
THE ROLE OF OPEN INNOVATION ON SUSTAINABLE COMPETITIVE ADVANTAGE OF SMES – DUBAI AS A CASE STUDY

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Abstract:

Open Innovation (OI), conceptualized as a strategic paradigm of purposive inbound and outbound knowledge flows across organizational boundaries, has emerged as a critical mechanism for enhancing firm competitiveness. By leveraging external knowledge sources and commercializing internal ideas beyond firm boundaries, OI enables SMEs to overcome resource constraints and strengthen innovation outcomes. These strategies are anticipated to increase a company's Sustainable Competitive Advantage (SCA) when paired with a Creative Climate and Radical Innovation (CC&RI). Few studies have looked at the integration of OI and CC&RI inside Small and Medium Enterprises (SMEs), especially in the Middle East, despite the rising interest in this field. The mediating function of CC&RI in the relationship between OI and the SCA of SMEs in Dubai is investigated in this study. A conceptual model linking OI practices to SCA was developed and realistically assessed using data collected from 433 SMEs in Dubai. Tests using partial least squares path modeling revealed that OI greatly enhances SCA. Additionally, it was discovered that CC&RI positively mediated this association. These results demonstrate that the influence of OI on maintaining competitive advantage among Dubai's SMEs may be significantly increased by encouraging radical innovation and cultivating a creative organizational atmosphere.

Key words: *Dubai; Open Innovation; Radical Innovation; SME; Sustainable Competitive Advantage*

1. Introduction

Businesses are always working to stay competitive in today's fast-paced, extremely unstable business climate by implementing creative tactics. The modern marketplace is characterized by rapid technological advancement, which has profoundly transformed the nature of competition. A new age in which people work with sophisticated and intelligent technologies is represented by the current Industrial Revolution 5.0 (Ajaj et al., 2024; Taj & Jhanjhi, 2022). This paradigm shift necessitates continuous attention to the integration of machines and systems to enhance productivity, efficiency, and the creation of distinctive products (Humayun, 2021). Thus, gaining a competitive edge, maintaining long-term development, and guaranteeing organizational longevity all depend heavily on innovation.

The United Arab Emirates (UAE) has become a major global business hub, attracting investment from around the world due to its strong commitment to innovation-driven economic strategies (Almerri, 2024; Pervan et al., 2015). Within this context, the UAE government places significant emphasis on the development of the private sector, particularly small and medium-sized enterprises (SMEs), which are widely recognized as key drivers of economic growth, diversification, and employment generation. In Dubai, SMEs constitute the vast majority of registered businesses and play a central role in shaping a dynamic and resilient economic landscape (Banerjee & Essa, 2026). This strategic importance is further reinforced by government-led initiatives such as the Dubai Economic Agenda (D33), which prioritizes SME development as a cornerstone for enhancing global competitiveness and accelerating sustainable economic transformation. Recent official reports highlight that Dubai SME, operating under the Dubai Department of Economy and Tourism, has expanded its support ecosystem by facilitating the establishment of new enterprises, providing advisory and training services, and enabling access to finance and market opportunities (Government of Dubai Media Office, 2025). These efforts align with broader national strategies aimed at building a knowledge-based and innovation-driven economy, as reflected in forward-looking initiatives promoted by the UAE government and innovation-focused platforms such as the Dubai Future Foundation (Dubai Future Foundation, 2025; UAE Government, 2025). Collectively, these policy frameworks position SMEs at the center of the UAE's transition toward a more innovative, competitive, and sustainable economic model.

Dubai has become known around the world for its dynamic trade and innovation skills over the past ten years. Dubai is now a global center for SMEs because the government puts a lot of emphasis on innovation and entrepreneurship. Its strategic vision seeks to transition from an oil-dependent economic framework to one founded on knowledge and perpetual innovation (Pervan et al., 2015). Within the UAE innovation agenda, fostering organizational creativity and supporting radical innovation are widely emphasized as key drivers of long-term competitiveness (Alzahmi & Ibrahim, 2025).

Current literature emphasizes the necessity to investigate Open Innovation (OI) among firms of varying sizes and sectors (Hossain et al., 2016). Nonetheless, additional research is necessary, especially concerning micro and emerging SMEs (Papapanagiotou et al., 2021), to comprehend how these businesses adopt and execute OI practices (Stefan & Bengtsson, 2017). While a growing body of research has examined the

relationship between OI and firm performance, including SCA (e.g., recent studies in Technological Forecasting & Social Change and Sustainability), limited empirical work has explored the mediating mechanisms through which OI translates into sustained advantage within SME contexts in emerging innovation ecosystems such as Dubai (Farid & Day, 2019; Hossain & Kauranen, 2016; Wang et al., 2025; Zhang et al., 2023).

Recent studies highlight the critical significance of OI in bolstering SMEs' SCA in Dubai's quickly changing economy. Almehairbi et al. (2023) report a positive association between OI practices and SCA in Dubai's SMEs, highlighting the mediating influence of transformational leadership and innovation strategy. Their findings suggest that enhancing CC&RI capabilities can substantially boost SME competitiveness. Similarly, Asad et al. (2023) examine how entrepreneurial attitude, overall quality management, and OI interact to find that OI is a crucial mechanism that connects quality and entrepreneurial endeavors to better company performance. These insights underscore the strategic necessity of embedding OI within SME frameworks to promote sustainable growth.

Athooli et al. (2023) expand on this by examining the impact of sustainable manufacturing practices on SME competitiveness in the UAE. Their findings show that implementing Industry 4.0-aligned, sustainability-driven operations improves market positioning and environmental performance. In support of this viewpoint, Al-Omush et al. (2023) investigate how digitalization can boost SMEs' sustainable performance, demonstrating that digital transformation, when combined with strong OI strategies, improves resilience and adaptability in the face of market volatility. Further, Al Jneibi and Kudus (2024) emphasize organizational learning's significance in fostering industrial innovation among UAE SMEs, pointing to it as a crucial facilitator for getting beyond resource and regulatory limitations. According to their research, using OI to improve SCA requires fostering a culture that is focused on learning.

When taken as a whole, these studies offer a thorough grasp of the intricate connection between OI and SCA in Dubai's SME environment. In order to assist SMEs in overcoming current obstacles and preserving long-term competitiveness, they emphasize the significance of including leadership, quality management, sustainability, digitization, and organizational learning into OI plans.

In an attempt to bridge existing gaps, this study examines the relationships between OI, SCA, and CC&RI in the context of SMEs. The study's two main goals are to: (1) To examine the direct effect of Open Innovation (conceptualized as inbound and outbound knowledge practices) on Sustainable Competitive Advantage in SMEs; (2) To investigate whether Creative Climate and Radical Innovation jointly mediate the relationship between Open Innovation and Sustainable Competitive Advantage. The following research questions were developed as a result of these objectives: Q1: Does OI impact the SCA of Dubai's SMEs? Q2: How does the mediating role of CC&RI affect the relationship between OI and SMEs' SCA? In order to accomplish these goals, the following sections describe the conceptual framework, methodological steps, and analytical findings, ending in important conclusions and implications for SMEs looking to use OI to attain sustained competitiveness.

2. Literature review

Large, high-tech companies and multinational corporations were the primary focus of early OI research, with little attention paid to SMEs (Wynarczyk, 2013). But an increasing body of research indicates that SMEs need unique OI strategies based on their size, resources, and strategic orientation (Isaksen & Akkermans, 2011; Parida et al., 2012; Usman et al., 2018). In addition to identifying the research gaps this study fills, this section summarizes the body of knowledge on innovation, OI, CC, RI, and SCA.

2.1 Innovation and Open Innovation

Open Innovation (OI), as introduced by Chesbrough (2003), represents a paradigm shift from closed, internally focused innovation models toward purposive inflows and outflows of knowledge across organizational boundaries. OI is commonly categorized into two primary forms: inbound open innovation, which involves acquiring external knowledge to support internal innovation processes, and outbound open innovation, which refers to the external commercialization of internally developed knowledge (Chesbrough et al., 2006). Laursen and Salter (2006) further expand this perspective by examining the breadth and depth of external knowledge sourcing and their impact on innovation performance.

OI has a positive impact on the innovation and success of SMEs, according to empirical research (Exposito & Sanchis-Llopis, 2018; Parida et al., 2012). However, SMEs' adoption of OI is still uneven, frequently hampered by a lack of resources, risk aversion, and expertise (Todericiu, 2021). According to recent research, complementary elements like leadership, culture, and strategic orientation are necessary for OI effectiveness (Almehairbi et al., 2023).

Table 1. OI benefits and challenges: Large enterprises vs. SMEs (Antonelli et al., 2026; Henttonen & Lehtimäki, 2017; F. Huang et al., 2015).

	Large enterprises	SMEs
Benefits	Access to a larger pool of talent and ideas: external networks unlock a variety of expertise, accelerating time-to-market, utilizing outside knowledge sources, and surpassing internal constraints. Sharing innovation risks and easing the strain on internal R&D budgets result in lower R&D costs. Faster market entry: Use outside resources and expertise to launch your products more quickly. Improved brand reputation: Positive brand perception and trust can be	Access to vital resources: granting them access to resources (such as money, knowledge, and infrastructure) that they lacked internally. Enhanced flexibility and agility: By utilizing outside partnerships, SMEs can swiftly adjust to changes in the market. Take advantage of a wider variety of market opportunities. ability to combine proven technologies to produce more complex products

Challenges	developed through open communication with external stakeholders. Cultural resistance to change: implementing new strategies may be challenging due to ingrained internal procedures and cultures. Loss of intellectual property (IP): Concerns regarding IP control and protection may arise when knowledge is shared with outside partners. Complexity of management: it's necessary to integrate external knowledge into internal processes and manage external relationships effectively. Selection and partner management: Selecting the appropriate partners and successfully overseeing cooperation can be difficult. Building cooperation and trust: It can be difficult to establish productive cooperation and trust with outside partners, particularly when working with diverse organizational cultures.	Enhanced learning and knowledge: making it possible to acquire important information and abilities from seasoned partners. Decreased failure risk: well-established partners can reduce the risks associated with innovation. Lack of knowledge and resources: SMEs might not fully understand the advantages of OI or have the means to put it into practice successfully. Limited bargaining power: When negotiating with larger partners, SMEs may find themselves at a disadvantage, which could result in unfavorable terms. IP protection challenges: SMEs might not have the means or know-how to properly safeguard their intellectual property in open partnerships. Partner attraction and retention challenges: Due to their limited resources and reputation, SMEs may find it difficult to draw in and keep top-notch partners.
Common issues	Internal process adaptation: It can be challenging to incorporate OI into the existing internal structures and procedures. Data and knowledge sharing: Concerns regarding confidentiality and misuse may arise when sensitive data and knowledge are shared. Measuring the success of OI: The return on investment (ROI) from OI can be difficult to calculate due to its complexity.	

2.2 Radical Innovation

According to Wang and Xu (2018), RI is a transformative process that introduces innovative technologies or business models that have the potential to change markets. RI can significantly boost a company's performance, market reach, and sustainability despite the increased risk and uncertainty involved (Nabi et al., 2023). However, due to financial and technological constraints, many SMEs find it difficult to effectively pursue RI (Oxley & Sampson, 2004). Research indicates that incorporating OI practices makes RI easier by

promoting experimentation and providing access to outside knowledge (Parida et al., 2012).

2.3 Creative Climate

The organizational culture that promotes innovation, teamwork, and taking calculated risks is referred to as CC. According to Matzler et al. (2015), a supportive CC fosters innovation performance by boosting team motivation and idea generation. A healthy CC is influenced by elements like autonomy, trust, candid communication, and productive disagreement (McLean, 2005). According to empirical data, inbound OI fosters a creative environment that has a positive impact on RI (Wang & Xu, 2018). Thus, by fostering ongoing innovation, CC and RI work together to reinforce the connection between OI and SCA. Ekvall's Ten Dimensions of the CC are depicted in Fig. 1 (Isaksen, 2017).

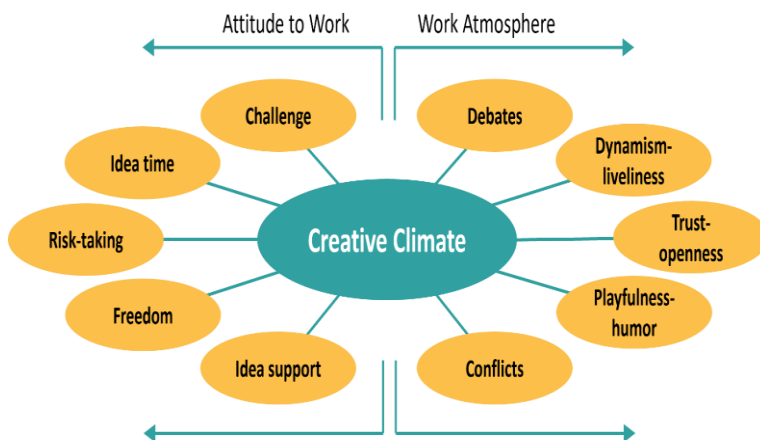


Fig. 1. Ekvall's Ten Dimensions of the CC, differentiating attitude to work and work atmosphere (Isaksen, 2017).

2.4 Sustainable Competitive Advantage

SCA is the capacity of a business to continue outperforming rivals thanks to special characteristics that are hard to imitate (Kuncoro & Suriani, 2018). According to Porter's framework, innovation, differentiation, and cost leadership are essential tactics for reaching SCA (Crema et al., 2014). Innovation and OI are especially crucial for SMEs to maintain competitive positions in fast-paced markets (Expósito et al., 2019). Maintaining customer value and long-term growth requires working with outside partners, investing in R&D, and creating knowledge-sharing mechanisms (Ajaj et al., 2025; Popa et al., 2017).

2.5 Research Gaps

Researchers examining the relationship between OI and SCA in SMEs have found a number of gaps in our current understanding. Table 2 summarizes these gaps, which serve as the basis for the current study.

Table 2. Gaps in the literature's research

Type of Gap	Description and References
Geographical gap	In many regions, especially Asia and the Middle East, where institutional frameworks, innovation ecosystems, and policy support differ greatly from those in Western economies, research on OI development within SMEs is still lacking (Sabando-Vera et al., 2022).
Enterprise size gap	There is a lack of studies that specifically address innovation in SMEs, which leaves a gap in the identification of trustworthy indicators for SME-oriented OI implementation (Rosa et al., 2020). Direct comparisons between multinational and small-business OI practices are problematic because SMEs frequently experience OI differently from large corporations. This highlights the need for a more in-depth analysis of the contextual factors that allow SMEs to successfully apply OI (Radziwon & Bogers, 2019). Despite making up the majority of businesses worldwide, SMEs are still underrepresented in OI research (Odriozola-Fernández et al., 2019). While many studies have examined OI applications in general, SMEs and their unique resource constraints have received relatively little empirical attention (Farid & Day, 2019). Due to the disproportionate emphasis on large, technology-driven companies, there is a significant knowledge gap about how smaller, less resource-intensive businesses use OI to gain a competitive edge (Henttonen & Lehtimäki, 2017).
Knowledge gap	There is still little knowledge about how businesses manage external partnerships, particularly how value is created, shared, and captured across collaborative networks, despite the availability of several OI frameworks (Rauter et al., 2019). There is still a lack of research on how inter-firm collaboration boundaries affect both radical and incremental innovation (Jugend et al., 2018). Additionally, conflicting results about SMEs' openness and adoption of OI practices are reported by empirical studies, suggesting the need for more context-sensitive and long-term research (Sağ et al., 2016).

In conclusion, the literature shows that studies of large organizations in developed economies have dominated OI research, leaving SMEs in emerging markets like Dubai understudied. The ways in which OI interacts with organizational elements like CC and RI to affect SCA have also received little attention. This study aims to bridge these gaps by experimentally examining the relationships between OI, CC&RI, and SCA in the context of Dubai's SMEs.

Collectively, Schumpeter's innovation theory explains the origin of innovation-driven change, while the dynamic capabilities perspective explains how firms adapt and

reconfigure resources in turbulent environments. The Resource-Based View further clarifies how such capabilities translate into sustained competitive advantage. Integrating these perspectives provides a robust theoretical foundation for examining the role of Open Innovation, Creative Climate, and Radical Innovation in shaping SMEs' performance.

3. Theoretical Models and Hypotheses

3.1 Open Innovation and Sustainable Competitive Advantage

OI has been recognized by Henry Chesbrough and later researchers as a crucial factor in a company's ability to achieve RI (Figueiredo, 2025). OI is the intentional application of both internal and external ideas and pathways to improve organizational innovation and increase market opportunities, according to Chesbrough (2003). Researchers have long examined OI's role in creating new products and services that facilitate business growth. For example, K. F. Huang et al. (2015) found that a company's SCA is enhanced when it has access to external technology resources.

SMEs in particular depend on R&D collaborations and external knowledge-sharing channels to grow and remain economically viable (Expósito et al., 2019; Popa et al., 2017). Businesses must come up with innovative ideas and launch goods and services with unique features in order to continuously satisfy consumer expectations (Kuncoro & Suriani, 2018). According to earlier research, companies can attain SCA by implementing cutting-edge technologies (Akbari et al., 2020). Arsawan et al. (2020), however, pointed out the dearth of studies on how SMEs, especially in developing countries, expand SCA through OI. To address the first research question and expand upon these findings, the following hypothesis is proposed: H1: Open innovation (OI) greatly improves SCA.

3.2 CC&RI's Mediating Effect

The survival and sustainable competitiveness of businesses in today's global market depend heavily on creativity and innovation, which are fundamental elements of SCA (Zain et al., 2019). An organization's CC is essential to fostering innovation success. Matzler et al. (2015) demonstrated that employees who perceive their workplace as creative exhibit higher motivation, which enhances organizational innovation. Similarly, leadership behavior strongly influences the extent to which creativity and innovation flourish in the workplace (Mumford & Hemlin, 2017).

Evidence from the UAE indicates that leadership styles at the top management level positively affect employee creativity (Ahmad et al., 2019). Additionally, it has been demonstrated that CC improves the relationship between leadership conduct and organizational innovation (Mathisen et al., 2012). Internal business culture also acts as an enabler of RI, facilitating the translation of novel ideas into tangible innovations (Tellis et al., 2009). The following hypothesis is put out in relation to the second research question and in light of these findings: H2 - In Dubai SMEs, the connection between OI and SCA is strongly and favorably mediated by CC and RI.

In the present study, Creative Climate (CC) and Radical Innovation (RI) are modeled as complementary and sequentially related constructs. Creative Climate represents an organizational context that enables experimentation, autonomy, and knowledge sharing. Radical Innovation reflects the transformative innovation outcomes that emerge within such climates. Accordingly, CC functions as an enabling condition, while RI captures the resulting innovation intensity. For parsimony in structural modeling, both dimensions are operationalized as a higher-order construct representing an innovation-enabling mechanism.

3.3 Theoretical Model

It is widely acknowledged that innovation may spur economic change (Wynarczyk, 2013). Schumpeter's theory of innovation emphasizes the role of entrepreneurs as agents of "creative destruction," driving economic development through the introduction of new products, processes, markets, and organizational forms (Schumpeter, 1934; Schumpeter, 1943; Thanawala, 1994). According to this theory, entrepreneurs drive economic development by introducing new products, adopting novel production techniques, entering untapped markets, sourcing alternative materials, and developing innovative organizational structures. While risk-taking and coordination are integral aspects of entrepreneurship, Schumpeter emphasized that genuine progress stems from a firm's capacity for innovation.

From a dynamic capabilities perspective, firms must continuously integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Teece et al., 1997). From a Resource-Based View (RBV) perspective, Sustainable Competitive Advantage emerges when firms possess valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). Open Innovation enhances access to heterogeneous knowledge resources, while Creative Climate strengthens absorptive and recombination capabilities, enabling Radical Innovation that competitors cannot easily replicate (Barney, 1991; Cohen & Levinthal, 1990).

This study proposes a conceptual framework grounded in Schumpeter's innovation theory and the dynamic capabilities perspective, complemented by the Resource-Based View (RBV) to explain how firms develop and sustain competitive advantage through innovation. The proposed theoretical model is presented in Fig. 2, which also outlines the hypothesized relationships underpinning this research.

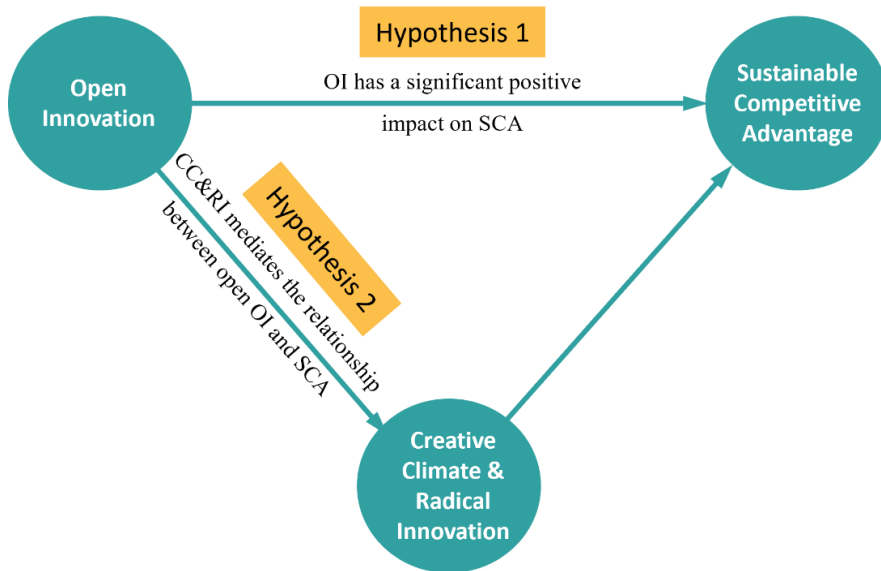


Fig. 2. Proposed research Model

4. Research Methods

This study was conducted in the United Arab Emirates, with a focus on the Emirate of Dubai. The main hub for foreign investment and private business in the nation is Dubai. A hybrid approach strategy that combined quantitative and qualitative research was employed, as shown in Fig. 3. Relevant factors were extracted from a comprehensive review of the literature to inform the questionnaire design. To further hone these standards, sixteen semi-structured qualitative interviews with business owners with five to twenty years of experience were conducted. Twenty-eight factors that were found in the literature were later used in the statistical phase of the study after being verified by experts.

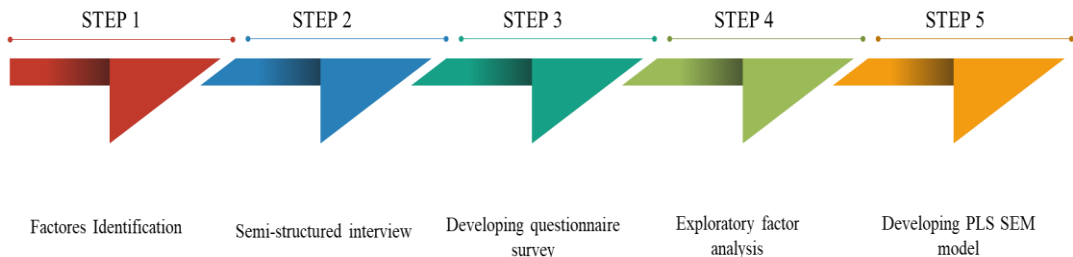


Fig. 3. Research flow

In order to examine factors related to OI, CC & RI, and SCA, entrepreneurs with substantial industry experience took part in multiple rounds of semi-structured interviews. To determine the factor structure and evaluate the internal reliability of the measures derived from the survey data, the “Exploratory Factor Analysis (EFA)” method was utilized. The reliability and applicability of the chosen factors were validated by the EFA results.

The twenty-eight factors that were found were divided into four categories based on the EFA, which represented the salient features of the SMEs.

4.1 Entrepreneurs' Demographic Information

After the interviews, SMEs mostly in the service industry were given a standardized questionnaire survey. Using a Stratified Random Sampling technique (SRS), 700 questionnaires were disseminated, and 433 valid responses were collected. The sampling frame was provided by the Dubai Economy Department (DED). SmartPLS software was used to evaluate the data. There were five primary sections of the questionnaire. Demographic data were collected in the first part. The next sections evaluated OI, RI, CC, and SCA-related characteristics using a five-point Likert scale. The demographics of the entrepreneurs who took part in the study are summarized in Fig. 4.

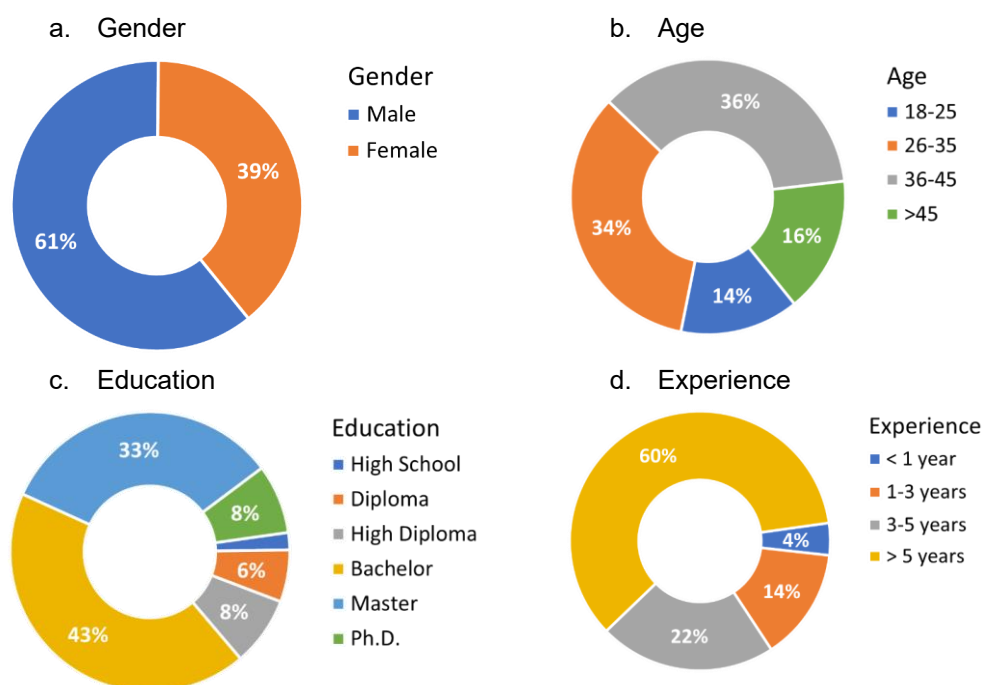


Fig. 4. Demographic information of the entrepreneurs

According to Luthra et al. (2016), participants in these kinds of studies ought to be well-versed in the subject. Consequently, the selected business owners had a great deal of experience in “operations, finance, project management, and decision-making” across their different businesses.

4.2 Evaluation of Validity and Reliability

The “Kaiser–Meyer–Olkin (KMO)” measure of sampling adequacy was employed to evaluate factor homogeneity and ensure that partial correlations among variables were

minimal (Sharma et al., 2021). In accordance with Tabachnick et al. (2007), a minimum KMO value of 0.6 is required for factor analysis to be appropriate. The KMO value obtained in this study was 0.819, exceeding the recommended threshold. Moreover, “Bartlett’s test of sphericity” produced a noteworthy outcome ($\chi^2(465) = 2413.378$, $p < 0.00$), verifying that the data was appropriate for factor analysis.

4.3 Exploratory Factor Analysis

The EFA was conducted to evaluate the questionnaire’s construct reliability and validity (Buniya et al., 2024). A sample size of between 100 and 300 is usually sufficient for EFA, as advised by Tabachnick et al. (2007). A solid dataset for the analysis was produced via the distribution of 700 forms in this study, which produced 433 valid replies (Buniya et al., 2024).

4.4 Partial Least Squares Structural Equation Modeling (PLS-SEM)

The study utilized SEM, a popular method in social science research for analyzing causal linkages and evaluating the fit between theoretical models and actual data, to further confirm the associations found in the exploratory stage. Specifically, the “PLS-SEM” approach was utilized to confirm and extend the findings from the EFA. There were two phases to the “PLS-SEM” procedure. To make sure the measurement model was robust, the first step evaluated “outer loadings”, “discriminant validity”, and “Composite Reliability (CR)”. In order to examine the connections between latent and dependent variables, the second step computed the path coefficients (β) (Buniya et al., 2024). This method maximized the explained variance among the latent constructs and improved the model’s accuracy.

4.5 Measurement Development

OI was measured using nine reflective indicators capturing inbound and outbound innovation practices, including external collaboration, R&D investment, experimentation, and market introduction of novel products. CC was measured through organizational, supervisory, and work-group support dimensions based on established creative climate frameworks (Isaksen, 2017). RI was operationalized using three items assessing the degree to which innovations introduced substantial technological or market discontinuities. SCA was measured using multidimensional indicators reflecting strategic positioning, diversification, collaborative intensity, and innovation-oriented strategic objectives.

5. Results

The data collected for assessing OI, CC&RI, and SCA were analyzed through path modeling. “T-values”, “beta coefficients”, significance levels, and 95% “Bias-Corrected and accelerated (BCa)” confidence intervals were obtained using a simple bootstrapping process with 5,000 subsamples. Following J. F. Hair et al. (2017) the measurement and

structural models were then evaluated and validated. Additionally, individual item reliability, concept reliability, and both “convergent and discriminant validity” were assessed in order to evaluate the measurement model’s validity and reliability.

5.1 Model Assessment

5.1.1 Viability and reliability analysis

A validity analysis and reliability test of the underlying variables were performed. It was determined that every “factor loading” was higher than 0.5. Additionally, it was determined that the variation exceeded 50% across all factor interpretations. These findings reveal that the “convergent validity” of the test dimension is good. Furthermore, each underlying variable in the measurement element has a “Cronbach’s α ” value of 0.7 or above, demonstrating the reliability of the underlying variables. That concludes that the data were reliable, as the full “Cronbach’s α ” value was 0.920. Considering the number of employees and company turnover, SMEs were classified as small or medium-sized. Companies with 8 to 50 employees and a turnover of up to AED 20 million were considered small. In contrast, companies with 51 to 200 employees and a turnover of up to AED 50 million were considered medium-sized. SMEs were further classified into four groups to provide a more nuanced perspective of the sample, as shown in Table 3. Fig 5 illustrates the percentage of SMEs in each classification and category.

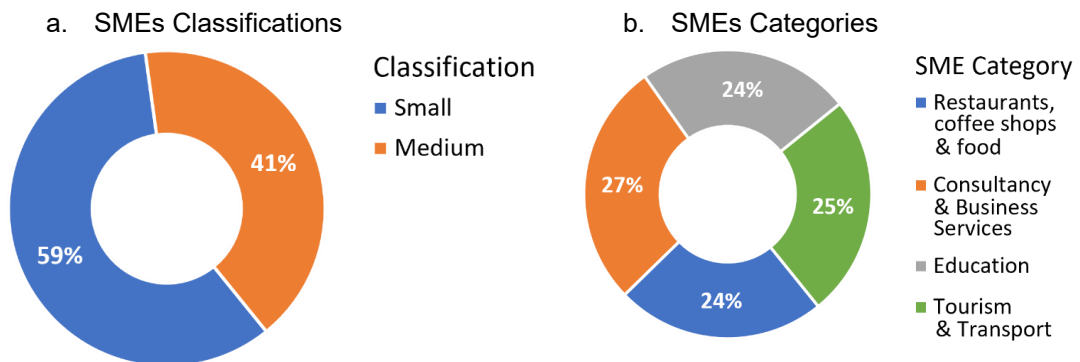


Fig. 5. Classification and categories of the SMEs included in the survey

Table 3. SMEs Categories

SME Categories	Type of entrepreneur included
Restaurants, cafeterias, and food stores	Distributors & Wholesalers, Food Stuff Trading, Bakeries, Desserts & Sweets, Cafeterias, Catering Services, Coffee Shops, Food Delivery Services, Restaurants & Bars, Health Food & Supplement Stores, Supermarkets, Hypermarkets & Grocery Stores and Central Kitchen

Commercial services and Consultancy	IT services, engineering consultants, financial and human resource consultants, legal consultants, management consultants, commercial consultation services, and business process outsourcing services
Education	Colleges & Universities, Religious Schools, Schools, Driving Schools, and Training & Learning Centers
Tourism and Transport	Airlines and Service Providers, Car Rental Services, Hotels and resorts, Travel and ticketing Agencies, Amusement Parks and arcades, Circus and zoo, Air Cargo Services, Local Tours and activities, Private Transport, Sea Tickets and Service Providers, Serviced Apartments and Marine Services

To guarantee the robustness of the results, the model's validity and dependability were thoroughly investigated. "Construct validity" and "convergent validity" were used to evaluate validity, which is a measure of how well a construct captures the idea it is meant to convey. Reliability, on the other hand, is the internal consistency of the model's output (Sekaran & Bougie, 2016). The degree to which the test results matched theoretical predictions and associated hypotheses was used to verify "construct validity." Conducting (SRS) was based on a proportional sampling technique. The formula was used to calculate the percentage of service-oriented SMEs:

$$\frac{\text{sample size}}{\text{population size}} \times \text{stratum size}$$

All measurement scales exceeded the 0.7 cutoff value when the reliability of the outer model was assessed, indicating high reliability without the need to eliminate any items (Hair et al., 2010). The "Fornell and Larcker (FL)" criteria, which require a "Average Variance Extracted (AVE)" value greater than 0.5, were then used to assess "convergent validity." All constructs attained AVE values higher than this benchmark, as shown in Table 4, indicating sufficient convergent validity for the model.

Table 4. Construct reliability and AVE

	α	CR	AVE
CC&RI	0.930	0.940	0.547
OI	0.930	0.942	0.642
SCA	0.845	0.890	0.619

Table 5 summarizes the sample "mean", "standard deviation (STDEV)", "t-values", and "p-values". The correlation coefficients between the independent variables are all less than 0.7, as the table illustrates, indicating that multicollinearity is not present in the model. Furthermore, since the "R² values" along the diagonal is greater than the matching correlation coefficients in the same columns, the requirement for "discriminant validity" is met. This indicates that every construct assesses a different idea and is experimentally different from the others.

Table 5. Statistics results

	Original sample	Mean	(STDEV)	T values	P values
CC&RI → SCA	0.647	0.652	0.057	11.537	0.000
OI → CC&RI	0.642	0.650	0.049	13.240	0.000
OI → SCA	0.139	0.148	0.058	2.42	0.013

5.1.2 Discriminant Validity

To confirm “discriminant validity”, two well-known methods were used. Initially, it was determined whether the correlations between components were less than each construct R2. As seen in Table 6, this phase verified adherence to the FL criteria. Second, in accordance with Henseler et al. (2016), the “Heterotrait–Monotrait (HTMT)” ratio of correlations was computed. As seen in Table 7, the results showed that all “HTMT” values were below the permissible limit of 0.85 or 0.90, offering further proof of excellent “discriminant validity”.

Table 6. FL criterion

	CC&RI	OI	SCA
CC&RI	0.740	0.000	0.000
OI	0.642	0.801	0.000
SCA	0.746	0.564	0.797

Table 7. HTMT

	CC&RI	OI	SCA
CC&RI	0	0	0
OI	0.688	0	0
SCA	0.836	0.629	0

In order to ascertain whether each construct shared more variance with its own indicators than with those of other constructs, discriminant validity was further evaluated by comparing the AVE of each construct with its correlations to other constructs (Buniya et al., 2024). To do this, each construct’s square root of the AVE was compared to its inter-construct correlations. The findings showed that each construct was both dependable and empirically different from the others since the absolute correlation values for each construct were less than the square roots of their corresponding AVEs.

5.2 Evaluation of Structural Models

The data showed a high overall match, according to the structural model analysis. To begin, the model was examined for potential multicollinearity by computing the

“Variance Inflation Factor (VIF)” values. The VIF results, as displayed in Table 8, ranged from 1.537 to 3.042, significantly below the suggested upper limit of 5, indicating that there was little multicollinearity among the predictor variables. After this validation, the PLS path model was further evaluated using the blindfolding technique with an omission distance of 7.

Table 8. VIF values for OI, CC&RI, and SCA

#	Groups/Variable	ID	VIF
1	OI (in the firm)		
	Frequently experiments with new concepts	OI1	2.487
	Introduces novel goods, services, procedures, or systems for management or organization	OI2	2.469
	Market new products or services (through marketing channels)	OI3	2.474
	Its management look for innovative approaches	OI4	2.320
	Is innovative in how it operates	OI5	3.042
	Makes use of modern technology	OI6	2.552
	Employs innovative marketing techniques	OI7	2.581
	Creates innovative methods for building connections with clients	OI8	2.751
	Invests in R&D to create new goods, services, or procedures	OI9	2.470
2	CC&RI		
2a	CC Organizational Support		
	Rewards new ideas	CCOS1	2.104
	Provides materials to encourage the creation of fresh concepts	CCOS3	2.827
	Provides relevant technology for creativity	CCOS4	2.828
2b	CC Supervisory Support		
	Supervisors encourage the use of diverse skills	(CCS1)	2.427
	Supervisors facilitate creativity	(CCS2)	2.700
	Supervisors set creativity objectives	(CCS3)	2.176
	Supervisors consult with their staff	(CCS5)	2.408
2c	CC Work Group Support		
	Gives each member of our team the assistance they need at work	(CCWG2)	2.604
	Provides a friendly teamwork atmosphere	(CCWG4)	2.664
	Disagreements in our teamwork are constructively resolved	(CCWG5)	2.292
2d	RI (Departmental level)		
	Introduces innovation that is a major advancement over earlier technology	RI1	2.631

	Introduces innovation that results in items that are hard to replace with alternatives made with outdated technology	RI2	2.352
	An innovation that significantly alters market consumption patterns	RI3	2.574
3	SCA		
3a	Balance Scorecard		
	The firm has a clear Balanced Scorecard (BSC)	(SCABSC)	1.537
3b	Diversification (pertaining to the previous five years)		
	Achieving a variety of product/market sectors has been the primary goal	(SCAD)	2.528
3c	OI (pertaining to the previous five years)		
	Has worked with several partners	(SCAOI1)	2.071
	Has collaborated in many phases/activities.	(SCAOI2)	2.142
	Often evaluates the possibility of collaborating with external partners.	(SCAOI3)	2.014
3d	Strategy Innovation		
	Main objectives have been to achieve an image as an “innovator”	(SCASI)	2.005

The structural model has enough predictive power if its Q^2 predictive relevance value is higher than zero. The PLS path analysis verifies that the model has sufficient out-of-sample predictive ability, as shown in Table 9. Additionally, these results are further validated by the R^2 values, which support the Q^2 test results (J. Hair et al., 2017). An overview of the structural model results is shown in Fig. 6, which shows the links between the variables in the suggested framework and the related R^2 values.

Table 9. Cross-validated redundancy and commonality model

Construct	Cross-validated	Q^2 redundancy	Q^2 Community
CC&RI		0.222	0.481
OI		0.000	0.553
SCA		0.345	0.427

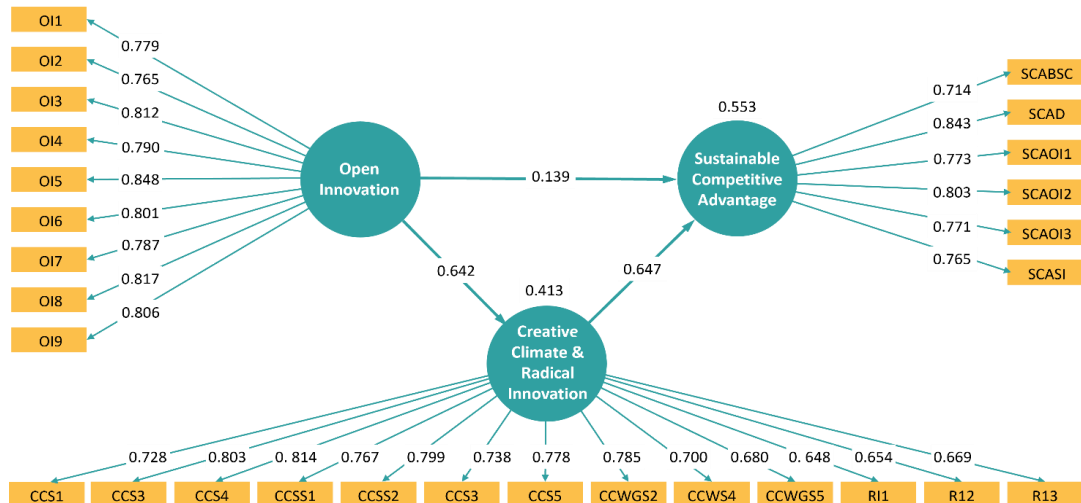


Fig. 6. Structural model results and the variables R²

5.3 Hypothesis Testing

Testing the research hypotheses came next once the inner and outer models had been evaluated. According to H1, OI significantly improves SCA. Table 10 demonstrates that OI has a substantial and beneficial impact on SCA ($\beta = 0.139$, $t = 2.42$, $p > 0.05$), supporting H1. These results align with earlier studies (Hochleitner et al., 2017; Lee & Yoo, 2019; Rosenbusch et al., 2011; van de Vrande et al., 2009; Yoon et al., 2016).

The degree to which independent and dependent variables are related is shown by the R² value. An R² of 0.67 or above is regarded as strong, 0.33 as moderate, and 0.19 as weak, according to Sotirchos et al. (2019). Greater prediction accuracy and a better fit of the regression line are indicated by higher R² values. The size of the organization was also taken into consideration when evaluating the effect size (f^2), with suggested limits of 0.02, 0.15, and 0.35 for small, medium, and large effect sizes, respectively (Sotirchos et al., 2019). Applying the formula:

$$f^2 = \frac{R^2_{\text{included}} - R^2_{\text{excluded}}}{1 - R^2_{\text{included}}}$$

The CC&RI effect size was determined to be $f^2 = 0.13$, suggesting a medium effect. The bootstrap approach was used to assess the mediating influence of CC&RI on the link between OI and SCA in order to further investigate their involvement (J. F. Hair et al., 2017). The results showed that OI had a direct influence on SCA ($\beta = 0.139$, $t = 2.42$, $p > 0.05$) and that CC&RI had a substantial indirect effect ($\beta = 0.419$, $t = 10.017$, $p < 0.001$). These findings corroborate earlier research in the context of SMEs (Isaksen, 2017; Parida et al., 2012; Usman et al., 2018), suggesting that CC&RI partially mediates the link between OI and SCA. Tables 11 and 12 display all of the R² and F².

Table 10. Results of hypothesis evaluation

Code	Hypothesis	Path Coefficient	Standard Error	T	P	Decision
H1	OI → SCA	0.139 ^a	0.058	2.42	0.013	Supported
H2	OI → CC&RI → SCA	0.419 ^b	0.042	10.017	0.000	Supported

^a p < 0.05; ^b p < 0.001

Table 11. R² results

	R ²	R ² Adjusted
CC&RI	0.413	0.411
SCA	0.553	0.551

Table 12. f² results

	CC&RI	OI	SCA
CC&RI	0.000	0.000	0.579
OI	0.703	0.000	0.025
SCA	0.000	0.000	0.000

5.4 Goodness of Fit (GoF)

One composite indicator is used to assess the “Goodness of Fit (GoF)” in PLS-SEM (Tenenhaus et al., 2005). The following formula is used to produce this index, which is the geometric mean of the AVE and R2 values of the endogenous constructs:

$$Gof = \sqrt{(R^2 \times AVE)}$$

The GoF for this study is 0.598, as seen in Table 13, which is regarded as a high number, indicating the validity of the suggested model (Henseler et al., 2016; Wetzels et al., 2009).

Table 13. GoF Results

Construct	R ²	AVE
OI		0.642
SCA	0.568	0.619
Average	0.568	0.630
Goodness of Fit (GoF)	0.598	

6. Discussion

For the first time, this study looked at the connection between OI and SCA in the context of Dubai culture. The influence of OI on SME SCA was examined in order to satisfy the research goals and provide a response to the main problem of the study. The findings corroborate H1 ($\beta = 0.139$, $t = 2.42$, $p > 0.05$) by showing a positive and significant connection between OI (as a composite construct) and SCA. According to these results, adopting OI promotes SCA, which is consistent with earlier research (Chatzoglou & Chatzoudes, 2018; Expósito et al., 2019; Hochleitner et al., 2017; Lee & Yoo, 2019; Rosenbusch et al., 2011; van de Vrande et al., 2009; Yoon et al., 2016).

Furthermore, the bootstrap approach was used to establish the mediating effect of CC&RI between OI and SCA, demonstrating significance at the 0.001 level ($\beta = 0.419$, $t = 10.017$, $p < 0.001$), confirming H2. These findings align with past studies emphasizing the significance of CC&RI in attaining superior performance and product innovation (Cavaleri & Shabana, 2018; Lee & Yoo, 2019).

The survey also highlights how important SMEs are to Dubai's economic growth (Banerjee & Essa, 2026). Additionally, it discusses the paucity of research on SMEs, especially with regard to the use of OI, and offers insights into how small businesses use OI to get a competitive edge (Hinteregger et al., 2019; Hossain & Kauranen, 2016; Jugend et al., 2018; Rubio & Aragón, 2009; Usman et al., 2018).

6.1 Implications

The examination of OI and how it affects SCA has various significant theoretical and practical ramifications, especially when it comes to dynamic capabilities perspective and Schumpeter's theory. The results add to the body of knowledge on OI procedures in SMEs by showing that OI directly improves SCA. The work of Pervan et al. (2015), who highlighted the need for more research to produce useful insights for policymakers and entrepreneurs, is also expanded upon by this study. According to the findings, authorities should bolster initiatives that foster innovation, such as institutional frameworks, structured finance programs, and platforms for collaboration between academic institutions and SMEs.

This study confirms previous findings that OI has a favorable impact on SMEs' SCA. OI is the intentional influx and outflow of information to enhance internal innovation processes and leverage outside ideas, according to Chesbrough (2003). OI offers a strategic way for SMEs, who often have fewer resources than bigger companies, to access outside knowledge, technology, and market possibilities that would not otherwise be possible (Lee et al., 2010).

OI allows SMEs to collaborate with suppliers, consumers, startups, institutions, and even rivals. According to Gassmann et al. (2010), this kind of cooperation allows for the more effective creation of novel goods and services, quicker reactions to changes in the market, and lower expenses and risks related to innovation. OI directly supports a company's long-term competitive advantage by promoting distinctiveness, adaptability, and market response.

The study's conclusions are consistent with other studies showing that OI improves SMEs' market adaptation and innovation performance (van de Vrande et al., 2009; Zeng et al., 2010). Additionally, by encouraging ongoing learning and adaptation, two essential skills in dynamic and unpredictable corporate environments, OI promotes sustained success. For SMEs hoping to stay competitive, OI should thus be viewed as a strategic need rather than just a tactical instrument.

The study emphasizes the need of a methodical and proactive approach to OI from a managerial standpoint. Managers should actively look for outside alliances, make investments in systems for exchanging information, and foster an environment that values cooperation and outside advice. SMEs may strengthen their market position over time and increase their capacity for innovation by incorporating OI into their core business operations.

In conclusion, this study emphasizes the strategic importance of OI for SMEs and offers managers looking to adopt OI practices useful advice. SMEs may guarantee long-term competitive resilience, promote sustainable innovation, and open up new prospects by utilizing OI.

6.2 Research Limitations

Although the study's conclusions provide insightful information for SMEs worldwide, a number of limitations need to be acknowledged. First, the study only looks at SMEs in Dubai, which restricts how broadly the findings may be applied. Second, while though Dubai's SMEs are divided into trading, manufacturing, and services, the research is limited to businesses in the service sector. Lastly, the authors were unable to evaluate or confirm the results against comparable studies in the region because there was no prior study on this issue in Dubai.

7. Conclusions

Due to their limited operational and financial resources, SMEs have more difficulty surviving in today's quickly changing climate than bigger businesses. As a result, SMEs need managers who can successfully negotiate business challenges in a competitive and multicultural environment. SMEs must use innovation and leadership to provide unique goods and services that satisfy consumer demands in order to sustain SCA. As mentioned in the introduction, the goal of this study was to create a research model that would pinpoint the primary factors that lead to SCA in SMEs.

This study adds to the body of existing material in a number of ways. First, it builds on earlier studies on OI and SCA by analyzing and assessing certain factors in the Dubai setting. Strong inferences are possible due to the findings' statistical significance. H1, which suggested that OI has a favorable impact on SCA in Dubai's SMEs, received support. Similarly, there was substantial evidence with high statistical significance for H2, which suggests that CC&RI significantly and favorably moderate the link between OI and SCA. These findings imply that OI is a useful strategic method for SMEs in Dubai to

improve SCA, and that the advantages of OI may be further maximized by encouraging radical innovation and cultivating a creative culture.

Additionally, the study adds actual data to the OI literature on SMEs' competitive behavior, offering insights outside the often examined US and European contexts. It answers the unanswered topic of how OI connects to SCA in Dubai's SMEs and proposes best practices for creating successful management strategies in small enterprises. By highlighting the significance of OI and CC&RI in attaining excellent corporate SCA, the findings offer a theoretical contribution.

The report concludes by outlining four possible directions for further investigation. First, more SME categories should be included in the scope. Second, more research should be done on the measures and indicators used to evaluate competitiveness across the short, medium, and long terms. Third, in order to gain a deeper understanding of resource creation and the use of OI techniques in SMEs, longitudinal studies are advised. Fourth, in order to improve SMEs' SCA development and better support OI activities, present policies should be reviewed and modified.

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8. References:

- Ahmad, M. F., Alhefeiti, H. S. O., Mohd Nawi, M. N., & Abdullah, A. S. (2019). The relationship of innovation capabilities towards employees' performance: Mediating effect of technological diversity in UAE manufacturing companies. *International Journal of Supply Chain Management*, 8(5), 1095-1110. <https://doi.org/10.59160/ijscm.v8i5.3647>
- Ajaj, R., Buniya, M. K., Wuni, I. Y., & Yousif, O. S. (2024). A case study on the barriers towards achieving Sustainable Smart City for Abu Dhabi. *IET Smart Cities*, 6(2). <https://doi.org/10.1049/smc2.12077>
- Ajaj, R., Buniya, M. K., Wuni, I. Y., & Yousif, O. S. (2025, 2025/09/01/). A structural equation model of the critical success factors for sustainable smart cities: A case study of Abu Dhabi. *Journal of Urban Management*, 14(3), 843-855. <https://doi.org/10.1016/j.jum.2025.02.008>
- Akbari, M., Khodayari, M., Khaleghi, A., Danesh, M., & Padash, H. (2020). Technological innovation research in the last six decades: a bibliometric analysis. *European Journal of Innovation Management*. <https://doi.org/10.1108/EJIM-05-2020-0166>
- Al-Omush, A., Momany, M. T., Hannon, A., & Anwar, M. (2023). Digitalization and sustainable competitive performance in small-medium enterprises: A moderation mediation model. *Sustainability*, 15(21), 15668. <https://doi.org/10.3390/su152115668>
- Al Jneibi, F. A. A. R., & Kudus, N. B. (2024). Unlocking the potential of SMEs in the UAE: Exploring challenges, opportunities, and the role of organizational learning in manufacturing innovation. *International Journal of Academic Research in Business and Social Sciences*, 14(11), 2705-2712. <https://doi.org/10.6007/IJARBSS/v14-i11/23768>

- Almehairbi, K., Arunprasad, P., & El Hathat, Z. (2023). Role of open innovation and strategy on SMEs in Dubai: review and theoretical framework. *Benchmarking*, 30(8), 3158-3182. <https://doi.org/10.1108/BIJ-04-2022-0234>
- Almerri, A. S. (2024). Investigating The Impact of Emirati Entrepreneurial Innovation Strategies by SMEs Within Abu Dhabi's Business Landscape. *Khalifa University of Science*.
- Alzahmi, A. J. S., & Ibrahim, I. (2025). Regulatory Innovation in UAE: A Systematic Review. *International Journal on Emerging Technologies*, 16(1), 130-136.
- Antonelli, G. A., di Prisco, D., & Leone, M. I. (2026, 2026/01/01). Trust in Open Innovation: An Integrated Model Based on a Systematic Literature Review. *R&D Management*, 56(1), 37-54. <https://doi.org/https://doi.org/10.1111/radm.70007>
- Arsawan, I. W. E., Koval, V., Rajiani, I., Rustiari, N. W., Supartha, W. G., & Suryantini, N. P. S. (2020). Leveraging knowledge sharing and innovation culture into SMEs sustainable competitive advantage. *International Journal of Productivity and Performance Management*. <https://doi.org/10.1108/IJPPM-04-2020-0192>
- Asad, M., Asif, M. U., Sulaiman, M. A. B. A., Satar, M. S., & Alarifi, G. (2023). Open innovation: The missing nexus between entrepreneurial orientation, total quality management, and performance of SMEs. *Journal of Innovation and Entrepreneurship*, 12(1), 79. <https://doi.org/10.1186/s13731-023-00335-7>
- Athooli, J., Dayanandan, R., & Elsaman, H. (2023). Study on the impact of strategic management through sustainable operations for Industry 4.0 from the perspective of SMEs in the UAE. *International Journal of Advanced and Applied Sciences*, 10(9), 165-173. <https://doi.org/10.21833/ijaas.2023.09.019>
- Banerjee, B., & Essa, A. (2026). The Impact of Sustainability Policies on Dubai's SME (Small and Medium Enterprises) Sector: A Path to Economic Recovery. In *Roadmap of Impactful Organizations: Innovation, Resilience, Agility, and Flexibility* (pp. 141-159). Springer.
- Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99-120. <https://doi.org/10.1177/014920639101700108>
- Buniya, M. K., Wuni, I. Y., Yousif, O. S., & Al-Mhdawi, M. K. S. (2024). Quantifying the impact index of key barriers to safety program initiatives in the Iraqi construction industry. *Construction Innovation*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/CI-08-2023-0185>
- Cavaleri, S., & Shabana, K. (2018). Rethinking sustainability strategies. *Journal of Strategy and Management*, 11(1), 2-17. <https://doi.org/10.1108/JSMA-08-2016-0050>
- Chatzoglou, P., & Chatzoudes, D. (2018). The role of innovation in building competitive advantages: an empirical investigation. *European Journal of Innovation Management*, 21(1), 44-69. <https://doi.org/10.1108/EJIM-02-2017-0015>
- Chesbrough, H., Vanhaverbeke, W., & West, J. (2006). *Open innovation: Researching a new paradigm*. Oxford University Press.
- Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business School Press. <https://www.hbs.edu/faculty/Pages/item.aspx?num=103>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 35(1), 128-152.
- Crema, M., Verbano, C., & Venturini, K. (2014). Linking strategy with open innovation and performance in SMEs. *Measuring Business Excellence*, 18(2), 14-27. <https://doi.org/10.1108/MBE-07-2013-0042>
- Dubai Future Foundation, D. (2025). THE GLOBAL 50. <https://www.dubaifuture.ae/the-global-50>
- Expósito, A., Fernández-Serrano, J., & Liñán, F. (2019). The impact of open innovation on SMEs' innovation outcomes: New empirical evidence from a multidimensional approach. *Journal of*

- Organizational Change Management, 32(5), 558-577. <https://doi.org/10.1108/JOCM-09-2018-0253>
- Exposito, A., & Sanchis-Llopis, J. A. (2018). Innovation and business performance for Spanish SMEs: New evidence from a multi-dimensional approach. *International Small Business Journal: Researching Entrepreneurship*, 36(8), 911-931. <https://doi.org/10.1177/0266242618782596>
- Farid, M., & Day, J. D. (2019). Implementation of Open Innovation in The Small and Medium-Size enterprise (SMEs): A Literature Review. *Journal of Physics: Conference Series*, 1244(1), 012041. <https://doi.org/10.1088/1742-6596/1244/1/012041>
- Figueiredo, R. (2025). Spinner Innovation: Integrated Model for the Development and Prediction of Innovation. *Studies in Business and Economics*, 20(1), 43-57. <https://doi.org/10.2478/sbe-2025-0003>
- Gassmann, O., Enkel, E., & Chesbrough, H. (2010, 2010/06/01). The future of open innovation. *R&D Management*, 40(3), 213-221. <https://doi.org/10.1111/j.1467-9310.2010.00605.x>
- Government of Dubai Media Office, G. (2025). Dubai SME achieves remarkable milestones, transforms entrepreneurial landscape in 2024. <https://mediaoffice.ae/en/news/2025/april/20-04/dubai-sme-achieves-remarkable-milestones>
- Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems*, 117(3), 442-458. <https://doi.org/10.1108/IMDS-04-2016-0130>
- Hair, J. F., Black, W. C., & Babin, B. J. (2010). *Multivariate Data Analysis: A Global Perspective*. Pearson Education. <https://books.google.iq/books?id=SLRPLgAACAAJ>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)*. SAGE Publications.
- Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: updated guidelines. *Industrial Management & Data Systems*, 116(1), 2-20. <https://doi.org/10.1108/IMDS-09-2015-0382>
- Henttonen, K., & Lehtimäki, H. (2017). Open innovation in SMEs: Collaboration modes and strategies for commercialization in technology-intensive companies in forestry industry. *European Journal of Innovation Management*, 20(2), 329-347. <https://doi.org/10.1108/EJIM-06-2015-0047>
- Hinteregger, C., Durst, S., Temel, S., & Yesilay, R. B. (2019). The impact of openness on innovation in SMEs. *International Journal of Innovation Management*, 23(1). <https://doi.org/10.1142/S1363919619500038>
- Hochleitner, F. P., Arbussà, A., & Coenders, G. (2017). Inbound open innovation in SMEs: indicators, non-financial outcomes and entry-timing. *Technology Analysis and Strategic Management*, 29(2), 204-218. <https://doi.org/10.1080/09537325.2016.1211264>
- Hossain, M., Islam, K. M. Z., Sayeed, M. A., & Kauranen, I. (2016). A comprehensive review of open innovation literature. *Journal of Science and Technology Policy Management*, 7(1), 2-25. <https://doi.org/10.1108/JSTPM-02-2015-0009>
- Hossain, M., & Kauranen, I. (2016). Open innovation in SMEs: a systematic literature review. *Journal of Strategy and Management*, 9(1), 58-73. <https://doi.org/10.1108/JSMA-08-2014-0072>
- Huang, F., Rice, J., & Martin, N. (2015). Does open innovation apply to China? Exploring the contingent role of external knowledge sources and internal absorptive capacity in Chinese large firms and SMEs. *Journal of Management & Organization*, 21(5), 594-613. <https://doi.org/10.1017/jmo.2015.36>
- Huang, K. F., Dyerson, R., Wu, L. Y., & Harindranath, G. (2015). From Temporary Competitive Advantage to Sustainable Competitive Advantage. *British Journal of Management*, 26(4), 617-636. <https://doi.org/10.1111/1467-8551.12104>

- Humayun, M. (2021). Industrial Revolution 5.0 and the Role of Cutting Edge Technologies. *International Journal of Advanced Computer Science and Applications*, 12(12), 605-615. <https://doi.org/10.14569/IJACSA.2021.0121276>
- Isaksen, S. G. (2017). Chapter 7: Leadership's role in creative climate creation *Handbook of Research on Leadership and Creativity*. In. Edward Elgar Publishing. <https://doi.org/10.4337/9781784715465.00014>
- Isaksen, S. G., & Akkermans, H. J. (2011). Creative Climate: A Leadership Lever for Innovation. *The Journal of Creative Behavior*, 45(3), 161-187. <https://doi.org/10.1002/j.2162-6057.2011.tb01425.x>
- Jugend, D., Jabbour, C. J. C., Alves Scaliza, J. A., Rocha, R. S., Junior, J. A. G., Latan, H., & Salgado, M. H. (2018). Relationships among open innovation, innovative performance, government support and firm size: Comparing Brazilian firms embracing different levels of radicalism in innovation. *Technovation*, 74-75, 54-65. <https://doi.org/10.1016/j.technovation.2018.02.004>
- Kuncoro, W., & Suriani, W. O. (2018). Achieving sustainable competitive advantage through product innovation and market driving. *Asia Pacific Management Review*, 23(3), 186-192. <https://doi.org/10.1016/j.apmr.2017.07.006>
- Laursen, K., & Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic management journal*, 27(2), 131-150. <https://doi.org/10.1002/smj.507>
- Lee, K., & Yoo, J. (2019). How does open innovation lead competitive advantage? A dynamic capability view perspective. *Plos one*, 14(11), 1-18. <https://doi.org/10.1371/journal.pone.0223405>
- Lee, S., Park, G., Yoon, B., & Park, J. (2010). Open innovation in SMEs—An intermediated network model. *Research Policy*, 39(2), 290-300. <https://doi.org/10.1016/j.respol.2009.12.009>
- Luthra, S., Govindan, K., Kharb, R. K., & Mangla, S. K. (2016, 2016/09/01/). Evaluating the enablers in solar power developments in the current scenario using fuzzy DEMATEL: An Indian perspective. *Renewable and Sustainable Energy Reviews*, 63, 379-397. <https://doi.org/10.1016/j.rser.2016.04.041>
- Mathisen, G. E., Einarsen, S., & Mykletun, R. (2012). Creative leaders promote creative organizations. *International Journal of Manpower*. <https://doi.org/10.1108/01437721211243741>
- Matzler, K., Bauer, F. A., & Mooradian, T. A. (2015). Self-esteem and transformational leadership. *Journal of Managerial Psychology*, 30(7), 815-831. <https://doi.org/10.1108/JMP-01-2013-0030>
- McLean, L. D. (2005). Organizational Culture's Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development. *Advances in Developing Human Resources*, 7(2), 226-246. <https://doi.org/10.1177/1523422305274528>
- Mumford, M. D., & Hemlin, S. (2017). *Handbook of Research on Leadership and Creativity*. Edward Elgar Publishing. <https://doi.org/10.4337/9781784715465>
- Nabi, M. N., Liu, Z., & Hasan, N. (2023). Investigating the effects of leaders' stewardship behavior on radical innovation: a mediating role of knowledge management dynamic capability and moderating role of environmental uncertainty. *Management Research Review*, 46(2), 173-195. <https://doi.org/10.1108/MRR-04-2021-0276>
- Odriozola-Fernández, I., Berbegal-Mirabent, J., & Merigó-Lindahl, J. M. (2019). Open innovation in small and medium enterprises: a bibliometric analysis. *Journal of Organizational Change Management*, 32(5), 533-557. <https://doi.org/10.1108/JOCM-12-2017-0491>
- Oxley, J. E., & Sampson, R. C. (2004). The scope and governance of international R&D alliances. *Strategic management journal*, 25(89), 723-749. <https://doi.org/10.1002/smj.391>

- Papapanagiotou, K., Rotsios, K., & Sklavounos, N. (2021). Innovating in Emerging Markets By Building Meaningful it Alliances. *Studies in Business and Economics*, 16(3), 160-172. <https://doi.org/10.2478/sbe-2021-0052>
- Parida, V., Westerberg, M., & Frishammar, J. (2012). Inbound Open Innovation Activities in High-Tech SMEs: The Impact on Innovation Performance. *Journal of Small Business Management*, 50(2), 283-309. <https://doi.org/10.1111/j.1540-627X.2012.00354.x>
- Pervan, S., Al-Ansaari, Y., & Xu, J. (2015). Environmental determinants of open innovation in Dubai SMEs. *Industrial Marketing Management*, 50, 60-68. <https://doi.org/10.1016/j.indmarman.2015.05.029>
- Popa, S., Soto-Acosta, P., & Martinez-Conesa, I. (2017). Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs. *Technological Forecasting and Social Change*, 118, 134-142. <https://doi.org/10.1016/j.techfore.2017.02.014>
- Radziwon, A., & Bogers, M. (2019, 2019/09/01/). Open innovation in SMEs: Exploring inter-organizational relationships in an ecosystem. *Technological Forecasting and Social Change*, 146, 573-587. <https://doi.org/10.1016/j.techfore.2018.04.021>
- Rauter, R., Globocnik, D., Perl-Vorbach, E., & Baumgartner, R. J. (2019, 2019/10/01/). Open innovation and its effects on economic and sustainability innovation performance. *Journal of Innovation & Knowledge*, 4(4), 226-233. <https://doi.org/10.1016/j.jik.2018.03.004>
- Rosa, A. C. M., Mello, C. h. P., Chimendes, V. C. G., & Amorim, G. F. (2020). Measuring open innovation practices in small companies at important Brazilian industrial centers. *Technological Forecasting and Social Change*, 151, 119805. <https://doi.org/10.1016/j.techfore.2019.119805>
- Rosenbusch, N., Brinckmann, J., & Bausch, A. (2011). Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs. *Journal of Business Venturing*, 26(4), 441-457. <https://doi.org/10.1016/j.jbusvent.2009.12.002>
- Rubio, A., & Aragón, A. (2009). SMES Competitive Behavior: Strategic Resources and Strategies. *Management Research: Journal of the Iberoamerican Academy of Management*, 7(3), 171-190. <https://doi.org/10.2753/JMR1536-5433070301>
- Sabando-Vera, D., Yonfa-Medrandá, M., Montalván-Burbano, N., Albors-Garrigos, J., & Parrales-Guerrero, K. (2022). Worldwide Research on Open Innovation in SMEs. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(1), 20. <https://doi.org/10.3390/joitmc8010020>
- Sağ, S., Sezen, B., & Güzel, M. (2016, 2016/11/24/). Factors That Motivate or Prevent Adoption of Open Innovation by SMEs in Developing Countries and Policy Suggestions. *Procedia - Social and Behavioral Sciences*, 235, 756-763. <https://doi.org/10.1016/j.sbspro.2016.11.077>
- Schumpeter, J. (1934). *The Theory of Economic Development* (Vol. 1). Springer. https://doi.org/10.1007/0-306-48082-4_3
- Schumpeter, J. A. (1943). *Capitalism, socialism and democracy*. routledge.
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach*. John Wiley & Sons.
- Sharma, S., Kumar, N., & Kaswan, K. S. (2021). Big data reliability: A critical review. *Journal of Intelligent & Fuzzy Systems*, 40, 5501-5516. <https://doi.org/10.3233/JIFS-202503>
- Sotirchos, E. S., Fitzgerald, K. C., & Crainiceanu, C. M. (2019). Reporting of R2 Statistics for Mixed-Effects Regression Models. *JAMA Neurology*, 76(4), 507-507. <https://doi.org/10.1001/jamaneurol.2018.4720>
- Stefan, I., & Bengtsson, L. (2017). Unravelling appropriability mechanisms and openness depth effects on firm performance across stages in the innovation process. *Technological*

- Forecasting and Social Change, 120, 252-260.
<https://doi.org/10.1016/j.techfore.2017.03.014>
- Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). Using multivariate statistics (Vol. 5): pearson Boston. MA.
- Taj, I., & Jhanjhi, N. Z. (2022). Towards Industrial Revolution 5.0 and Explainable Artificial Intelligence: Challenges and Opportunities. International Journal of Computing and Digital Systems, 12(1), 285-310. <https://doi.org/10.12785/ijcds/120124>
- Teece, D. J., Pisano, G., & Shuen, A. (1997, 1997/08/01). Dynamic capabilities and strategic management. Strategic management journal, 18(7), 509-533.
[https://doi.org/https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Tellis, G. J., Prabhu, J. C., & Chandy, R. K. (2009). Radical innovation across nations: The preeminence of corporate culture. Journal of Marketing, 73(1), 3-23.
<https://doi.org/10.1509/jmkg.73.1.3>
- Tenenhaus, M., Vinzi, V. E., Chatelin, Y. M., & Lauro, C. (2005). PLS path modeling. Computational Statistics and Data Analysis, 48(1), 159-205. <https://doi.org/10.1016/j.csda.2004.03.005>
- Thanawala, K. (1994, 1994/12/01). Schumpeter's Theory Of Economic Development and Development Economics. Review of Social Economy, 52(4), 353-363.
<https://doi.org/10.1080/758523329>
- Todericiu, R. (2021). Challenges for Romanian SMEs: A Study of the Romanian Central Region SMEs. Studies in Business and Economics, 16(3), 266-277. <https://doi.org/10.2478/sbe-2021-0059>
- UAE Government, U. a. (2025). The UAE's Future Roadmap 2025-2030. <https://u.ae/en/about-the-uae/uae-in-the-future/uae-future>
- Usman, M., Roijakkers, N., Vanhaverbeke, W., & Frattini, F. (2018). A Systematic Review of the Literature on Open Innovation in SMEs. In (pp. 3-35). WORLD SCIENTIFIC.
https://doi.org/10.1142/9789813230972_0001
- van de Vrande, V., de Jong, J. P. J., Vanhaverbeke, W., & de Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. Technovation, 29(6-7), 423-437. <https://doi.org/10.1016/j.technovation.2008.10.001>
- Wang, X., & Xu, M. (2018). Examining the linkage among open innovation, customer knowledge management and radical innovation. Baltic Journal of Management, 13(3), 368-389.
<https://doi.org/10.1108/BJM-04-2017-0108>
- Wang, X., Yusof, R. N., & Jaharuddin, N. S. (2025). Driving SMEs' Sustainable Competitive Advantage: The Role of Service Innovation, Intellectual Property Protection, Continuous Innovation Performance, and Open Innovation. Sustainability, 17(9), 4093.
- Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. MIS Quarterly: Management Information Systems, 33(1), 177-196.
<https://doi.org/10.2307/20650284>
- Wynarczyk, P. (2013). Open innovation in SMEs. Journal of Small Business and Enterprise Development, 20(2), 258-278. <https://doi.org/10.1108/14626001311326725>
- Yoon, B., Shin, J., & Lee, S. (2016). Open innovation projects in SMEs as an engine for sustainable growth. Sustainability (Switzerland), 8(2). <https://doi.org/10.3390/su8020146>
- Zain, M., Kassim, N. M., Khan, G. M., & Al Shukaili, A. M. (2019). A comparative assessment of firms' creative climate across selected Gulf countries (Oman, Qatar and Saudi Arabia). Journal for Global Business Advancement, 12(6), 839-859.
<https://doi.org/10.1504/JGBA.2019.107746>

- Zeng, S. X., Xie, X. M., & Tam, C. M. (2010, 2010/03/01/). Relationship between cooperation networks and innovation performance of SMEs. *Technovation*, 30(3), 181-194. <https://doi.org/10.1016/j.technovation.2009.08.003>
- Zhang, X., Chu, Z., Ren, L., & Xing, J. (2023, 2023/01/01/). Open innovation and sustainable competitive advantage: The role of organizational learning. *Technological Forecasting and Social Change*, 186, 122114. <https://doi.org/https://doi.org/10.1016/j.techfore.2022.122114>