Uncertain Supply Chain Management 12 (2024) ****–****

Contents lists available at GrowingScience

Uncertain Supply Chain Management

homepage: www.GrowingScience.com/uscm

The moderating role of organizational readiness on the blockchain adoption in supply chain among Saudi SMEs

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A B S T R A C T

Article history:
Received March 28, 2024
Received in revised format April 27, 2024
Accepted May 21 2024
Available online
May 21 2024
Keywords:
Organizational Readiness
Block chain
Supply Chain
Saudi Arabia
SMEs

The study aims to investigate the moderating role of Organizational Readiness (OR) in the relationship between Supply Chain Agility (SCA) and Blockchain Adoption Intention (BAI) among these SMEs, drawing on the Resource-Based View (RBV) theory. The study adopts a positivist approach and a cross-sectional design to explore how organizational readiness moderates blockchain adoption in Saudi SMEs. It uses a quantitative methodology, surveying decision-makers from SMEs engaged in supply chain activities to gather data. Data analysis is performed using Structural Equation Modeling (SEM). The study's findings indicate that Operational Supply Chain Transparency (OSCT) impacts Supply Chain Alignment (SCL), Supply Chain Adaptability (SCD), SCA, and BAI. Moreover, there is a positive influence of SCL on SCD and SCA. SCA also significantly influences BAI. Furthermore, the moderation analysis shows that OR significantly affects the SCA-BAI relationship, indicating that higher OR amplifies the positive impact of supply chain agility on blockchain adoption intention, underscoring the critical roles of supply chain factors and OR in blockchain adoption among SMEs. Based on the RBV theory, the study delves into how constructs like SCL, OSCT, SCD, and SCA are influenced by blockchain technology. It assesses the extent to which these factors would impact the propensity of SMEs to implement blockchain yet explores the moderating influence of OR on this dynamic.

1. Introduction

In recent years, thorough global transformations have notably influenced corporate entities, facilitating advancement and development. Commercial enterprises are fast responsive to technological evolution, besides the consequences of globalization and the information era. These events have boosted competitive intensity and intricacy in the marketplace. Consecutively, these organizations are investigating innovative methodologies to gain technological dominance and achieve progress across their respective industries. The adaptation of emerging technologies redefines traditional business paradigms and considerably alters the commercial environment (Al-Momani, 2023a; Al-Shanableh *et al.*, 2024; Alzyoud *et al.*, 2024).

Supply Chain Management (SCM) is effective in coordinating and moderating the complex web of interrelationships within the supply chain, aiming to efficiently cater for consumers (Al-Awamleh *et al.*, 2022). In addition, the increasing engagement with Digital Supply Chains (DSCs) amongst industry experts indicates a dramatic transition in SCM methodologies (Alshawabkeh *et al.*, 2022), representing the continuous adaptation and progression of supply chains within the contemporary commercial landscape.

Digital Supply Chain Management (DSCM) permeates the integration of avant-garde technologies that dramatically change traditional business processes within the supply chain. This optimal shift is a cooperative effort, enhancing organizational transformation and engendering innovative opportunities in supply chain activities (Al-Alwan *et al.*, 2022; Rahamneh *et al.*, 2023). Such digital metamorphosis in SCM enables entities to constitute highly adaptable strategies and policies, consequently

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ISSN 2291-6830 (Online) - ISSN 2291-6822 (Print)

doi: 10.5267/j.uscm.2024.5.021

boosting organizational value (Tariq et al., 2022).Additionally, it is acclaimed for a multitude of benefits, including enhanced speed, resilience, global interconnectivity, intelligent operations, transparency, and expandability (Al-Khwaldeh et al., 2022).

Blockchain, one of the key transformative technologies driving the fourth industrial revolution, is attracting considerable attention for its capacity to revolutionize business practices (Al-Momani & Ramayah, 2023c), and was originally conceptualized by(Nakamoto, 2008)as a method for secure and transparent transaction processing. Saberi *et al.* (2019), assert that the exploration of blockchain's utility should be concentrated at the supply chain echelon, given that its practical scenarios entail the cooperative utilization of blockchain technology among supply chain collaborators.

Blockchain technology facilitates the enhancement of organizational supply chain competencies, thereby augmenting competitive advantage (Rejeb & Rejeb, 2020). This technology is pivotal in managing the incessant exchange of data, financial assets, and materials amongst supply chain affiliates, necessitating process transparency (Dubey *et al.*, 2020). Correspondingly, blockchain possesses an intrinsic capability to regulate the movement of various elements within the supply chain (Korpela, Hallikas & Dahlberg, 2017), thereby establishing a system of transparency for all involved stakeholders (Dubey *et al.*, 2020).The adoption of blockchain into SCM enables organizations to transform their entire operation, from the procurement of raw materials to the delivery of products to end-users. This transformation is characterized by expedited processes and enhanced security at each stage (Dutta *et al.*, 2020). Furthermore, the application of blockchain in supply chain logistics significantly enhances the reliability and transparency of material and data flows. This advancement facilitates increased customization and cost efficiency, ultimately improving service to the end-users (Liu *et al.*, 2021).

SMEs must formulate and implement avant-garde business strategies to sustain and excel amidst the transformative impacts of Industry 4.0 and global integration (Morgan *et al.*, 2020). Nevertheless, empirical industry analyses indicate that SMEs are notably trailing behind in their adoption of innovative business paradigms, primarily attributable to their limited technological and strategic capabilities required for achieving business model efficacy (Garzella *et al.*, 2021). Blockchain empowers SMEs to surmount fundamental technological prerequisites for novel business models, primarily by optimizing financial transactions, facilitating smart contract implementation, enhancing supply chain visibility, augmenting data security, and amplifying transparency (Nuryyev *et al.*, 2020).

2. Conceptual Model and Hypotheses

The RBV theory, originally presented by (Wernerfelt, 1984), suggests that an organization's resources and capabilities are essential for policy development and constitute the main determinants of profitability. Subsequent scholars, such as Fawcett *et al.* (2011) and Lavie (2006), have enhanced this theory by integrating dynamic and relational dimensions, specifically in relation to resources and capabilities within the supply chain, thus broadening the scope of RBV beyond its initial boundaries. (Teece, 2007) stressed the vibrant element of this expanded RBV, emphasizing the need for merging external and internal competencies in fast-paced changing market environments to maintain a competitive edge. Keeping up with this perspective, (Eckstein *et al.*, 2015) delineated agility and adaptability as pivotal dynamic abilities. These could be attested through the proficient synchronization of processes among supply chain collaborators leading to the alignment. The significance of transparency is high considering the realization of supply chain alignment, adaptability, and agility. Drawing on the RBV theory, this paper assumes a connection among Operational Supply Chain Transparency (OSCT), Supply Chain Alignment (SCL), Supply Chain Adaptability (SCD), and Supply Chain Agility (SCA) (see Fig. 1). Additionally, the research endeavors to examine the moderating influence of OR on the connectedness between SCA and the Blockchain Adoption Intention (BAI), as presumed by Iranmanesh *et al.* (2023). Accordingly, this research mitigates the dearth of empirical data regarding the impact of blockchain advantages on supply chains concerning its adoption among SMEs in Saudi.

2.1. Operational Supply Chain Transparency (OSCT)

OSCT is defined as the capacity of an organization to engage proactively with stakeholders, thereby fostering visibility and traceability in both upstream and downstream supply chain activities (Dubey *et al.*, 2020). (Wong *et al.*, 2012) identified the lack of transparency within the chain as the primary obstacle to achieving both internal and external alignment. Consequently, it can be deduced that operational visibility in the supply chain facilitates alignment among chain partners. Furthermore, transparency, a fundamental attribute of blockchain, enhances trust, visibility, and information amalgamation among chain participants(Dubey *et al.*, 2020). Additionally, (Walsh, 2007) detailed that increased transparency correlates with enhanced flexibility. In addition, (Shin, Kang and Bae, 2020) highlighted that blockchain significantly increases transparency, a feature non-profit organizations use to boost donations and transparency. Concurrently, research by (Maroufkhani *et al.*, 2020) has pinpointed relative advantage as a pivotal determinant in SMEs' technology adoption. Corroborating this, (Iranmanesh *et al.*, 2023) identified a beneficial impact of OSCT on both SCD and BAI, but they did not find a significant influence of OSCT on SCA. Considering these outcomes, the subsequent hypotheses are formulated:

H_1: *OSCT has a positive influence on SCL.*

H_2: *OSCT has an influence on SCA.*

H_3: *OSCT has an influence on SCD.*

H4: *OSCT has an influence on the BAI.*

2.2. Supply Chain Alignment (SCL)

SCL, as (Sheel and Nath, 2019) elucidate, involves harmonizing partner processes to optimize performance. (Dubey and Gunasekaran, 2016) discovered a positive correlation between humanitarian SCD and such alignment. This alignment paves the way for the process improvement, information compatibility, growing flexibility, enhanced visibility, and data quality enhancement. In addition, (Alfalla-Luque, Machuca & Marin-Garcia, 2018) assured the positive impact of SCL on SCD. Additionally, (Tallon and Pinsonneault, 2011) explored a significant correlation between SCL and SCA through empirical research. In the same vein, (Aslam *et al.*, 2020) noticed a positive impact of SCL on agility. In addition to that, Feizabadi et al. (2019) highlighted information visibility, integration, and collaboration as basic preceding factors of agility. Besides, Iranmanesh *et al.* (2023) discerned a notable effect of SCL on SCD, however, they did not observe a substantial influence of SCL on SCA. Accordingly, the following hypotheses are subsequently hypothesized:

H5: *SCL has a positive influence on SCD.*

H6: *SCL has a positive influence on SCA.*

2.3. Supply Chain Adaptability (SCD)

Aslam *et al.* (2020) modify SCD as the ability to revise the supply chain structure and realign the network according to modifications in products, technologies, and strategies as a result of market dynamics. (Eckstein *et al.*, 2015) affirm that this adaptability enhances agility, which in turn plays a crucial driver of competitive edge and enhanced performance. In humanitarian supply chain contexts, Dubey and Gunasekaran (2016) constructed a positive correlation between adaptability and agility. Going further in this realization, Iranmanesh *et al.* (2023) explored a crystal-clear impact of SCD on SCA. Consequently, the following hypotheses are proposed:

H7: *SCD has a positive influence on SCA.*

2.4. Supply Chain Agility (SCA)

Gligor and Holcomb (2012) describe SCA as the ability of the supply chain to adapt its strategies and operations swiftly, whether in expectation or in the reaction to changes. This agility is an essential element to indicate how swiftly a company can adjust to immediate variations in the business landscape. (Swafford, Ghosh & Murthy, 2008) introduce it as the capability to explore and enhance unforeseen shifts in business essentials, to play to the advantage of the market. Lee (2004) identifies the key aims of SCA as the prompt adaptation to moving changes in supply or demand and the effective navigation of external perturbations. Additionally, Sheel and Nath (2019) discuss the role of blockchain technology in questioning this agility, resulting in competitive superiority and improved performance. Extending this discourse, Iranmanesh *et al.* (2023) unveiled a significant influence of SCA on BAI, prompting the proposal of the subsequent hypothesis:

H8: *SCA has a positive influence on the BAI.*

2.5. Organizational Readiness (OR)

Gangwar (2018) addresses OR as a firm's capability and inclination to twining new technological innovations. This readiness reflects the organization's proficiency in managing and investing in technological advancements, which includes technology technical skills and knowledge (Taxman *et al.*, 2014). Within the SME sector, research by Asiaei and Rahim (2019), as well as Ghobakhloo *et al.* (2011), has identified a substantial and positive linkage between OR and the adoption of novel technologies. SCA frequently results in a competitive edge. Accordingly, SMEs prepared for organizational transformation might perceive the adoption of blockchain as a tactical approach to maintain market leadership. Thus, it is anticipated that the agility advantage offered by blockchain holds greater significance for SME managers in environments with OR. Therefore, within such contexts, SCA exerts a more pronounced influence on the BAI in these SMEs. Based on this reasoning, we suggest:

H9: *OR positively moderates the relationship between SCA and BAI.*

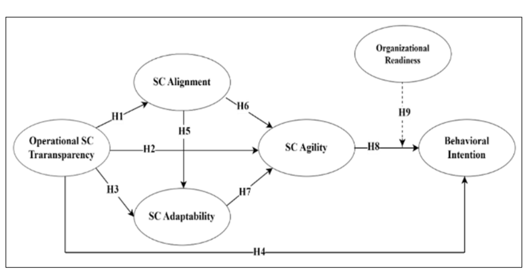

Fig. 1. Conceptual model of study.

3. Methodology

3.1. Design

The research adopts a positivist epistemological stance, seeking to derive objective and generalizable knowledge regarding the moderating role of organizational readiness in the context of blockchain adoption. The use of statistical analyses aims to uncover patterns and relationships that can be generalized to the broader population of Saudi SMEs. Through a cross-sectional design, this research framework is structured to capture a snapshot of data at a single point in time, aligning with the inherent characteristics of a cross-sectional approach (Attiany *et al.*, 2023). This design allows for the simultaneous collection of information from multiple subjects or entities within the studied population. The primary objective is to provide a comprehensive and instantaneous view of the moderating role of organizational readiness on blockchain adoption in the specific context of Saudi SMEs engaged in supply chain activities. Furthermore, it applies a quantitative approach that involves surveying a representative sample of Saudi SMEs engaged in the supply chain.

3.2. Sample

The participants in this research primarily consist of SMEs operating in the Saudi context and engaged in supply chain activities. The inclusion criteria for selecting participants based on their status as SMEs ensured a targeted and relevant sample for the study. These enterprises are often agile and responsive to technological advancements, making them particularly relevant for studying the adoption of blockchain in the context of supply chain management. The research targets decision-makers within the selected SMEs, including senior managers, IT professionals, and individuals responsible for supply chain management through a purposive sample with at least 200 valid responses. Accordingly, the research instrument link was sent to 350 decision-makers to ensure that minimum responses were met. However, 238 responses were received, including 18 ones with missed values or pattern answers. Hence, the final sample of the research was composed of 220 responses with a 62.8% response rate. Table 1 summarizes the demographic characteristics of the research sample.

Table 1
Demographic characteristics of the sample (N= 220)

Variable		N	%
Gender	Male	181	82.3
	Female	39	17.7
Age	Less than 30	41	18.6
	31-40	150	68.2
	41 or above	29	13.2
Education Level	Bachelor’s degree	161	73.2
	Master’s degree	48	21.8
	PhD	11	5.0
Working Experience	Less than 3 years	47	21.4
	3-10 years	84	38.2
	11-20 years	65	29.5
	More than 20 years	24	10.9

3.3. Measures

In this research, the investigator employed a survey questionnaire to collect responses, as the data required a substantial number of participants, best obtained through a survey format. Consequently, the researcher distributed the questionnaire to the designated population. The questionnaire, designed for self-administration, utilized a five-point Likert scale. Respondents were expected to complete the questionnaire within 5 to 10 minutes. The survey instrument drew inspiration from various studies to ensure comprehensive coverage of relevant aspects. The research employs a robust set of measurement scales to assess key constructs within the study, each carefully selected from reputable sources. OSCT, SCL, SCA, SCA, and BAI are assessed through measurement items adapted from (Iranmanesh *et al.*, 2023). In addition, OR, a critical factor in technology adoption, is measured through a three-item scale adapted from (Maroufkhani *et al.*, 2020).

4. Findings

4.1. Measurement Model

Confirmatory Factor Analysis (CFA) is a pivotal component of Structural Equation Modeling (SEM), crucial for comprehending latent construct structures and examining relationships between latent variables(Hoyle, 1995 as cited in Al-Momani, 2022). Boudlaie *et al.* (2022) underscore that CFA aids in understanding the associations between constructs and latent variables, revealing the extent to which latent variables explain construct variations. Mohammad et al. (2022) supports CFA by highlighting measures such as factor loadings, convergent validity, discriminant validity, and composite reliability to assess construct validity and reliability. The analysis of CFA, detailed in Table 1, validates constructs through these measures.

Table 2
Validity, reliability, and descriptive analysis

Constructs	Loadings	AVE	MSV	√AVE	CR	M	SD
OSCT	[0.731-0.812]	0.587	0.415	0.766	0.850	3.63	0.824
SCL	[0.682-0.762]	0.524	0.462	0.724	0.814	3.49	0.755
SCD	[0.679-0.824]	0.589	0.488	0.768	0.810	3.58	0.816
SCA	[0.652-0.783]	0.521	0.398	0.722	0.897	3.75	0.902
OR	[0.735-0.791]	0.587	0.403	0.766	0.810	3.64	0.791
BAI	[0.681-0.758]	0.515	0.442	0.718	0.761	3.71	0.834

The results confirmed that the constructs' loadings ranged from 0.652 to 0.824, indicating that variables are attributed to their respective constructs as they exceeded the minimum value of 0.50(Al-Hawary & Al-Syasneh, 2020). Average variance extracted (AVE) values ranging from 0.515 to 0.589 reveal that a significant proportion of the variance in the observed variables is attributed to their respective constructs. (Bader *et al.*, 2022) argued that this demonstrates the constructs' ability to explain the variability within the measured variables while minimizing the influence of measurement error and affirming convergent validity.

The Maximum Shared Variance (MSV) values, ranging from 0.398 to 0.488, suggest a reasonable level of shared variance among the constructs. This implies that while there is some commonality, it is not excessive, supporting discriminant validity. This conclusion was confirmed by the square root of AVE, ranging from 0.718 to 0.768, which surpasses the correlations between constructs and minimizes the risk of overlap in the variance they capture. Furthermore, Composite Reliability (CR) values, ranging from 0.761 to 0.897, indicate a high level of internal consistency for each construct. This implies that the observed variables reliably measure their respective constructs, reinforcing the stability of the measurement model according to (Amiruddin *et al.*, 2023).

4.2. Descriptive Statistics

The descriptive analysis presented in Table 2 provides a comprehensive overview of key constructs related to the research. Notably, OSCT attains a mean (M) of 3.63 with a low standard deviation (SD) of 0.824, indicating a moderate consensus among respondents regarding the transparency of the operational supply chain. SCL is reported with (M= 3.49) and (SD = 0.755), signifying a moderate level of alignment with a consistent yet moderately variable perception among participants. Similarly, SCD obtains (M= 3.58) and (SD = 0.816), indicating a moderate level of agreement on the adaptability of the supply chain. SCA reveals a relative (M= 3.75) and (SD = 0.902), pointing towards a collectively perceived high level of agility with moderate variability in responses. OR is characterized by (M= 3.64) and (SD = 0.791), indicating a moderate level of consensus on the organization's readiness for change. BAI receives (M= 3.71) and (SD = 0.834), revealing a moderate level of intention to adopt blockchain technology with moderate variability in individual intentions.

4.3. Direct Effects

The application of SEM in our study was executed using the IBM SPSS AMOS 22.0 software, a widely recognized tool for conducting advanced statistical analyses. This sophisticated software platform allows for a meticulous examination of complex relationships and facilitates the testing of theoretical models and hypotheses, aligning with contemporary research practices as noted by scholars such as Zahran *et al.* (2023). The utilization of SEM within the framework of our study signifies a commitment to methodological rigor, enabling a comprehensive exploration of the intricate interconnections among variables. Fig. 2 serves as a visual representation of the research structural model, encapsulating the intricate web of relationships elucidated through SEM.

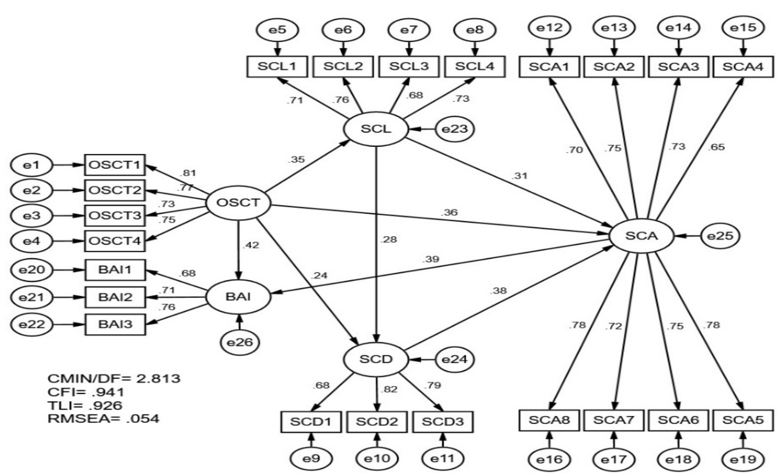

Fig. 1. The structural model of direct effects

Based on the results in Fig. 2, the CMIN/DF ratio, a measure of the discrepancy between the proposed model and the observed data, stands at 2.813, falling within the acceptable range of less than 3. This suggests a reasonable fit, indicating that the proposed model captures the underlying relationships to a moderate extent. Moving to comparative fit indices, which exceed the recommended threshold of 0.90, registering at 0.941, signifying a strong comparative fit (Dwijendra *et al.*, 2023). Despite the Tucker-Lewis Index (TLI) being slightly below the CFI at 0.926, it still indicates an acceptable fit, emphasizing the model's adequacy in representing the observed data (Pallathadka *et al.,* 2023). Moreover, the root mean square error of approximation (RMSEA) at 0.054, below the threshold of 0.08, underscores a close fit between the model and the observed data as mentioned by (Muda *et al.*, 2022). Hence, Table 3 furnishes a detailed exposition of the direct effects between various constructs under investigation, shedding light on the strength and statistical significance of these relationships.

Table 3
Path coefficients for direct effect

Paths			B	Β	S.E.	C.R.
OSCT	→	SCL	0.364	0.351	0.069	5.27**
OSCT	→	SCA	0.377	0.365	0.066	5.71**
OSCT	→	SCD	0.251	0.244	0.068	3.69*
OSCT	→	BAI	0.423	0.416	0.062	6.82***
SCL	→	SCD	0.302	0.285	0.075	4.03*
SCL	→	SCA	0.320	0.315	0.072	4.44**
SCD	→	SCA	0.393	0.382	0.063	6.24***
SCA	→	BAI	0.402	0.396	0.062	6.48***

Significance levels: * *P*< 0.05, ** *P*< 0.01, *** *P*< 0.001.

According to the results in Table 3, OSCT demonstrates a positive and statistically significant influence on both SCL and SCA with beta standardized coefficients of 0.351 and 0.365, respectively. The critical ratios of 5.27 and 5.71 underscore the robust statistical significance (P< 0.01), emphasizing the substantial impact of transparency on these dimensions of the supply chain. Furthermore, OSCT exhibits a significant positive association with SCD and BAI, reflected in beta values of 0.244 and 0.416, respectively. While the relationship with SCD is moderately significant with a critical ratio of 3.69 (P< 0.05), the association with BAI is notably strong, as evidenced by a critical ratio of 6.82 (P< 0.001).

Moving to the relationships between SCL and subsequent constructs, a positive and statistically significant link is observed between SCL and both SCD and SCA. The beta standardized coefficients of 0.285 and 0.315, coupled with critical ratios of 4.03 and 4.44, indicate moderate to high statistical significance (P< 0.05 and P< 0.01, respectively). SCD positively and significantly influences SCA with a beta standardized coefficient of 0.382 and a critical ratio of 6.24, emphasizing a robust and highly significant relationship (P< 0.001). Similarly, SCA exhibits a positive and highly significant impact on BAI, as reflected in a beta standardized coefficient of 0.396 and a critical ratio of 6.48 (P< 0.001).

4.4. Moderation Effect

Table 4 presents the outcomes of a moderation analysis, delving into the interplay between SCA, OR, and their combined influence on BAI. The sequential steps provide a comprehensive understanding of the direct and moderated effects within the model.

Table 4
Path coefficients for moderation effect

Independents	Dependent variable (BAI)					
	Step 1		Step 2		Step 3	
	β	T	β	T	Β	T
SCA	0.369	6.48**	0.375	6.82**	0.382	7.64**
OR			0.215	3.91*	0.271	4.23**
SCA × OR					0.263	3.86*
Δ F	---		59.66		122.09	
R2	0.263		0.295		0.350	
Δ R2	---		0.032		0.055	

Significance levels: * *P*< 0.05, ** *P*< 0.01

In the first step, SCA demonstrates a significant positive impact on BAI (β= 0.369, T= 6.48, P< 0.01). This initial assessment underscores the direct contribution of SCA to the intention to adopt blockchain technology. The second step introduces OR as an independent variable, revealing its independent and significant influence on BAI (β= 0.215, T= 3.91, P< 0.05). This addition contributes to an increase in the R^2 value from 0.263 to 0.295, indicating that OR independently explains additional variance in BAI beyond supply chain agility.

The third step introduces the interaction between SCA and OR to explore the moderating effect of OR on the relationship between SCA and BAI. This interaction proves to be significant (β= 0.263, T= 3.86, P< 0.05). This finding underscores the nuanced influence of OR in shaping the strength and direction of the relationship between SCA and BAI. Notably, the F value of 122.09 in Step 3 signifies a substantial improvement in model fit, signifying that the addition of the interaction significantly enhances the overall explanatory power of the model. The R^2 value of 0.055 reflects the proportionate increase in the variance explained by the introduction of the interaction, emphasizing the moderating role of OR in the relationship. Accordingly, Fig. 3 was extracted to depict this interaction by slop analysis.

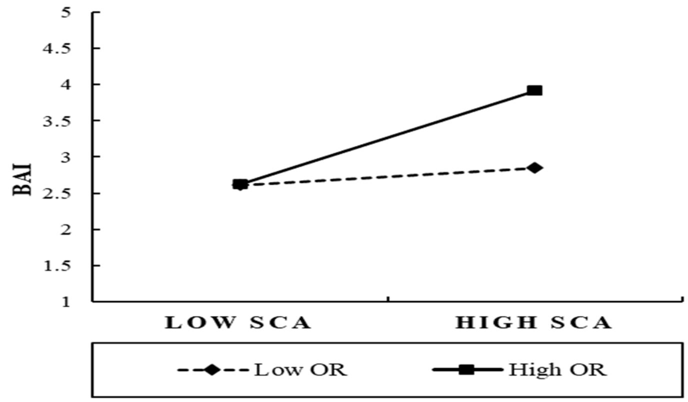

Fig. 2. The moderating effect of OR on SCA and BAI.

The examination of slopes depicted in Fig. 3 reveals nuanced insights into the interplay between SCA and OR concerning BAI. Specifically, the figure underscores that when SCA interacts with a low level of OR, the resulting impact on BAI is marginal, implying a minimal enhancement. Conversely, a distinct and noteworthy finding emerges when SCA engages with a high level of OR, showcasing a substantial improvement in BAI. This aligns seamlessly with the outcomes detailed in Table 4, solidifying the confirmation that the interaction effect is most pronounced and statistically significant when SCA is coupled with a heightened level of OR.

5. Discussion and Conclusion

Recently, the global scene, characterized by turbulence and immense competition, has witnessed a significant data turnover impacting numerous sectors (Al-Momani and Ramayah, 2023c; AlHamad *et al.,* 2022). The evolution of information systems within companies is noteworthy; these systems have moved from transactional record-keepers, per se, to vital tools that underpin business decision-making at various organizational levels). This evolution plays a pivotal role in evading geographical and temporal limitations, affirming the extensive influence of these advancements (Abu-Shanab, Al-Momani and Ababneh, 2012).

The study's findings affirm the critical importance of blockchain in increasing the competencies of organizational supply chains. In consensus, the validated hypotheses delineate a distinct trend wherein factors such as operational transparency, alignment, adaptability, and agility in SMEs notably have an impact on the propensity to adopt blockchain technology. This trend is especially pronounced in scenarios characterized by heightened organizational preparedness, stressing the significance of these elements in the efficacious inclusion of blockchain into supply chain management practices.

In the context of Industry 4.0, SMEs can unleash blockchain technology for strategic gains, competing with the technological challenges inherent in the adoption of innovative business models. This technology streamlines financial operations, opens the door to the implementation of smart contracts, and consolidates the traceability and security of data, thereby supporting the transformation of SMEs' business models. This adaptation is fundamental for SMEs to effectively modernize and preserve competitiveness in a rapidly evolving digital environment.

This research paper comes in line with the RBV theory by incorporating both dynamic and relational perspectives into the evaluation of supply chain resources and capabilities. It questions the relationships between OSCT, SCL, SCD, SCA, and the moderating effect of OR on BAI within supply chains. The study sheds light on the impact of blockchain technology on supply chain dynamics, taking Saudi Arabia's role in SMEs. This enriched approach to RBV makes availability of a more nuanced understanding of how blockchain technology can revolutionize SCM and strategic planning.

This research aims to concentrate on SMEs within Saudi Arabia in the first place, potentially limiting the extrapolation of its findings to varying environments or larger corporate entities. Future scholarly pursuits should question the enduring effects of blockchain technology implementation across a variety of sectors and in distinct geographical settings. Furthermore, an in-depth analysis of the unique impediments and challenges SMEs encounter in adopting blockchain could offer critical insights, serving as a resource of high value for both industry practitioners and policy developers. Such investigations would not only augment this study but also extend the understanding of blockchain's integration across a variety of operational landscapes. Furthermore, the incorporation of the Structural Equation Modeling-Artificial Neural Network (SEM-ANN) methodology in subsequent research could offer a significant methodological advancement. This combined approach is recognized for its utility in facilitating decision-making processes(Wan *et al.*, 2022), supporting the results obtained by SEM(Rehman *et al.*, 2022), and providing a deeper understanding of the research problem(Scott & Walczak, 2009).

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