

The Mediating Role of Organization Agility between Business Intelligence & Innovative Performance

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Abstract: Organizational agility and innovative performance are among the most critical issues within an organization. However, only limited research has been dedicated to exploring the relationship between innovative performance and organizational agility. Drawing from the resource-based view and motivation theory, this article delves into the mediating role of organizational agility in the connection between business intelligence and innovative performance. The study employs structural equation modeling using survey data gathered from Jordanian communication companies. As posited by the proposed theories, there exists a positive relationship between business intelligence and innovative performance, with organizational agility serving as a mediating factor. The article also discusses the implications of these findings.

Keywords: *Organization Agility, Business Intelligence, Innovative Performance, Jordanian Communication Companies.*

1 Introduction

In the era of globalization, profound technological advancements spanning systems, software, and applications have taken center stage. Companies operating in global markets confront challenges on both local and global fronts (Parida et al., 2015). Amidst this landscape, businesses are devoted to sustaining profitability and global competitiveness, all while navigating an intricate web of external and internal pressures. Externally, they navigate the dynamic terrain of escalating local and global competition, as well as rapid technological progress. Internally, organizations are tasked with optimizing efficiency, containing costs, and elevating customer service, all while preserving their competitive edge (Zheng et al., 2023). Cultivating competitiveness across realms such as quality, pricing, agility, customer responsiveness, and innovation is paramount for safeguarding sustained advantages (Yusuf et al., 2022). The strategic adoption of attributes like cost efficiency, effective management, and flexibility distinctly sets companies apart within the market (Nagle and Müller, 2017).

Simultaneously, the surge in data accumulation, coupled with technological evolution, particularly in the domain of cloud-based solutions, is reshaping operational, administrative, and functional spheres within modern organizations (Bibri, 2019). Cloud solutions, leveraging remote storage and accessible devices, streamline operations, heighten efficiency, and make substantial contributions to the attainment of organizational goals (Attaran and Woods, 2019). Business Intelligence (BI) signifies the evolution of information management and utilization within corporations. Beyond mere data handling and interaction, BI embodies data analysis, extending its influence to assist businesses in anticipating and adeptly responding to the ebb and flow of market dynamics (Gelinis et al., 2017).

Alternatively, BI can be comprehended as an all-encompassing category encompassing applications, technologies, and processes dedicated to data collection, storage, access, and analysis, all strategically designed to fortify the decision-making process (Banasiewicz, 2019).

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The alignment of BI with stakeholders and academia has catalyzed discussions, largely due to the ascendancy of Information Technology (IT) in corporate landscapes and the intricacies associated with data integration. The judicious selection of technology, particularly when rooted in extensive datasets, takes on paramount importance (Cerrato, 2023). The acquisition of BI capabilities has evolved into a pivotal corporate objective, underscoring its profound influence on investments in IT (Ravichandran, 2018). Remarkably, the International Data Corporation's (IDC) study underscores business analytics as a premier IT priority, as substantial enterprises forecast a scarcity of individuals skilled in analytics and managerial roles by 2018. This scarcity has propelled communication companies to wholeheartedly embrace analytics initiatives (Isson, 2018). Business analytics systems possess transformative potential to amplify processes, enhance performance, and elevate competitiveness (Aljawarneh et al., 2022). Through the harmonious integration of human capital, procedures, and technology, these systems metamorphose raw data into strategic insights (Mishra et al., 2021). Despite empirical validation, limited research comprehensively dissects the mechanisms underlying these benefits. Building upon the resource-based view, this study aims to bridge this gap by pinpointing capabilities within an organizational business analytics initiative.

BI empowers corporations to effectively navigate diverse information formats, nurturing innovation and cultivating competitive advantages. It notably accentuates the mastery of big data management as a foundational requirement (Jawaad et al., 2019). Enterprises invest in BI for a multitude of reasons, including the amplification of decision-making acumen, automation of capabilities, and the streamlining of processes (Pierson, 2021). A report by IBM in 2012 highlights compelling outcomes: 49% achieved results driven by customer-centric initiatives, 18% optimized operations, and 15% effectively managed cash flows, further accentuating the urgency of addressing cost reduction, performance enhancement, and risk management (Holbeche, 2023). The strategic leverage of BI proves indispensable across realms such as administration, finance, and marketing, addressing analytical and predictive imperatives. The cultivation of BI competencies transcends traditional functions, permeating into an expanded spectrum of product and service offerings (Dwivedi et al., 2022). Companies prioritize research initiatives that augment workflows and stimulate innovation, seeking to harness the potential of BI (Watson & Schwarz, 2023).

The study's pivotal contribution lies in its exploration of the mediating role of organizational agility in the nexus between BI and innovative performance. Organizational agility, characterized by swift and adept adaptation to change, assumes a central role in this interplay. This study delves into how BI tools, particularly cloud-based solutions, influence knowledge sharing and elevate innovative performance through the mechanism of organizational agility.

In essence, this research bridges theoretical underpinnings with pragmatic applications, illustrating how organizations can harness BI to foster innovation. By dissecting the mediating role of organizational agility, this study unravels the nuanced way BI propels innovation. The insights gleaned from this study possess the potential to guide managerial decisions, enabling the astute utilization of BI for transformative endeavors.

This paper is structured as follows: Section 2 provides a comprehensive literature review and outlines the hypotheses. Section 3 discusses the research methodology employed in this study. Section 4 utilizes a descriptive-analytical approach to analyze the data and results. Section 5 delves into the findings and discusses the potential theoretical and practical implications, while also acknowledging the limitations of the study.

2 Theoretical Framework & Hypotheses Development

Business intelligence, innovative performance, and organizational agility are all interconnected in a way that highlights their combined importance as pillars of business development. These connected subjects make up a dynamic triad that fuels expansion and success in the contemporary business environment (Soares et al., 2018). Business intelligence equips organizations with the means to harness data-driven insights, enabling informed decision-making, efficient resource allocation, and a deep understanding of market trends. In tandem, innovative performance fuels the engine of progress by fostering creativity, enabling the development of novel products and processes, and engendering a culture of adaptability in the face of evolving customer preferences (Turban et al., 2018). However, the full realization of these gains depends on organizational agility, which enables organizations to quickly change strategies, reallocate resources, and view change as an opportunity.

This integrated approach to business development ensures that companies not only navigate challenges adeptly but also proactively seize prospects for growth (Tallon et al., 2019). In essence, the confluence of business intelligence, innovative performance, and organizational agility constitutes a dynamic blueprint for fostering resilience, innovation, and sustained advancement in today's complex business ecosystem (Holbeche, 2023).

2.1 Business Intelligence and Organization Agility

According to Awan et al. (2021), the pivotal role of Business Intelligence (BI) in shaping organizational decision-making has garnered significant attention among scholars in the management field. BI's seamless integration of applications and data, coupled with the accumulation of user expertise, has been underscored as a catalyst for well-informed decision-making, facilitated through comprehensive data analysis from diverse sources. Donnelly (2022) explained that this capacity, in turn, contributes to fostering organizational agility. This analytical acumen permeates all levels of management, effectively influencing both strategic and tactical decisions. Bouckaert (2016) demonstrates that scholars emphasize the impact of BI, particularly in the realm of organizational and functional planning, where the need for sophisticated tools to enable comprehensive business analysis becomes readily apparent.

In contexts where organizations strive for heightened utilization of operational information, the strategic significance of BI becomes increasingly evident. Its system adeptly facilitates the monitoring, comprehension, and efficient management of organizational data, ultimately leading to improved decision-making processes (Shin & Lowry, 2020). Leveraging mathematical and scientific models within the BI framework yields valuable insights from raw data, thereby contributing to making wiser and more accurate decisions. This data is meticulously stored and managed, and decision-makers derive tangible benefits from accessing both internal and competitive intelligence, significantly streamlining the decision-making process (Banasiewicz, 2019). Furthermore, Brown (2017) assures that decisions supported by BI-derived data not only facilitate the integration of novel business paradigms but also expedite the management of organizational processes.

According to Wujarso & Dameria (2023), the development of a well-defined BI strategy has emerged as a critical consideration, with researchers underscoring the imperative of meticulous planning encompassing objectives, methodologies, and well-defined delivery timelines. Furthermore, the predictive capabilities inherent in BI have garnered substantial attention, offering organizations the advantage of insights into future operational landscapes that aid in strategic planning for both innovation and growth (Awan et al., 2021).

Ghasemaghaei et al. (2018) added that the effectiveness of strategic decision-making receives a notable boost through the integration of data mining tools alongside BI tools, creating a comprehensive analytical framework. The user-friendly interfaces of BI tools empower seamless data processing and value

extraction, allowing managers to discern project strengths and vulnerabilities with precision. This integration is further fortified by data mining technologies that enhance insights through simulations, reinforce predictive models, and deepen the understanding of organizational dynamics, thus contributing to a holistic sense of agility (Vermesan et al., 2022).

Dagnino et al. (2021) discussed organizational agility, indicating that this evolving concept is closely intertwined with BI and innovative performance. Its capacity to adeptly navigate shifting landscapes, facilitate adaptable changes in organizations, and optimize resource allocation resonates harmoniously with the core tenets of BI. Rialti et al. (2018) demonstrated that the pursuit of innovation, supported by insights derived from BI, assumes a pivotal role in fostering organizational agility. In an era of heightened global competition, the capability to promptly respond to customer needs, adapt to operational shifts, and capitalize on new market opportunities has ascended to a central position in enhancing organizational productivity and ensuring enduring relevance. Thus, the following hypothesis is proposed:

H1: Business Intelligence has a positive impact on Organization Agility.

2.2 Business Intelligence and Innovative Performance

There is a lack of unanimous consensus regarding the various terminologies associated with business intelligence, with no fewer than eighteen distinct interpretations of the concept. Some authors even amalgamate the terms 'big data' and 'analytics' (Nyman et al., 2021). In the context of our discussion, Business intelligence can be broadly defined as the utilization of a wide array of techniques, technologies, systems, methodologies, approaches, and applications, all directed toward dissecting essential business data. This practice fosters evidence-based problem-solving and recognition within the realm of business scenarios. Remarkably, Business intelligence plays a pivotal role in driving innovative performance within organizations. It encompasses the amalgamation of technologies, processes, and strategies employed for the acquisition, analysis, and presentation of business data, ultimately serving as the bedrock for informed decision-making processes (Doh et al., 2021). According to Shirazi et al. (2022), in the contemporary swiftly evolving business landscape characterized by an unprecedented deluge of data, Business Intelligence equips enterprises with the instrumental means to harness the potency of information and transform it into actionable insights. These insights, in turn, underpin innovative strategies and enhance overall performance.

Ansari (2021) explicates that the competency of business intelligence capacity is defined by its culmination in two domains: adept information management and proficient analytical skills. Consequently, Business intelligence capacity emerges as a technologically enabled faculty capable of grappling with extensive volumes of high-velocity data and diverse data insights. In its operation, Business intelligence leverages information technology (IT)-centric tools, exemplified by data repositories, "online analytical processing (OLAP)", statistical and quantitative instruments, visualization aids, and

data mining utilities (Bibri & Krogstie, 2017). Moreover, Business intelligence facilitates a profound comprehension of customer behaviors and preferences, enabling the creation of personalized experiences, targeted marketing campaigns, and products finely tuned to fulfill precise customer requirements. These endeavors collectively contribute to heightened customer satisfaction and engender steadfast loyalty (Griva et al., 2018). Furthermore, Woodland (2022) illustrates that business intelligence fosters an iterative process of continuous improvement. Providing metrics and key performance indicators (KPIs) allows meticulous tracking of the efficacy of innovation initiatives. The invaluable insights derived from data-driven feedback empower the refinement of strategies, the optimization of processes, and the seamless alignment of innovation endeavors with the overarching goals of the organization.

Despite the multitude of interpretations and discussions surrounding Business Intelligence, scholars and industry practitioners concur on its fundamental goal—to create an enabling environment where businesses can adeptly respond to a dynamic landscape. By adeptly balancing the dynamics of structured and unstructured data, business intelligence not only revolutionizes organizational management paradigms but also grants businesses the opportunity to access the most pertinent and relevant data (Grover et al., 2018). As Johnson et al. (2022) postulate, the exploration of enhancing firm performance through IT applications assumes paramount significance. Substantiation has emerged indicating that IT capabilities act as a pivotal differentiator between higher- and lower-performing firms. Subsequent investigations have confirmed that Business Intelligence capabilities provide fertile ground for robust analyses that assist organizations in gaining a competitive edge (Mikalef et al., 2020). Convincing evidence underscores the nexus between business intelligence and the augmentation of organizational efficacy, authoritatively affirming that business intelligence nurtures an environment conducive to data-driven decision-making, ultimately culminating in enhanced outcomes for firms (Tinnell, 2017). Thus, the following hypothesis is proposed:

H2: Business Intelligence has a positive impact on Innovative Performance.

2.3 Organizational Agility and Innovative Performance

According to Koçyiğit & Akkaya (2020), agility pertains to an organization's flexibility and its ability to respond and adapt rapidly in an unpredictable and uncertain environment. This capability allows organizations to achieve milestones in an ever-changing landscape by quickly updating, integrating, and utilizing knowledge to react effectively. Holbeche (2023) further mentions that this dynamic capacity enables businesses to swiftly adapt to shifts in the market, technological advancements, and evolving customer demands. Agile organizations exhibit flexibility, resilience, and the capacity to pivot strategies and operations as needed. A central aspect of organizational agility involves empowering the workforce, streamlining processes, and nurturing a culture that embraces innovation. This approach ensures that organizations can offer high-quality products and services while adjusting to changing circumstances and demands (Sarder, 2016).

Shahzad et al. (2021) demonstrate that as organizations confront heightened competition characterized by shifts in customer preferences, increased product rivalry, and technological advancements, the need to adapt and enhance agility practices and strategies becomes imperative. According to Yeung & Ulrich (2019), organizational agility reflects a firm's readiness to rapidly and innovatively respond to changes in the business environment. Agile firms excel in complex and uncertain contexts, as they can swiftly replace existing processes and resources with new ones based on evolving conditions. Bayighomog et al. (2020) emphasize that this adaptability and market-sensing capacity enhance innovation, enabling firms to meet customer needs through novel offerings and potentially improve performance. To outperform rivals in the market, organizations must exploit their knowledge structures, seek and seize opportunities, and compete effectively.

The literature underscores agility as a dominant concept for responding to uncertainty and environmental changes. Organizations that fail to embrace agility lack the necessary capabilities to adjust routines and processes according to external dynamics (Tallon et al., 2019). Richey et al. (2022) explain that agility involves utilizing internal and external organization-specific capabilities to renew and develop responses to shifting business environments. It operates across various organizational levels, encompassing robustness and responsiveness. Additionally, Felipe et al. (2017) add that agility proactively equips organizations to enhance sustainable competitiveness. Agile performance correlates with success through innovation, quicker response times, and adaptation to market and product novelty.

Research by Appelbaum et al. (2017) establishes a positive relationship between organizational agility and performance. Agility contributes to organizational performance by responding to customer demand changes, capitalizing on external partner competencies and knowledge, streamlining processes, reducing costs, and achieving higher flexibility, accuracy, and speed. Organizational agility ensures customer satisfaction by adapting to changing trends and maintaining performance.

Attar & Abdul-Kareem (2020) conclude that the interplay between organizational agility and innovative performance is mutually beneficial. Agile organizations are better poised to embrace emerging opportunities and navigate disruptions, fostering an environment conducive to innovation. Simultaneously, a culture of innovation enables companies to thrive amid rapid changes, complementing agility. Organizations that embody both agility and innovation excel in delivering value to customers, surpassing competitors, and achieving sustainable growth (Lepeley, 2020). Thus, the following hypothesis is proposed:

H3: Organizational Agility has a positive impact on Innovative Performance.

2.4 The mediating role of organizational agility between business intelligence and innovative performance

According to Enad Al-Qaralleh & Atan (2022), the recent prominence of organizational agility as a mediating factor between business intelligence and innovative performance has garnered substantial attention. This perspective is echoed by Hamill et al. (2022), who illustrates that business intelligence encompasses methodologies, technologies, and strategies that enable organizations to gather, analyze, and interpret data for well-informed decision-making. In contrast, innovative performance signifies an organization's capability to generate and implement fresh ideas, products, and processes, fostering growth and a competitive edge (Slater et al., 2014). The insights extracted from data analysis through business intelligence provide valuable information to organizations. Kalaigianam et al. (2021) elucidates that organizational agility plays a pivotal role in promptly translating these insights into actionable steps. The hallmark of an agile organization lies in its ability to respond swiftly to fluctuating market dynamics and consumer preferences, guided by data-driven choices derived from business intelligence.

The interplay between adaptability and innovation is intricately intertwined, as highlighted by Garcia et al. (2023). Agile organizations are inclined to experiment, explore new avenues, and effectively implement innovative ideas. In this context, business intelligence emerges as a vital informant, furnishing essential context and data to nurture innovation. Russell & Swanson (2019) affirm that the agility of an organization ensures the rapid transformation of these insights into inventive products, services, or processes. Furthermore, the concept of continuous improvement is central to agile organizations. Business intelligence data pinpoints areas requiring refinement or optimization, with the organization's agility guaranteeing the swift and consistent implementation of these enhancements, ultimately elevating innovative performance. Moreover, organizational agility thrives within a dynamic feedback loop, as acknowledged by Heisterberg & Verma (2014). Data generated from endeavors to enhance innovative performance can be fed back into the business intelligence system for analysis. The insights derived from this iterative process further fuel innovation, establishing a self-reinforcing cycle.

Hayajneh et al. (2022) affirm that the relationship between organizational agility and innovative performance gains greater potency when augmented by knowledge-based human resource management practices and business intelligence. Sjödin et al. (2018) conclude that agile organizations prioritize empowering and engaging their entire workforce, streamlining processes to minimize complexity and decision delays, thus expediting the introduction of new products or services to the market. This approach nurtures a symbiotic relationship between organizational agility and innovative performance, yielding valuable insights. Firstly, agility empowers organizations to navigate changing and uncertain business environments, thereby securing their market position. Secondly, possessing agility capabilities serves as a pivotal gauge of organizational achievement. The overarching aim of organizational agility is to cultivate sustainable competitive advantages by bolstering innovative performance and guiding organizations through uncertainty towards the achievement of goals and objectives (Ahmed et al., 2020). Thus, the following hypothesis is proposed:

H4: Organizational agility mediates the relationship between business intelligence and innovative performance.

3 Methodology

This study is one of the field studies that use the analytical descriptive method, using the applied method that aims at collecting and analyzing data, and testing hypotheses. This approach is known as a research method that deals with events, phenomena, and practices that exist and are available for study and measure as they are without the researcher's intervention in the course of the study (Sekaran & Bougie, 2015).

Regarding the study population, it includes all workers employed in the main sections of the Jordanian telecommunication companies, with an overall of 510 employees. A random sample of 260 employees was chosen for this study. 17 questionnaires were excluded because they were not valid for analysis, and 214 questionnaires were valid which represents 82.3% of the study sample.

3.1 Research instruments

The research used a questionnaire with a combination of a five-point Likert scale to measure the items of business intelligence in total, 7 scale items developed by Popovič et al. (2012). To measure the items of organization agility In total, 6 scale items were adopted (Aljawarneh et al., 2021). Also, to measure the items of innovative performance in total, 4 scale items were adopted (Dangelico, 2017; Ashok et al., 2016; Abualoush et al., 2022).

3.2 Demographic information of the respondents

The present study is comprised of 74.1 % male employees and 25.9% female employees. 27.3% of the participants were 30-39 years old, 32.9% of the participants were from 40-49 old, 23.8% of the participants were 50-59 and 16.1% of the participants were more than 60 years old. Regarding academic ranking, 16.1% of the participants were Teachers, 39.9% of the participants were professors, 28.0% of the participants were assistant Professors and 16.1% of the participants were Associate professors. As for colleges, 48.3% of the participants were Scientific colleges and 51.7% of the participants were Humanities colleges, Finally, 28.0% of the sector were formal universities and 72.0% were private universities.

4 Data analysis and results

4.1 Assessment of the measurement model

To check and estimate the interactive relation between the model variables we used a structural equation modeling (SEM) method with smart PLS-4 software. Covariance-based SEM (CB-SEM) is based on the indeterminacy of item scores. (Rigdon et al., 2017). PLS-SEM, on the other hand, operates on fixed latent scores and aims to maximize the prediction of endogenous components rather than the model fit (Hair et al., 2019). PLS-SEM can deal with very difficult and complex structural models as second-order models, and small sample sizes, and isn't strict on data normality. Figure 1 shows the = loadings items of different scales and f2 in the model and shows the significance R2 of each variable within the inner model. table 4 shows the significance level of each of the scale items in the outer model and the significance level of the relationships between the variables within the inner model.

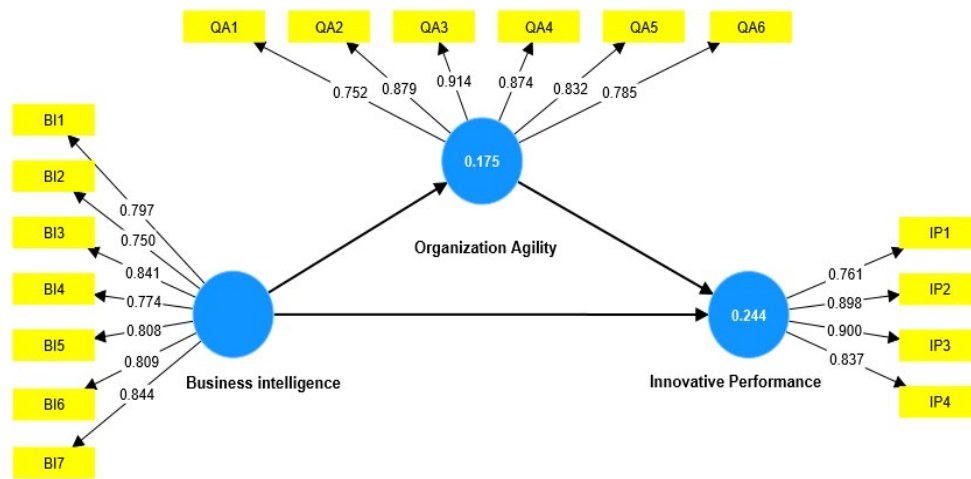


Fig. 1 Measurement model estimates.

Table 1 Mean & Stander division (SD)

Measures	Mean	SD
Business intelligence	3.26	.787
Innovative Performance	3.80	.781
Organization Agility	3.96	.815

The outer model loadings presented in Figure 2 were mostly above the 0.7 threshold and their respective B-values were vital in table 4. Together with Cronbach’s alpha (α) >.70, composite reliability (CR) >.70, and average variance extracted (AVE) >.50 values are presented in Table 2. Furthermore, Table 3 shows that the Fornell–Larcker criterion was satisfied as the square of each variable’s AVE is greater than the inter-correlations.

Table 2 Reliability & convergent validity.

Instruments	α	CR	rho	AVE	R ²
Business intelligence	0.909	0.918	0.927	0.646	

Innovative Performance	0.871	0.870	0.913	0.724	0.244
Organization Agility	0.917	0.935	0.935	0.708	0.175

Table 3 Divergent validity based on the Fornell–Larcker approach.

Measures	1	2	3
Business intelligence	0.804		
Innovative Performance	0.434	0.851	
Organization Agility	0.418	0.396	0.841

The preceding sections established the models’ reliability and validity. The coefficient of estimation for the structural model is reported in Table 4. The observed direct impact of business intelligence on innovative Performance is positive and significant ($\beta = .325, \rho = .001$), the direct effect of business intelligence on organization agility is positive and significant ($\beta = .818, \rho = .000$), also the direct effect of organization agility on innovative Performance positive and significant ($\beta = -0.026, \rho = .032$). The mediating impact of organization agility on the association between business intelligence and innovative Performance was significant ($\beta = .109, \rho = .046$). See Table 4. Moreover. The variance explained by the model R^2 is .244 translated as 24.4% for innovative Performance in Table 2. Falk and Miller (1992) set a benchmark for R^2 values and argued that the lowest recommended level should be 0.10. The R^2 in our study showed a large effect.

Table 4 Direct effects

Relationships	β	T	ρ
Business Intelligence -> Innovative Performance	0.325	3.416	0.001
Business intelligence -> Organization Agility	0.418	4.301	0.000
Organization Agility -> Innovative Performance	0.260	2.144	0.032
Business intelligence -> Organization Agility -> Innovative Performance	0.109	1.996	0.046
Note: β , beta value; ρ , ρ -value; T, T-value			

5 Conclusion

This study examines how business intelligence and organizational agility can help companies achieve innovative performance. The results indicate that business intelligence and organizational agility exerted similar (positive and significant) linear effects on the innovative performance of telecom companies. Moreover, there is an impact of business intelligence on organizational agility also there is an impact of organizational agility on innovative performance. Furthermore, organizational agility is a necessary and sufficient condition for innovative performance in telecommunications companies and organizational agility mediates the relationship between business intelligence and innovative performance of telecommunications companies. The paper concludes that managers must ensure appropriate implementation of business intelligence applications with organizational agility to achieve innovative performance to compete and survive in a saturated industry or market.

6 implications

This study highlighted the agile capability that enables telecom organizations to adjust and be adaptable, ensuring effective business advances in a timely way. It will help communication company managers recognize the significance of organizational agility in building and sustaining organizational competitiveness, as well as enhancing innovative and effective operational performance. Adopting business intelligence tools can improve decision-making, while innovative performance due to business intelligence capabilities plays a critical role in providing and absorbing high-quality, relevant information and knowledge, allowing managers to understand their business and make better decisions. This allows companies to build their answers based on their dynamic and volatile settings, allowing them to adapt and respond to the environment more quickly. Managers must be guided on how to grow and expand their skills in business intelligence applications. However, because the telecom environment is volatile and dynamic, unique market insights provided by BI tools can assist managers in understanding urgent environmental dynamics. Errors can be decreased when market

assumptions are validated. In essence, business intelligence and organizational agility enable telecom firms to outperform their competitors by improving operations, forecasting outcomes, making better decisions, innovating new services, and seizing new market possibilities.

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