



Unlocking the Future of Tourism in Kingdom of Saudi Arabia (KSA): The Synergy of Commercialization Activities and Sustainable Digital Transformation for Sustainable Industry Growth

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Abstract

In the recent decade, tourism has become a dominant global industry. However, sustainability in industry growth is one of the significant challenges in Kingdom of Saudi Arabia (KSA). This study proposed that the integration between the open innovation process and sustainable tourism digitalization can overcome the challenge of sustainable industry growth in the tourism industry. Therefore, this study examines the synergy of open innovation and sustainable digital transformation for sustainable industry growth. A survey questionnaire was prepared to collect data from the tourism industry employees. Three hundred questionnaires were analysed by using Structural Equation Modeling (SEM). It is observed that the synergy of open innovation and sustainable digital transformation is most critical to promoting sustainable industry growth. The combination of external knowledge and internal innovation leads to the development of new ideas for commercialization. Promoting commercialization can enhance sustainable tourism digitalization causes to promote sustainable growth. This study suggested that tourism industry management of KSA to introduce open innovation practices and digital tourism to enhance industry growth.

Introduction

The tourism sector is presently faced with an operational challenge, of having to bring in traditional growth models and new ecological imperatives into a period marked by rapid technological change (Pencarelli, 2020). Tourism, one of the biggest and fastest growing industries around the globe, plays a significant role in economy's growth as well enabling cultural exchange. However, the expansion of this phenomenon so often leads to negative environmental and sociocultural results (Mejjad, Rossi, & Pavel, 2022), especially in Kingdom of Saudi Arabia (KSA). What we have to get right is finding a tipping point in which the fostering of innovation and progress does not overshadow consequences (both direct & indirect) with this field. This delicate equilibrium is further complicated by the growing requirement of ecologically conscious and socially responsible performance driven by both customers and regulatory bodies (Carvalho & Alves, 2023). To be able to overcome this kind of complex issues, one has no other choice but to use inputs from external silos such as the most modern technology introduction globally around and new ways of doing business that keep happening. It fundamentally alters the internal processes by introducing a wealth of knowledge

leading to creative solutions development and helping establish viable digital transformation (Cuomo et al., 2021). While the significance of merging it with alien-like wisdom is catered to no stone unturned yet there still lies a gap in understanding how its embrace reconfigure momentum through the whole industrial pathway. In this respect, the study attempts to fill in a gap by exploring intricate linkages between external knowledge and internal innovation of Chinese firms through sustainable digitalization so as to create joint effects on commercialization industrial growth among industries (Moyle, Moyle, & Burgers, 2020). The aim of this study to measure the relationships between different variables, their interdependencies in tourism sector of KSA. This analysis provides profound insights to illuminate the path and guide the sector in creating a future that is one of viable integration between innovation, growth, and sustainability. It aims to ensure the tourism industry is sustainable in the long run and at same time achieve meaningful social outcomes.

It uses open innovation and sustainable digital transformation to contribute to addressing the complexity of problems faced in tourism industry (Kumar et al., 2024). Given the recognition that outside knowledge can be a wellspring for innovative practices and disruptive technologies, all players in this space

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need to make sure they are adopting and incorporating external information into their own systems will encourage innovation behavior (Gusakov, ul Haque, & Jokia, 2020). They operate from a mindset that is open to new ideas, where external knowledge can mix with the old guard and things are done differently as opposed to how they always have been. This approach, the industry can take advantage of these advances to produce new environmentally friendly products that meet market's needs (Dolnicar, 2020). More importantly, merging internal innovation with green digital transformation creates strategic blueprints for sharpening operational efficiencies and customer experiences while reducing environmental externalities. This sort of alignment has the potential to revolutionize tourism and allow a symbiotic relationship between companies that are prepared for environmental, carbon neutral practices in place to end waste while fostering deeper more responsible relationships with their traveler (Sun et al., 2021). However, the current state of literature does not comprehensively address how this solution is implemented. This study seeks to provide a comprehensive analysis of the mechanisms at play and their impacts on key outcomes (Liu & Tang, 2022). It is expected to support how open innovation and sustainable digital transformation reinforce each other for robust economic, environmentally, and socially sustainable growth (Streimikiene et al., 2021). Through the analysis and examination of intricate interconnections, the objective of this study is to provide valuable insights that enable stakeholders within the industry to effectively navigate the dynamic environment and embrace a future where innovation and sustainability are not conflicting objectives but, rather, mutually beneficial drivers of growth within the tourism sector. In the context of the rapidly changing tourism sector, a theoretical issue develops due to a limited comprehension of the interrelated functions of open innovation and sustainable digital transformation and their collective influence on the expansion of the sustainable industry (Cheng et al., 2023). Although prior research has examined each of these components in isolation, there is a shortage of literature investigating their combined impacts within the domain of the tourism industry. The present study aims to address a significant gap in existing literature (Gomez-Trujillo & Gonzalez-Perez, 2022). Although the importance of external knowledge, internal innovation, and sustainable digitization in shaping the industry's development is widely recognized, current research often lacks a comprehensive understanding of the interplay and mutual interaction among these factors (Thao, von Arx, & Frölicher, 2020). Moreover, there has been a lack of comprehensive investigation into the mediating functions performed by internal innovation and sustainable digital transformation in facilitating the linkage between external information and the processes of commercialization and industry expansion. By exploring these previously unexplored domains, this study enhances our comprehension of the fundamental principles that propel sustainable development in

the tourism industry (Sharpley, 2020). This study seeks to enhance the theoretical underpinnings and provide a comprehensive viewpoint that aligns with the intricate dynamics and requirements of the industry (Kuzior et al., 2021). It accomplishes this by bridging the theoretical divide and presenting a holistic framework incorporating open innovation, sustainable digital transformation, and growth outcomes.

This research thoroughly investigates the complex interconnections between external knowledge, internal innovation, sustainable tourism digitization, commercialization, and sustainable industry growth within the ever-changing context of the tourism sector (Traskevich & Fontanari, 2023). The main research objectives encompass two aspects. Firstly, to clarify the direct connections between external knowledge and internal innovation, external knowledge and commercialization, internal innovation and commercialization, and sustainable tourism digitization, and sustainable industry growth in KSA. Additionally, this research aims to investigate the intermediary functions of internal innovation and sustainable tourism digitization in influencing the indirect connections between external knowledge and commercialization and between commercialization and the expansion of the sustainable sector (Shang et al., 2023). Through a meticulous analysis of these intricate associations, the primary objective of this study is to offer a comprehensive comprehension of the intricate dynamics between open innovation and sustainable digital transformation. This endeavor seeks to illuminate their combined influence on the expansion of industries (Costa & Matias, 2020). This study aims to provide significant insights through empirical analysis. It promises to enhance both theoretical comprehension and innovative implications for policy makers, industrialists as well as researchers involved in directing the tourism sector towards a sustainable prosperous future.

This study has significant implications for the tourism industry and beyond. Academic study is of the highest standards and gives valuable insights into open innovation, sustainable digital transformation and trying to achieve the desired clip efficacy in industry. It helps identify ways in which international tourism can evolve without sacrificing its desire for global dominance and, at the same time, respect ecological principles or live up to social responsibilities (Entina et al., 2021). The study, therefore, essentially examines the interrelationships of external knowledge and internal innovation as critical factors for sustainable tourism digitization commercialization, based on industry growth. These complex interrelations are thus explored, and an overarching frame is presented to enable relevant stakeholders to understand how they must adapt in the face of shifting market dynamics while focusing on preserving environmental durability. Policy makers could use the findings to develop policies conducive to innovation, entrepreneurship and sustainable processes in the sector. Industry professionals and corporate executives must understand the effective use of external knowledge as part of an internal innovation from such

instructive experiences, commercialization in environmentally sympathetic consumer segments or digitalization innovations are needed. In addition, our study investigates the mediating roles of corporate innovation and sustainable digitalization to bring new light into how responsible growth can be achieved. This paper contributes to the theory of these interactions, and thus enhances academic discussion. It enables practitioners to take informed decisions in relation to tourism industry and future direction. The significance of the work stems from its potential to support an integrated innovation, technology and sustainability driven growth process in which a rebuilt tourism sector will be designed that responds not only to meeting current but also satisfying future generation needs in KSA.

Literature Review

Since its inception, the tourism industry has played an essential role in expanding the economy, disseminating

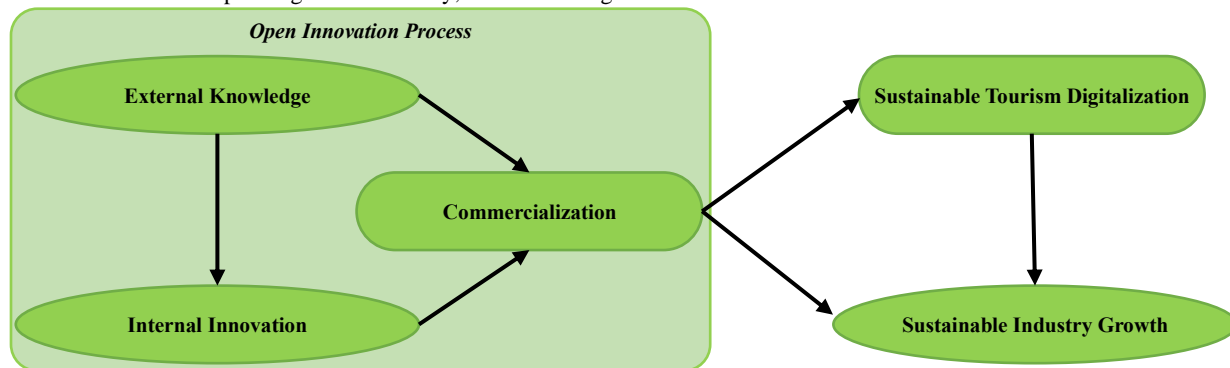


Figure 1: Research Model.

Theoretical Foundation and Framework Development

The essence of this research is found in the solid theoretical fielding between open innovation to sustainable digital transformation domains, which has serious ramifications on tourism industry. The nature of open innovation is characterized by its collaborative, and knowledge-sharing basis whilst providing us with a framework that allows one to understand how external inflow influences internal process of innovations (Romero & Tejada, 2020). Knowledge of this theoretical foundation is key to understanding the sustainability effects that innovation dynamics driven by exogenous discoveries can have on industry growth (Nguyen, Natoli, & Divisekera, 2021). Moreover, sustainable digital transformation is doing intentionally implementing cutting-edge technology to enhance operational processes, upgrade user experiences and reduce negative environmental consequences as well (Hakimi et al., 2024). A conceptual framework combining these constructs that highlights the importance of innovation and digitalization for achieving sustainable economic growth is established. Under this umbrella of theory, external knowledge and internal innovation are discursively linked to sustainable tourism digitalization in ways that might propel or shape the trajectory of growth within an industry. These theoretical strands, woven together like so

culture, and establishing global connections. Nevertheless, because of the rapid pace at which technology is advancing and the growing number of concerns regarding the long-term viability of the environment, the sector is confronted with the crucial task of striking a balance between innovation and growth and responsible and sustainable practices. This study takes a cross-sectional approach to investigate the dynamic interplay between open innovation and sustainable digital transformation and how these factors encourage sustainable growth within the tourism industry. This research adds to a deeper understanding of various aspects of tourism, such as external knowledge, internal innovation, sustainable tourism digitization, commercialization, and sustainable industry growth, combine to form the future of the tourism industry by examining the relationships between these aspects, as shown in Figure 1.

much conjectural spider web and form the basis for hypotheses that inform us about how they relate to one other, in direct ways (mediation effects) or indirect pathways (Gordon, Wadim, & Elena, 2021). This section critically examines the existing nascent literature, weaving these concepts together to provide an organizing framework that will guide the following exploration of their intersection in tourism.

Sustainable Industry Growth

This paper deals with the idea of sustainable development industrial growth as a major concept, which entails multifaceted changes in tourism sector beyond traditional economic sense. The idea integrates many intricate parts such as environmental stewardship, the protection of socio-cultural values and encourages moral economic development (Cavalheiro, Joia, & Cavalheiro, 2020). At the population level, sustainable development goes beyond numbers to include economic growth harmonized with reduced ecological footprints as well as better community resilience. This section provides a critical analysis of the existing research based on challenges, opportunities and strategies for sustainable growth within the growing transitory landscape emerging from an ever-changing and diversified tourist industry (Iannucci, Martellozzo, & Randelli, 2022). This part dissects the myriad

form of sustainable development from a macro and micro (local) perspective which establishes hypotheses linking independent variables frontier input knowledge, internal innovation benefiting small tourism companies, margins through scale economies via digitalization of sustainable tourism with more global target (Talwar et al., 2023). The current investigation provides a comprehensive understanding about the varied nature of sustainable industry growth and different pathways to develop a more responsible, holistic approach towards tourism sector development.

Hypotheses Development

External Knowledge

Indeed, there is strong empirical evidence of the importance and presence of this kind external knowledge internal innovation correlation in other industries that produce tourist products (Hameed, Nisar, & Wu, 2021). Madanaguli et al. (2022) conducted research and found that tourism enterprises involved with a particular geographic area actively seek out external knowledge such as industry trends, best practices. Thereby, facilitating potential enhancement of their specific offerings through innovation solutions (Giotis & Papadionysiou, 2022). In a similar note, Ogutu et al. (2023) work also suggest that collaborating to syndicate with topical networks and industries is crucial for scholarly activity. In this way, these forms of collaborative behaviour enrich the tapping into external knowledge which strengthens innovation in tourism and provides assistances to operations improvements. Similarly, research conducted by Wu (2020) finds a strong link between the degree of exposure to international markets and whether or not firms have used more innovative methods in tourism.

Findings from the Romero and Tejada (2020) show that organisations with a culture of innovation tend to develop their own internal network approaches and collaborating mechanisms as well. This, in turn, facilitates the cultivation of creative problem-solving abilities and adaptive responses to evolving consumer demands. The research conducted in the tourist industry emphasizes the empirical correlation between acquiring external information and developing internal innovative skills (Nguyen et al., 2021). Hence, external knowledge promotes tourism organisations with new perspectives, modern technologies, and industry trends. Consequently, this facilitates the development of innovative thinking and practices within their operations.

Hypothesis 1: *External knowledge has positive impacts on internal innovation.*

A significant body of empirical research supports the complex relationship between external information and the commercialization process in the tourism business. A landmark study by Shah, Trupp and Stephenson (2022), depicts the strategic use of external knowledge streams by tourism. Furthermore, those knowledge streams form the basis of some very valuable market insights and trends, positioning these

entities in an advantageous commercial position moving forwards (Fauzi, 2022). In a similar vein, the research of Alford and Jones (2020) sets attention to importance external collaborations with partners increase knowledge integration and hence facilitate innovative business models in destination tourism. Arcese et al. (2021) discussed the utilization of a global marketplace presence to support the increase in commercialization activities by tourism businesses. The study Loehr and Becken (2021) suggests that organisations which successfully make use of the external knowledge networks are more likely to align their products/services according to market preferences.

This alignment contributes to improved business performances in their respective fields. This empirical evidence together suggests that obtaining information from others relates to better commercialization in tourism (Sajib, 2022). Hence, external knowledge significantly enhances market insight, develops trends and new viewpoints of tourism institutions, and bolsters their commercialization efforts (Pramanti, 2020). Therefore, this study has the potential to provide valuable insights for strategic initiatives aimed at guiding the tourism sector onto a path of successful and meaningful development based on a well-informed strategy for business expansion.

Hypothesis 2: *External knowledge has positive impacts on commercialization.*

Internal Innovation

Numerous empirical studies have consistently shown the mutually beneficial connection between internal innovation and the commercialization process within the tourism sector. Prominent research, such as the studies conducted by Lopes et al. (2021), in similar geographical areas, reveals that tourism organisations that cultivate intense internal innovation climates possess enhanced capacities to develop new business strategies. Simultaneously, a study conducted by Gusakov et al. (2020) elucidates the significant impact of internal innovation on developing unique products and services, fostering economic prosperity within the tourism industry. The research conducted by Fraj, Matute and Melero (2015) highlights the correlation between internal innovation cultures and the enhancement of commercialization efforts within tourism businesses.

The research conducted by Giotis and Papadionysiou (2022) emphasizes the importance of organisations developing an internal culture of innovation. This culture enables them to customize their products and services according to market preferences, improving commercial performance within their operational domains. This empirical study provides evidence of a strong relationship between a company's internal ability to innovate and its success in commercializing innovations within the tourism industry (Gusakov et al., 2020). Internal innovation is a dynamic catalyst, giving tourism businesses the imaginative drive to enhance and optimize their offers for increased commercial success. Therefore, it is positioned to provide valuable insights into strategic initiatives, guiding the

tourist sector towards robust and purposeful development supported by innovative-driven business expansion.

Hypothesis 3: *Internal innovation has positive impacts on commercialization.*

Commercialization

Most of the empirical research shed light on the crucial correlation between commercialization and the digitalization of sustainable tourism situated within the context of the tourist industry. The exemplary study, as demonstrated by Zhao et al. (2023), done in comparable regions, highlights the correlation between increased commercialization efforts in the tourism sector and a greater emphasis on adopting sustainable digital technologies. Similarly, the study conducted by Syefriani et al. (2024) provides insight into the relationship between effective commercialization tactics and the integration of sustainable digital practices, resulting in improved operational efficiencies within the tourism industry. The research conducted by Zhang, Yin and Peng (2021) emphasizes the positive impact of commercialization on the promotion of investments in sustainable digitization efforts, hence enhancing the ecological resilience of the industry.

Tiago et al. (2021) emphasize that organisations that effectively direct their commercial endeavours towards digital solutions incorporating sustainability measures are more likely to improve their competitive advantage. This empirical analysis highlights the correlation between the intensity of commercialization efforts and the advancement of sustainable digital transformation in the tourism industry. The implementation of solid commercialization strategies serves as a driving force, encouraging the integration of sustainable digital practices that enhance operational effectiveness and environmental responsibility inside tourism facilities (Loureiro & Nascimento, 2021). Therefore, commercialization effectively leads to strategic attempts, directing the tourism sector towards responsible and technology-oriented expansion, emphasized by incorporating sustainability and digitization.

Hypothesis 4: *Commercialization has positive impacts on sustainable tourism digitalization.*

The empirical evidence that is now available supports the idea that there is a significant relationship between commercialization and the achievement of sustainable industry growth in the tourism sector. Prominent research, such as the studies conducted by Bortolotto (2021) in comparable areas, emphasize that increased commercialization efforts in tourism stimulate sustainable development and integrate ecological and socio-economic aspects. Concurrently, the study conducted by Izquierdo-Gascón and Rubio-Gil (2023) emphasizes the correlation between strategic commercialization and sustainability paradigms, resulting in industry growth trajectories that are in line with social well-being. The research conducted by Sharma (2021) provides valuable insights into the correlation between successful commercialization tactics and

the development of sustainable growth trajectories in the tourist industry. These studies emphasize balancing ecological and economic advancements to foster long-term progress.

In similar circumstances, Iannucci et al. (2022) emphasize consistently stimulating resilient growth in the tourism industry by integrating commercialization and sustainable principles. This collection of empirical evidence highlights the inherent connection between the dynamics of commercialization and the endeavours to achieve sustainable growth in industries. Hence, the integration of commercialization and sustainable practices serves as a driving force that guides the tourism industry towards a path of prudent and comprehensive development. Therefore, it is positioned to provide valuable insights into strategic endeavours, leading the industry towards a coordinated and substantial expansion trajectory that integrates business endeavours and sustainable principles.

Hypothesis 5: *Commercialization has positive impacts on sustainable industry growth.*

Sustainable Tourism Digitalization

Numerous empirical studies have consistently demonstrated the complex relationship between the digitalization of sustainable tourism and the achievement of sustainable industry growth in tourism. Prominent research, such as the investigations by Go and Kang (2023) in similar areas, elucidate how the deliberate integration of sustainable digital practices establishes the foundation for sustained expansion within the industry. Similarly, the study conducted by Cuomo et al. (2021) emphasizes the positive impact of sustainable digitalization on the business's growth potential. This digital technology integration enhances operational efficiencies and promotes ecological harmony within the tourism sector. The studies conducted by Cheng et al. (2023) explore the synergistic relationship between successful sustainable digitization techniques and developing growth trajectories that align with sustainability principles within the tourism industry. Simultaneously, Cuomo et al. (2021), emphasize the significance of organisations that can effectively utilise sustainable digital strategies, as they consistently contribute to the advancement of the industry while maintaining ecological balance. The empirical analysis presented highlights the strong correlation between the implementation of digitalization in sustainable tourism and the tangible manifestation of sustainable industry expansion.

Embedded within this empirical account, bolstered by a theoretical framework emphasizing the significance of sustainable digitalization in influencing economic development. Integrating digitalization in sustainable tourism is pivotal in facilitating the industry's progress towards long-lasting and balanced expansion, wherein technical innovations delicately interact with environmental considerations. Therefore, integrating sustainable tourism with digitization has the potential to drive strategic goals, leading the industry towards a path of comprehensive and long-lasting

development. The harmonious combination of digitalization efforts with the pursuit of sustainability characterizes this trajectory.

Hypothesis 6: *Sustainable tourism digitalization has positive impacts on sustainable industry growth.*

Indirect Relationship

A body of empirical research highlights the significant role played by internal innovation in mediating the relationship between external knowledge and commercialization within the tourism industry. Prominent research endeavours, such as the investigations undertaken by [Bortolotto \(2021\)](#), shed light on the role of external information as a catalyst in driving internal innovation processes, hence facilitating the development of novel commercial strategies. Similarly, the study conducted by [Talwar et al. \(2023\)](#) emphasizes the significance of establishing collaborations with external organisations to facilitate the acquisition of new knowledge. This, in turn, promotes internal innovation practices, ultimately enhancing the potential for commercialization within the tourism industry. The scholarly works by [Tiago et al. \(2021\)](#) extensively explore the complex relationship between exposure to external knowledge, the internal dynamics of innovation, and the subsequent enhancement of commercialization endeavours. [Bortolotto \(2021\)](#), underscore the significance of organisations that can effectively manage external knowledge networks, as they can foster a culture of internal solid innovation. This enables them to connect external knowledge with successful commercialization effectively. This empirical review supports the idea that internal innovation plays a crucial role in moderating the relationship between external knowledge and commercialization in tourism.

The empirical evidence highlights the role of internal innovation as a crucial intermediate that facilitates translating external information into practical methods for commercialization ([Syefriani et al., 2024](#)). This is a pivotal moment in enhancing our understanding of the complex dynamics governing the interplay of external knowledge, internal innovation, and commercialization in tourism ([Bortolotto, 2021](#)). Hence, internal innovation is positioned to effectively drive strategic initiatives, leading the industry towards improved knowledge transfer and new tactics that foster commercial success in the tourism sector.

Hypothesis 7: *Internal innovation mediates the relationship between external knowledge and commercialization.*

Several practical researches have decided the relevance of digital sustainable tourism in bridging among commercialization and sustainability business growth within the tourism industry. Studies by [Tiago et al. \(2021\)](#) within cases however with respect to successful commercialization strategies vis-à-vis sustainable digitalization. These studies provide insights into how such strategies may interact and potentiate one another, thereby moving fisheries along growth

trajectories that are consistent with ecological- and socio-economic-prosperity. In the same vein, [Zhang et al. \(2021\)](#) witness that a union of strategic commercialization with sustainable digital practices could improve operational efficiencies in addition to environmental sustainability within tourism. According to [Zhao et al. \(2023\)](#), pursuing growth that integrates environmental stewardship and economic success — the dual play of effective commercialization with sustainable digitalization alliance. [Tiago et al. \(2021\)](#) emphasize the importance of organisations that effectively utilise sustainable digital strategies in facilitating a connection between the vitality of commerce and the sustainable growth of industries, thereby establishing a mutually beneficial relationship.

The presented empirical data supports the idea that digitizing sustainable tourism is crucial in connecting commercialization and achieving sustainable growth in the tourism industry ([Zhang et al., 2021](#)). Sustainable tourism digitization is a transformative mediator that aligns commercialization efforts with sustainable growth paths, encompassing ecological stewardship. Therefore, the digitalization of sustainable tourism is positioned to guide strategic priorities, outlining a route towards more efficient commercialization approaches that align with sustainable principles ([Tiago et al., 2021](#)). This, in turn, steers the tourism sector towards a trajectory of responsible and long-lasting expansion.

Hypothesis 8: *Sustainable tourism digitalization mediates the relationship between commercialization and sustainable industry growth.*

Research Methodology

The data for this research is collected on the Likert scale questionnaire. Indeed, the perception of the respondents is collected for it, therefore, this study has used primary data for the findings. The constructs of this research are operationalized according to the context of the study. External knowledge is operationalized to determine the role of external knowledge to the employees for the advancement of their internal innovation and commercialization. The scale items based on these operationalization was taken by the study ([Zhang et al., 2021](#)). Moreover, internal innovation is operationalized to determine the impact of internal innovation of the commercialization of the of the organization. The scale items based on these operationalization was taken by the study ([Zhao et al., 2023](#)). Accordingly, the construct commercialization is operationalized to measure the impact of commercialization on sustainable tourism digitalization and sustainable industry growth. The scale items based on these operationalization was taken by the study ([Talwar et al., 2023](#)). The construct sustainable tourism digitalization is operationalized to determine the way sustainable tourism digitalization is a significant factor for the advancement of sustainable industry growth. The scale items based on these operationalization was taken by the study [Sharma \(2021\)](#). Finally, the construct

sustainable industry growth is operationalized as to determine the role of sustainable industry growth in relationship with firm performance and working for tourism sustainability. The scale items based on these operationalization was taken by the study (Jones, Hillier, & Comfort, 2014).

Furthermore, the data for this research is collected tourism industry employees in KSA. These employees represented the private sector tourism. The respondents of this research were physically contacted. The nature of data collection is cross-sectional because cross-sectional data is appropriate for the findings of this research. In accordance, the population of this study was known, therefore, the researchers faced no issues in the collection of data. The survey-based method of data collection is used as it is appropriate for the known population. Moreover, the respondents were informed about the purpose of the study. The random sampling approach is used to collect the data, as it is suitable to use when the population of study is known. 450 questionnaires were printed and physically distributed to the respondents to collect the data. These respondents were asked to fill in the questionnaire properly to study valid results. However, only 319 responses were collected from the respondents.

In the preliminary analysis, 19 responses were eliminated due to biased response. The data set based on 300 respondents is considered for the final analysis of this research. The findings of this study are taken with AMOS 24. This statistical tool is reliable for the findings of exploratory factor analysis, validity analysis, discriminant validity, confirmatory factor analysis model and standardized path coefficients.

Data Analysis

The respondents of this research were the employees of tourism sector in KSA. Out of 300 respondents, 221 were male and 79

were female. Furthermore, the education level of 197 respondents were bachelors, 99 were master’s in education and 04 were doctorate in education. Furthermore, 256 employees have experience between 1-3 years, 24 employees experience between 4-6 years, and 20 employees have experience between 6-10 years. The demographic information of respondents is reported in Table 1.

Table 1: Demographic Profile.

Category	Sub-Category	Respondents
Gender	Male	221
	Female	79
Education	Bachelors	197
	Masters	99
	Doctorate	4
Years of Experience	1-3 Years	256
	4-6 years	24
	6-10 Years	20

The results of confirmatory factor analysis are taken by inserting and analysis data with AMOS. The data is analyzed, and the findings of confirmatory factor analysis are used to check the reliability of research instruments. Since, this study is based on the data taken by Likert scale questionnaire, the validity of research items is checked with the finding of factor loadings. According to Sürücü and Maslakci (2020), the findings of factor loadings more than 0.60 are considered appropriate for significant results of confirmatory factor analysis. Furthermore, the internal consistency between the scale items for any construct is checked with the findings of Cronbach alpha. The threshold for Cronbach alpha > 0.70 is achieved by the findings of this research (Zakariya, 2022). Therefore, the results of this research have internal consistency. The results of this study reported in Table 2 and Figure 2 confirmed that the confirmatory factor analysis is significantly achieved.

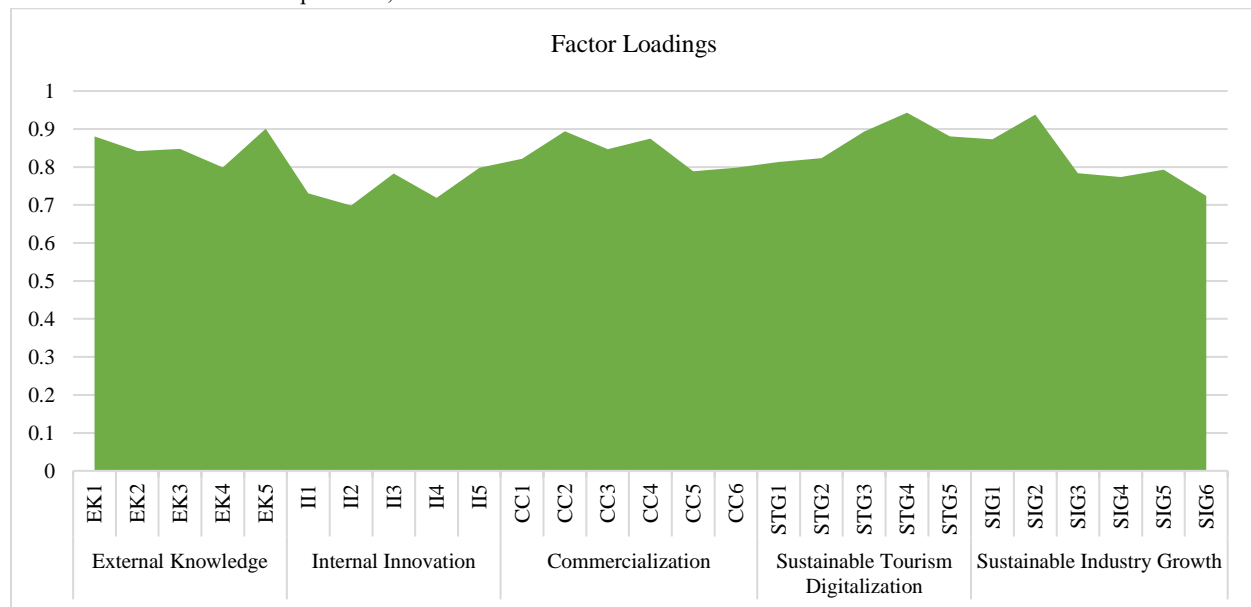


Figure 2: Factor Loading.

Table 2: Exploratory Factor Analysis.

Variables	No	Cronbach Alpha	Factor Loadings
External Knowledge	EK1	0.833	0.881
	EK2		0.842
	EK3		0.848
	EK4		0.799
	EK5		0.901
Internal Innovation	II1	0.799	0.731
	II2		0.699
	II3		0.783
	II4		0.719
	II5		0.798
Commercialization	CC1	0.938	0.822
	CC2		0.894
	CC3		0.847
	CC4		0.875
	CC5		0.789
	CC6		0.798
Sustainable Tourism Digitalization	STG1	0.913	0.813
	STG2		0.823
	STG3		0.893
	STG4		0.943
	STG5		0.881
Sustainable Industry Growth	SIG1	0.839	0.873
	SIG2		0.938
	SIG3		0.784
	SIG4		0.774
	SIG5		0.793
	SIG6		0.724

Furthermore, [Anis et al. \(2020\)](#) proposed discriminant validity as reliable for checking the distinction between the study variables. Furthermore, the AVE for study constructs must be higher than the squared correlation between the construct and any of the other constructs. The results of this study demonstrate that there is clear discriminant validity in the study’s constructs ([Table 3](#)). Furthermore, convergent validity determines the extent to which factors that ought to measure a

single construct agree with each other. Also, convergent validity was measured by employing composite reliability (CR) and average variance explained (AVE). Using these measures, CR should be above 0.6 and AVE should be above 0.5 for all constructs [Cheung et al. \(2024\)](#). Moreover, these values recommend that there is clear discriminant validity in the study. The results are reported in [Table 4](#).

Table 3: Validity Analysis.

Variable	CR	AVE	MSV	MaxR(H)	External Knowledge	Internal Innovation	Commercialization	Sustainable Tourism Digitalization	Sustainable Industry Growth
External Knowledge	0.911	0.674	0.913	0.876	0.733				
Internal Innovation	0.801	0.694	0.932	0.894	0.712***	0.724			
Commercialization	0.799	0.743	0.977	0.822	0.918***	0.824***	0.717		
Sustainable Tourism Digitalization	0.823	0.629	0.967	0.815	0.857***	0.913***	0.811***	0.712	
Sustainable Industry Growth	0.789	0.612	0.899	0.871	0.567***	0.574***	0.623***	0.619***	0.709

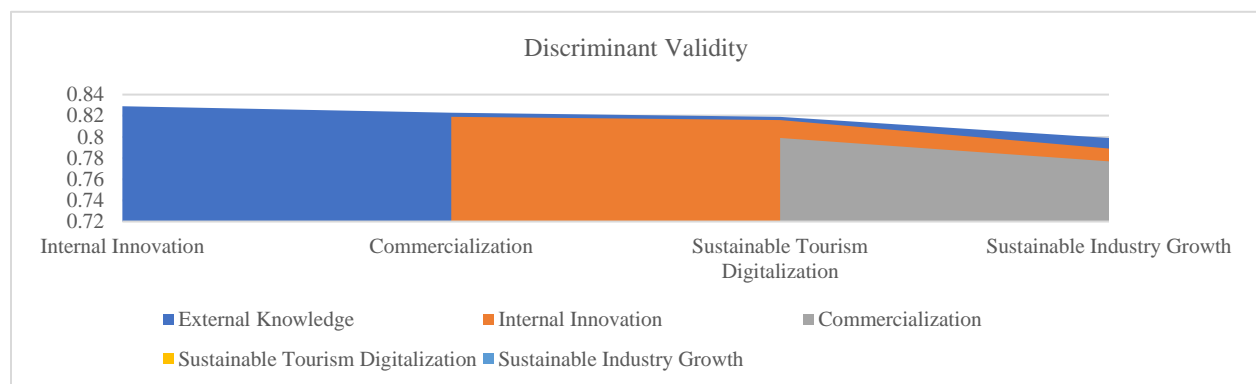


Figure 3: Discriminant Validity.

The discriminant validity of the data is also tested with the findings of AMOS. The results of AMOS are used to test the

discriminant validity of the data. The discriminant validity is tested with Heteritrait-Monotrait (HTMT) method. The discriminant validity is checked to determine the multicollinearity issues among the research data. The findings

of HTMT less than 0.90 are acceptable for significant discriminant validity (Cheung et al., 2024). The data reported in Figure 3 and Table 5 demonstrate that the discriminant validity is significantly achieved.

Table 4: Discriminant Validity.

Variable	External Knowledge	Internal Innovation	Commercialization	Sustainable Tourism Digitalization	Sustainable Industry Growth
External Knowledge					
Internal Innovation	0.829				
Commercialization	0.823	0.819			
Sustainable Tourism Digitalization	0.819	0.816	0.799		
Sustainable Industry Growth	0.799	0.789	0.777	0.767	

Accordingly, measurement model fit was determined by root to mean square of approximation (RMSEA), absolute fit measures including observed normed, Standardized Root Mean Square Residual, Comparative Fit Index, Normed Fit Index, Goodness

of fit, and Adjusted Goodness of fit. All the fit indices met the recommended thresholds for evaluating model fit. The results are shown in Table 5.

Table 5: Confirmatory Factor Analysis Model.

Measure	Recommended Threshold	Abbr.	Scores
Chi-square/df (CMIN/DF)	<3.0	2/df	2.71
Comparative Fit Index	>.90	CFI	0.99
The Normed Fit Index	>.90	NFI	0.93
Goodness of fit	>.90	GFI	0.91
Adjusted Goodness of fit	>.80	AGFI	0.88
Root Mean Square Residual	<.08	RMR	0.06
Standardized Root Mean Square Residual	<.08	SRMR	0.07
Root Mean-Square Error of Approximation	<0.08	RMSEA	0.07

The findings of standardized path coefficients are determined to test the relationship developed by hypotheses of this research. These relationships are highlighted in Figure 4 and Table 6. The findings of $t > 1.96$ and $p < 0.000$ are considered for acceptable or rejection of hypothesis (Amora, 2021). According to the findings of hypothesis 1, external knowledge has positive impacts on internal innovation. Furthermore, hypothesis 2 findings reported that external knowledge has positive impacts on commercialization. Accordingly, hypothesis 3 confirmed that internal innovation has positive impacts on commercialization. Meanwhile, hypothesis 4

asserted that commercialization has positive impacts on sustainable tourism digitalization. In accordance, hypothesis 5 established that commercialization has positive impacts on sustainable industry growth. Moreover, hypothesis 6 confirmed that sustainable tourism digitalization has positive impacts on sustainable industry growth. Likewise, hypothesis 7 demonstrated that internal innovation mediates the relationship between external knowledge and commercialization. Finally, hypothesis 8 pointed out that sustainable tourism digitalization mediates the relationship between commercialization and sustainable industry growth.

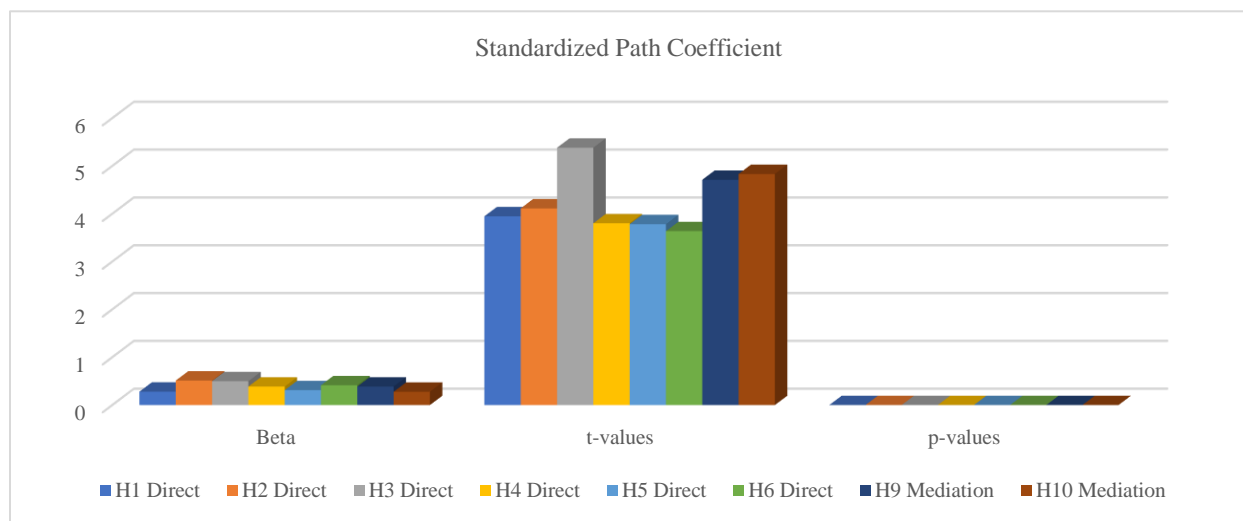


Figure 4: Standardized Path Coefficient.

Table 6: Standardized Path Coefficient.

No	Relationship	Beta	t-values	p-values	Remarks
H1	Direct	0.281	3.948	0.000	Accepted
H2	Direct	0.513	4.113	0.000	Accepted
H3	Direct	0.499	5.382	0.000	Accepted
H4	Direct	0.387	3.802	0.000	Accepted
H5	Direct	0.312	3.783	0.000	Accepted
H6	Direct	0.415	3.637	0.000	Accepted
H7	Mediation	0.387	4.711	0.000	Accepted
H8	Mediation	0.278	4.832	0.000	Accepted

Discussion

In this context, the empirical evidence provides support for a relatively high potential impact of external information on internal innovation in tourism business. [Arcese et al. \(2021\)](#) provides insights into how incorporating this external knowledge stimulate the innovative ideas and thus in turn encourage unique tech solutions within tourism organisations. These studies highlighted the historical importance of external knowledge in stimulating internal innovations ([Costa & Matias, 2020](#)). As a result, our research assists the well-documented literature that external knowledge is indeed an important prerequisite and driver of internal innovation processes in tourism. Recent studies have emphasized the crucial role played by external knowledge in underpinning tourism commercialization strategies through evidence from empirical work. [Mejjad et al. \(2022\)](#) informed that improved access to external perspectives may catalyze idea generation and facilitate commercialization pathways. At the same time, [Nguyen et al. \(2021\)](#) underlines that this injection of external information is the spark for market orientation and practical tourism product development. These historical efforts mirror our current findings, confirming that external information has been useful in spurring marketing action to go against the status quo for success within tourism.

Prior empirical studies have also suggested the critical role that internal innovation plays in fostering successful marketing efforts within tourism. [Pencarelli \(2020\)](#) reasons that such organisational capabilities will increase the likelihood of launching successful, unique products or services to the market. In addition, research executed by [Madanaguli et al. \(2022\)](#) demonstrated the importance of internal innovation in creating products with unique value propositions, and bolstering commercialization efforts. The historical insights offered correspond with our present research results, which emphasize the importance of internal innovation in effective methods for commercialization within the tourism industry. This section presents a variety of empirical studies that have shown the relation between commercialization attempts and sustainable tourism digitalization in industry. Research done by [Sharma \(2021\)](#) provided at improved definition of the influence level possible with strategic commercialization activities, concerning inducing sustainable digital practices. [Talwar et al. \(2023\)](#) demonstrates that commercialization strategies are crucial to assist digital technology integration leading towards sustainable operational efficiency in tourism industry which

confirmed similar findings of ([Sharma, 2021](#)). Our current research reveals how commercialization enabled the tourism industry to accept green digital practices, through historical studies conducted.

Past empirical studies have found commercialization has a major positive effect on stimulating sustainable development in tourism ([Tiago et al., 2021](#)). The noticeable consequences of securing commercialization strategies incur broader developmental pathway among tourism firms. In addition, [Traskevich and Fontanari \(2023\)](#) conducted several academic investigations along this context as well. It builds on the substantial rate of increase that strategic efforts have contributed to in terms of market share and expansion, consequently escalating tourism industry growth. The findings are in line with our research that suggests commercialization has had a positive effect on the tourism industry in terms of sustainable growth. A series of empirical works have recomposing shown a positive association between sustainable tourism digitalization and the industry increasing sustainability over time. First, the work of [Wu \(2020\)](#) revealed how well sustainable digital practices can help underpin the foundation for sustained industry growth over time. [Zhang et al. \(2021\)](#) outlined those sustainable methods of digitization, through operational efficiency and ecological health can be the determining factors for long-term viability. This interface could be critical to direct tourism development in a responsible and sustainable way.

The historical empirical findings shows that internal innovative processes are vital in the way of moderation impact external knowledge on successful commercialization. This matter occur also within the tourism industry. The study performed by [Wu \(2020\)](#) who stressed the significance of internal innovation to work as an enabler for turning external knowledge into innovative marketable strategies. Like the academic inquiries by authors has shed light on the importance of internal innovation in enabling external discoveries to be further developed and exploited, thus increasing commercialization opportunities. Notably the history of first things mentioned corresponds with our study confirming that internal innovation is also involved in linking external information into commercializing tourism practices. The extant corpus of empirical research underlines digitization as a vital intermediary in linking between the commercialization and growth of sustainable industry in tourism. This is in accordance with the study by [Zhao et al. \(2023\)](#) given us an insight on how strategic marketing combined with sustainable digital practices can lead to exponential growth in this domain. In addition, the empirical studies of [Gomez-Trujillo and Gonzalez-Perez \(2022\)](#) stress the crucial role of sustainable digitalization in driving commercialization strategies» and for accelerating transition to sustainable industry. These historical quests discussed in this analysis prove a similar element to our continuous research which bolsters the argument that sustainable tourism digitization serves as an intermediary and

is capable of catalyzing commercialized efforts are required both for sustainability growth by industry longer term developed on responsible basis.

Conclusion

This study has the following unique features: external knowledge, internal innovation; commercialization; sustainable tourism digitization and industry-led growth of sustainability business. Empirical research is providing evidence for the positive correlations between these variables, revealing more of a complex relationship that feeds into shaping how industries evolve. The outcomes indicate a noteworthy impact of external knowledge on the internal sources for innovation, hence increasing commercialization success chances in KSA. Additionally, the proposed internal innovation mediates external information acquisition and commercialization outcomes. When talking about the digital transformation of sustainable tourism practices, it is important to understand that without closer blockchain collaboration in common standardization practice scales between commercialization and sustainability industrial expansion can hardly be achieved.

The study sheds more light than theoretical investigations to which practitioners and policy makers might adhere. This highlights the need to leverage external knowledge and an internal culture of innovation in achieving successful commercialization. As well as highlighting how, sustainable digital strategies can benefit in driving economic growth, it also underlines the importance of this for subsequent business expansion. Overall, work is a valuable addition to an emerging literature focusing on how liberty may evolve in one part of a nation and the broader trajectory for tourism. We present a systems perspective on these relationships in an effort to inform industry stakeholders about mechanisms through which economic objectives align with sustainable management. The study illuminates where the rapidly growing and shifting tourist industry is headed, with expansion but stable growth; new business models to lower market friction; sustainability.

Implications of the Study

Theoretical Implications/Implications for Academicians

The testing of intricate relationships involving external knowledge, internal innovation, commercialization, sustainable tourism digitization and sustainable industry growth in the case of touristic organizations widens also theoretical limits because empirical validation is added to these businesses with findings at this research. It extends in the literature on innovation management and sustainable development theoretical frameworks by providing a clearer picture of mediating roles which have been suggested to hold between internal (innovation) environmental uncertainty, commissioning through informal entrepreneurial attitudes.

Practical Implications/Implications for Policymakers

The study's empirical findings have significant practical

implications for professionals in business and policymakers in KSA. The found relationships highlight the significance of fostering an innovative culture by incorporating external knowledge, ultimately driving successful tactics for commercialization. Furthermore, the research highlights the significance of using sustainable digital strategies to achieve profitable commercialization and sustainable expansion within the business. The results of this study provide stakeholders with the necessary information to make well-informed decisions that align with the business's financial goals and long-term sustainability objectives. This guidance will help steer the tourism industry towards responsible and sustainable growth that will last overtime.

Limitations and Future Directions

Useful as the study is, it also has a couple of important limitations to keep in mind. The research is mainly based on a local region, which will raise questions about the generalizability of its findings. The external validity of these findings would be enhanced if future studies included different geographical contexts. And cross-sectional design limits the ability to demonstrate causality as it detects only associations at one specific point in time. Longitudinal investigation techniques offer a possibility to obtain a wider understanding of temporal dynamics, which offers many opportunities for research. Furthermore, it is important to highlight the fact that a major source of information in this research comes from self-reported data prior by employed individuals within tourism which may also be subject to bias. Finally, it could be beneficial for future investigations to use mixed-method methodologies which would allow the study to include data from diverse sources and make a more robust analysis.

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CRedit Authorship Contribution Statement

Aljazi Misfer Alhajri: conceptualization, data curation, formal analysis, investigation, methodology. Tarfah Sami Abdullah Al-suwaigh: project administration, resources, software, supervision, validation, visualization, writing original draft, writing review & editing.

Declaration of Competing Interest

Authors confirm no relevant financial or non-financial conflicts of interest

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Ethical Statement

Ethical standards were upheld, and approval was not required since no biological or tissue samples were used.

Data Availability Statement

The datasets are available from the corresponding author upon request.

Artificial Intelligence/ Language Module Statement

The authors take full responsibility for this work, which was completed without AI or LLM assistance.

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