the predictor variable. Additionally, predictive relevance (Q^2) was employed to showcase the PLS model's predictive ability, with a Q^2 value exceeding zero validating the model. Through a blindfolding procedure, the model's accuracy was further assessed, revealing strong predictive relevance with Q^2 values of 0.247 and 0.335. Furthermore, all of the predictor VIF values in the model were less than 3.3, indicating that there may not be any significant correlation or collinearity among the variables that are used for prediction. The findings of the structural model evaluation, including R^2, adj. R^2, f^2, and Q^2 values, are summarized in Table VI.

The structural associations between BI adoption, intellectual capital, and the decision to innovate were investigated using a bootstrapping method with 5,000 iterations. The results, as indicated in Table VII, supported Hypothesis 1a by demonstrating a substantial positive association between human capital and the intention of adopting BI technology (β = 0.266; $p < 0.05$). Likewise, structural capital and an intention to use BI technology were shown to have a strong positive connection (β = 0.387; $p < 0.05$), which supports Hypothesis 1b. Hypothesis 1c was rejected because there was no statistically significant positive association

TABLE II. Construct Reliability and Validity.

Construct	Code	Loadings	VIF	Cronbach's alpha	CR	AVE
Human capital	HC1	0.838	2.405	0.906	0.915	0.731
	HC2	0.917	1.077			
	HC3	0.729	1.996			
	HC4	0.914	1.813			
	HC5	0.863	2.797			
Structural capital	SC1	0.847	2.143	0.878	0.914	0.666
	SC2	0.879	2.851			
	SC3	0.87	2.501			
	SC4	0.711	2.32			
	SC5	0.757	2.526			
Relational capital	RC1	0.907	3.056	0.873	0.915	0.662
	RC2	0.785	2.045			
	RC3	0.871	2.58			
	RC4	0.808	2.13			
	RC5	0.688	1.469			
Intention to adoption BI technology	BI1	0.922	2.365	0.898	0.906	0.713
	BI2	0.86	2.541			
	BI3	0.761	1.959			
	BI4	0.868	2.932			
	BI5	0.802	1.883			
Decision to innovate	IO1	0.912	2.488	0.921	0.934	0.762
	IO2	0.754	1.936			
	IO3	0.9	1.706			
	IO4	0.895	2.219			
	IO5	0.885	2.081			

between relational capital and the intention of adopting BI technology (β = 0.070; p > 0.05). These findings are presented in Figure 3.

The results indicated a substantial positive association between human capital and decisions to innovate (β = 0.333; p < 0.05), confirming Hypothesis 2a regarding the link between intellectual capital and the decision to innovate. However, there was no significant positive relationship between structural capital and the decision to innovate (β = 0.075; p > 0.05) or between relational capital and the decision to innovate (β = 0.052; p > 0.05), leading to the rejection of hypotheses 2b and 2c, respectively. Figure 3 provides a visualization of these results.

Finally, the study's results supported Hypothesis 3 by showing a strong positive relationship between the decision to innovate and the intention to use BI technology (β = 0.371; p<0.05).

5. Discussion

The results show that four of the seven hypotheses are confirmed, as shown in Table VII.

As regards the relationship between human capital and the intention to adopt BI technology (H1a), and in line with earlier research [30], this study supports the role of human capital as a crucial component influencing BI technology adoption. Similarly, the present study confirms a positive relationship between structural capital and the intention to adopt BI technology (H1b), which may fit the explanation offered by [33], [34], [36], who argue that to implement BI technology in the industrial sector and give decision-makers access to real-time data and analytics, structural

TABLE III. Discriminant validity based on the cross-loadings criterion.

Item	Human capital	Decision to innovate	Intention to adoption	Relational capital	Structural capital
BI1	-0.433	0.447	**0.922**	0.4	0.546
BI2	-0.408	0.597	**0.86**	0.272	0.399
BI3	-0.313	0.402	**0.761**	0.184	0.332
BI4	-0.386	0.452	**0.868**	0.32	0.521
BI5	-0.376	0.539	**0.802**	0.307	0.432
HC1	**0.838**	-0.486	-0.4	-0.342	-0.371
HC2	**0.917**	-0.491	-0.375	-0.391	-0.359
HC3	**0.729**	-0.33	-0.378	-0.255	-0.293
HC4	**0.914**	-0.493	-0.368	-0.383	-0.356
HC5	**0.863**	-0.539	-0.43	-0.275	-0.421
IO1	-0.538	**0.921**	0.553	0.375	0.434
IO2	-0.261	**0.754**	0.458	0.157	0.282
IO3	-0.531	**0.9**	0.514	0.315	0.374
IO4	-0.507	**0.895**	0.489	0.327	0.43
IO5	-0.526	**0.885**	0.521	0.308	0.375
RC1	-0.387	0.377	0.353	**0.907**	0.469
RC2	-0.234	0.138	0.233	**0.785**	0.317
RC3	-0.325	0.337	0.353	**0.871**	0.485
RC4	-0.274	0.244	0.255	**0.808**	0.346
RC5	-0.32	0.24	0.206	**0.688**	0.252
SC1	-0.376	0.456	0.511	0.456	**0.847**
SC2	-0.375	0.387	0.441	0.405	**0.879**
SC3	-0.387	0.417	0.525	0.4	**0.87**
SC4	-0.277	0.186	0.271	0.33	**0.711**
SC5	-0.282	0.232	0.328	0.332	**0.757**

TABLE IV. Discriminant validity assessment using the Fornell-Larcker criterion.

Construct	1	2	3	4	5
Human capital	**0.855**				
Decision to innovate	0.554	**0.873**			
Intention to adoption BI technology	0.457	0.581	**0.844**		
Relational capital	0.386	0.349	0.357	**0.814**	
Structural capital	0.425	0.439	0.533	0.478	**0.816**

TABLE V. Discriminant validity assessment using the HTMT criterion.

Construct	1	2	3	4	5
Human capital	**-**				
Decision to innovate	0.587	**-**			
Intention to adoption BI technology	0.504	0.635	**-**		
Relational capital	0.427	0.357	0.383	**-**	
Structural capital	0.462	0.451	0.566	0.515	**-**

TABLE VI. Structural model evaluation.

Construct	R^2	Adj. R^2	f^2	Q^2
Human capital	-	-	0.144	-
Structural capital	-	-	0.163	-
Relational capital	-	-	0.004	-
Intention to adoption BI technology	0.352	0.340	0.162	0.247
Decision to innovate	0.451	0.437	-	0.335

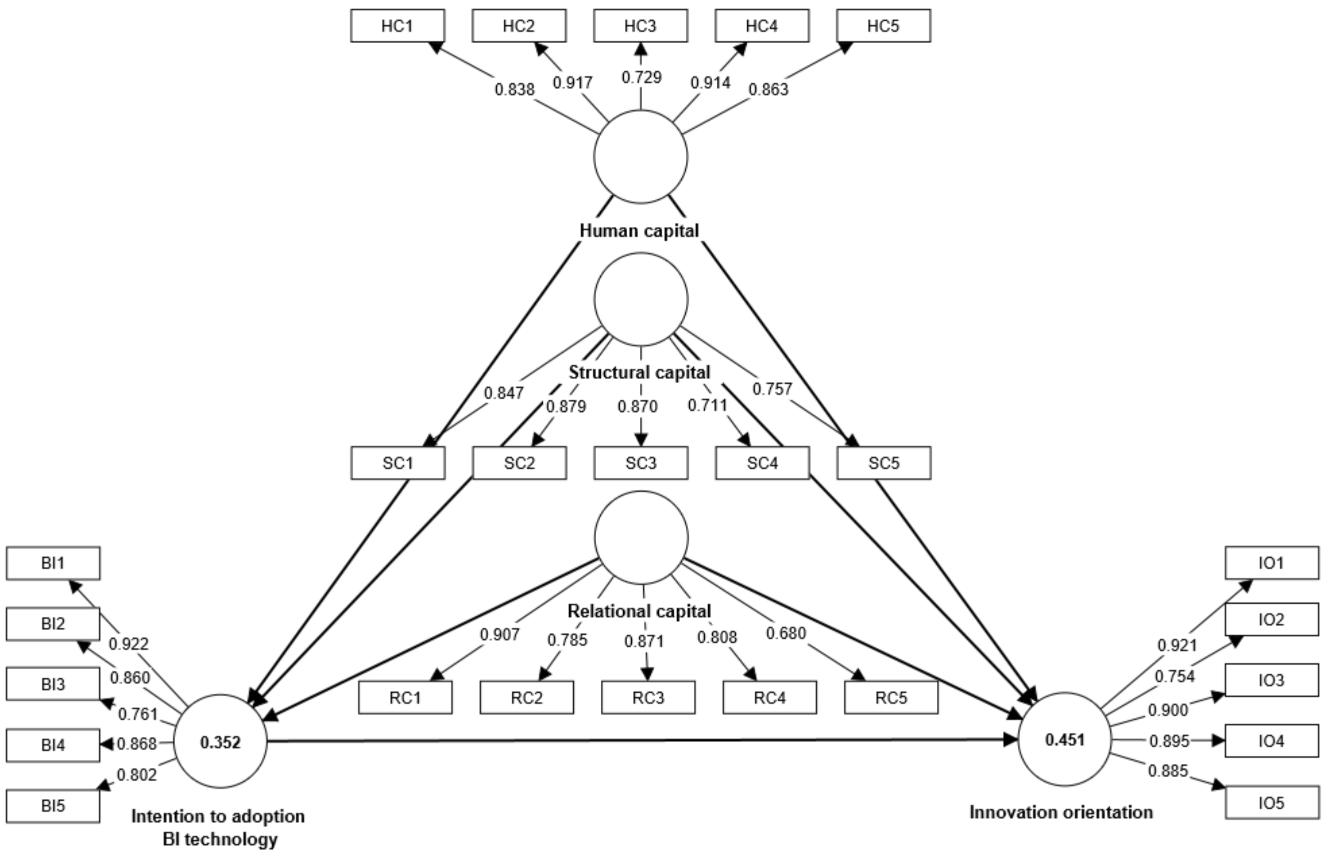

Figure 2. Item loadings and R^2 value

TABLE VII. Hypotheses testing.

Structural path	Coef (β) and (T Statistics)	P-Values	Bias-corrected 95% CI Lower Upper	Remarks
H1a	0.266 (4.294)	0.000	(0.195, 0.351)	Supported
H1b	0.387 (6.506)	0.000	(0.280, 0.514)	Supported
H1c	0.070 (1.320)	0.187	(-0.035, 0.171)	Not supported
H2a	0.333 (6.324)	0.000	(0.137, 0.326)	Supported
H2b	0.075 (1.016)	0.310	(-0.077, 0.212)	Not supported
H2c	0.052 (0.788)	0.431	(-0.077, 0.181)	Not supported
H3	0.371 (8.557)	0.000	(0.286, 0.457)	Supported

capital management is essential.

The unexpected findings in this study, revealing that Jordanian industrial companies tend to undervalue the crucial role of relational capital (H1c) despite its acknowledged significance in Business Intelligence technology adoption as indicated by [34], [43], prompt a thorough investigation. Contextual differences, resource constraints, and limited awareness within the industrial landscape of Jordan may contribute to this deviation from established norms. The specific intricacies of the Jordanian business environment, combined with competing priorities due to resource limitations, might shift attention away from cultivating relational capital. Furthermore, a potential lack of awareness regarding the benefits of relational capital in BI adoption, along with the influence of institutional factors and organizational culture, may further contribute to this unexpected trend. These complexities underscore the necessity for additional research to comprehensively understand the underlying dynamics and offer actionable insights for practitioners and scholars alike.

The study also confirmed that human capital has a significant impact on the decision to innovate in the industrial

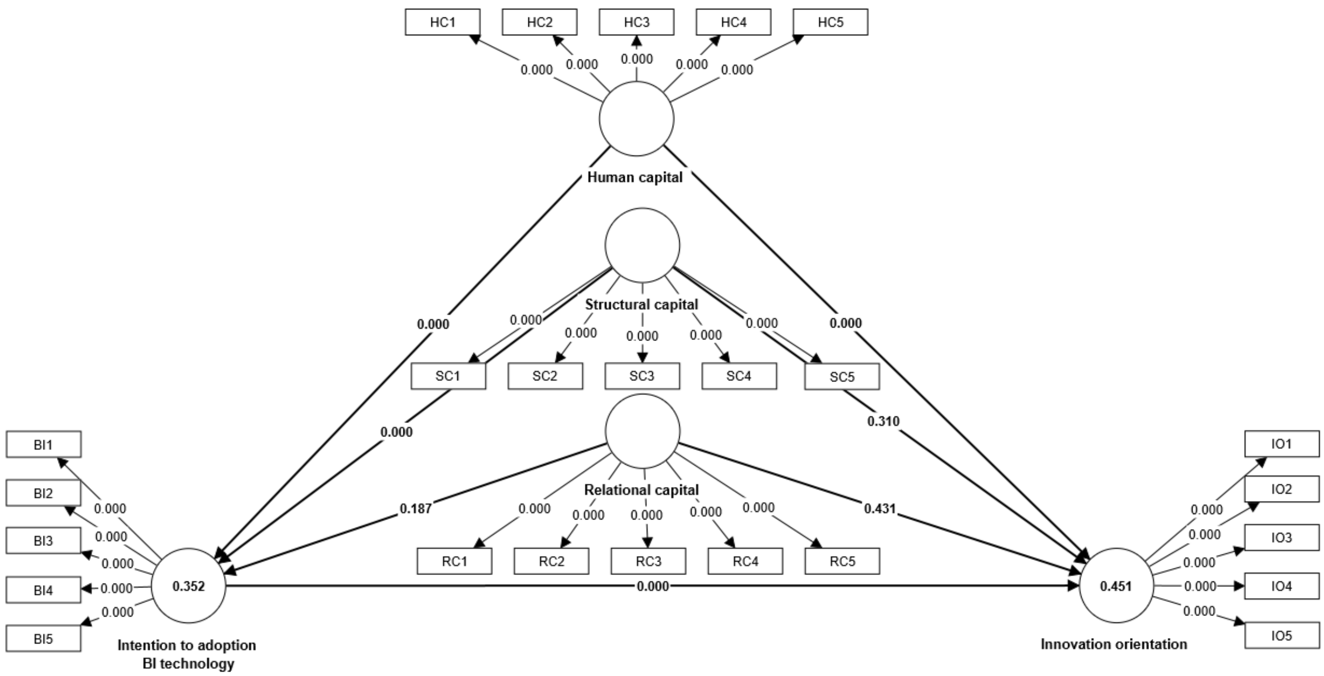

Figure 3. Coefficient significance test (p values) and R^2 value

sector (H2a), which is in line with the viewpoints of several studies, such as [24], [46], [48], [49]. Thus, recruiting staff with varied experiences might assist the industrial sector in promoting an innovation orientation.

On the contrary, the study did not substantiate the positive influence of structural capital on the decision to innovate in the industrial sector (H2b), deviating from earlier research that emphasized the role of structural capital in knowledge sharing and transmission, essential for fostering innovation, as mentioned by [54]. Possible explanations for this discrepancy may arise from contextual variations and methodological differences. Distinct features of the Jordanian industrial context or variations in research methodologies employed across studies could contribute to this unexpected result. Further exploration is essential to delve into the specific contextual and methodological factors influencing the relationship between structural capital and innovation within the industrial landscape.

Contrary to perspectives suggesting that organizations with robust networks of relationships with external stakeholders are more adept at seizing open innovation opportunities and demonstrating greater overall innovation [45], [21], our study did not align with this hypothesis (H2c). The organizational culture within the studied entities could have played a role in shaping this outcome, where factors such as risk aversion or a deficiency in fostering a supportive innovation culture may have impeded the anticipated impact of strong network relationships on innovation. This suggests the need for a more nuanced understanding of the interplay between external relationships, organizational culture, and innovation dynamics to draw comprehensive insights from these unexpected findings.

Finally, the study confirmed the significant impact of intention to adopt BI technology on the decision to innovate (H3), which is in line with previous research, such as [61], [66], [63]. Adopting BI technology is crucial for fostering the decision to innovate. It also promotes a creative and open workplace, enabling employees to share ideas and information and develop creative solutions to existing problems.

A. Theoretical Implications

This study underscores the imperative for a comprehensive comprehension of the factors shaping innovation decisions within the Jordanian industrial sector. Theoretical implications revolve around the intricate interplay among intellectual capital, business intelligence adoption, and the decision to innovate.

This study makes a substantial contribution to the existing literature by emphasizing the paramount importance of intellectual capital and Business Intelligence (BI) adoption in shaping the decision to innovate within the industrial sector. Notably, it sheds light on the imperative to scrutinize the intention behind adopting BI technology, positing that such intentional strategies could potentially pave the way for innovative orientations previously unexplored. In the dynamic landscape of today's ever-evolving organizations, understanding the intricate interplay among intellectual capital, BI adoption, and innovation orientation becomes crucial. By unraveling these complex relationships, the study not only offers valuable insights but also advances the theoretical underpinnings of innovation orientation within the industrial sector.

B. Practical Implications

Practitioners, especially managers and decision-makers in Jordan, can achieve significant operational improvements and foster innovation within their organizations by strategically leveraging Business Intelligence (BI) technologies. The study underscores the practical implications of adopting BI technology, emphasizing its role in enhancing decision-making procedures, improving operational effectiveness, and fostering the creation of new products. By integrating BI technologies into their operational frameworks, firms can gain a competitive edge in the market. These technologies provide valuable insights, enabling informed decision-making, streamlining processes for increased efficiency, and catalyzing the innovation of new products or services. The study further advises on resource allocation, highlighting the importance of strengthening various forms of intellectual capital. This strategic approach contributes to cultivating a more innovation-oriented sector, ensuring that organizations in Jordan remain dynamic, adaptive, and competitive in the rapidly evolving business landscape.

Furthermore, the practical implications extend beyond the Jordanian industrial sector. The results of this study are beneficial for policymakers in developing nations that seek to stimulate innovation in their industrial sectors. The study underlines the need to invest in intellectual capital and adopt BI technologies as crucial strategies for stimulating innovation. By implementing these guidelines, policymakers may create an atmosphere favorable to growth and economic development, leading to sustained innovation in the industrial sectors of developing nations. As a whole, this study presents practical insights that may influence decision-making and inspire positive change in businesses and communities facing issues in the industrial sector.

6. Conclusion

The present research investigate the interplay between intellectual capital, business intelligence adoption, and the decision to innovate in the Jordanian industrial sector. Findings unveil a noteworthy positive correlation between human capital and structural capital, as well as their association with the decision to innovate. Additionally, the study affirms the positive connection between the adoption of BI technology and the decision to innovate, underscoring the pivotal role of intellectual capital and business intelligence adoption in propelling innovation. We discussed especially the results that were compatible and contrary with the previous studies assumptions and deduced theoretical and practical implications. Overall, this study could show that intellectual capital and business intelligence adoption are important to driving innovation and should not be underestimated for the development of the industrial sector in developing countries.

This study has limitations, including a cross-sectional design, limited applicability to other countries and sectors, self-reported data, social desirability bias, and insufficient consideration of corporate culture or leadership. Additionally, the small sample size may reduce statistical power. To improve understanding, further research is needed to address these limitations and gain a more comprehensive understanding of innovation orientation.

Future research should explore factors influencing intellectual capital and the decision to innovate, examine cultural factors and the moderating effects of industry type, and explore the impact of AI and Big Data analytics on the decision to innovate. This could lead to more effective strategies for enhancing innovation and contributing to economic growth. Further investigation into these areas could help develop more effective strategies for enhancing innovation and economic growth.

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