




Presentation of the Business Intelligence Capabilities Model and Its Role in Innovation Considering the Impact of Network Learning and Performance (Case Study: Insurance Industry)

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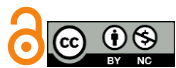
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ABSTRACT

Objective: The aim of the study was to present a model of business intelligence capabilities and its role in innovation, considering the impact of network learning and performance in the insurance industry.

Methodology: This study is applied in terms of its research objective and qualitative in terms of its methodology, adopting a grounded theory approach. In this research, methodological triangulation was employed using various data collection methods such as literature review and examination of specialized sources and texts, as well as semi-structured interviews. Based on purposive sampling, 14 managers and experts from the insurance industry were interviewed in 2023. The conducted interviews were coded using ATLAS.TI software. To validate the obtained results, data were evaluated and analyzed for reliability based on triangulation.

Findings: The research findings were categorized into five sections: causal conditions (management practices, technical practices, systemic practices, organizational practices, human resource practices), contextual conditions (policies and regulations, insurance industry), intervening conditions (financing, security interventions, cultural and social conditions), strategies (incentive policies, training and specialization, intelligentization and strategic review), and outcomes (increased efficiency of the insurance industry, improved customer management, improved strategic positioning, and improved project management). A model was identified in six categories, 18 axial codes based on 82 open codes. This model is one of the most comprehensive models of business intelligence capabilities and its role in innovation, considering the impact of network learning and performance.

Conclusion: Presenting a model that combines business intelligence and network learning can play a very important role in creating innovation and growth in the

insurance industry. These models help companies more accurately analyze risks, offer new products and services, and provide a better experience to their customers. Therefore, the development and use of these models are of high importance and can be effective in determining successful strategies and advancing this industry.

Keywords: *Business Intelligence, Innovation, Network Learning, Insurance Industry Performance.*

1 Introduction

Business intelligence in the insurance industry is valuable for gaining actionable insights from collected data (Kumburu, 2023). Managers can use business intelligence insights to improve customer experience, detect fraud, create targeted marketing campaigns, and enhance sales channel efficiency (Sadiku & Musa, 2021). Competitive intelligence, also known as business intelligence, market intelligence, customer intelligence, business analytics, and analysis, is the most developed topic in strategic management research (Chaubey & Sahoo, 2021). However, its relationship with industry performance has not been extensively studied (Tian & Wang, 2022). From the resource-based view (RBV) perspective, knowledge is considered one of the assets and even becomes the primary asset for winning current competition, leading to the knowledge-based view (KBV). In the knowledge-based view, the main asset of a company in formulating its competitive advantage is knowledge. The increase in knowledge can result from business intelligence (Ahmad et al., 2020).

The resource-based view (RBV) theory states that to develop and maintain competitive advantages, companies must utilize their physical, human, and organizational assets, both tangible and intangible (Chen & Lin, 2021). An important concept of this theory is that companies that control valuable and rare resources have the capacity to create a competitive advantage, especially if these resources are difficult to imitate or substitute (Huang, Savita, & Zhong-jie, 2022; Huang, Savita, et al., 2022). Additionally, the knowledge-based view (KBV) focuses on knowledge as the most valuable resource in the company. Considering knowledge as a primary production factor that a company can use to gain a competitive advantage is based on the theoretical foundation of RBV (Hamad et al., 2020).

Business intelligence is one of these assets because it can be used to acquire information and simultaneously increase the knowledge reservoir available to managers (Muntean et al., 2021). This is possible because the processes involved in knowledge production are both search and recombination. Business intelligence is "both a process and a product"

(Fashanu, 2021). This process consists of methods that organizations use to develop useful information or intelligence that can help organizations survive and thrive. The product is information that allows organizations to predict with some degree of certainty the behavior of "competitors, suppliers, customers, technologies, acquisitions, markets, products and services, and the general business environment." Business intelligence is one of the important aspects of knowledge and information management in the organization (Nuseir et al., 2021; Sadiku & Musa, 2021; Sjarif et al., 2021; Wu et al., 2014; Yiu et al., 2021). The availability of information through electronic tools for acquisition, processing, and communication has increased and can be used as a basis for informational actions (Tian & Wang, 2022). Additionally, the context of major political and social changes worldwide, increased global competition resulting from new competition or more aggressive strategies, and rapid technological changes require improved use of information. Increasing uncertainty leads to increased information processing activities in companies. Otherwise, the survival of companies may be at risk (Ahmad et al., 2021).

Increasing knowledge can result from business intelligence, as the processes involved in knowledge production include search and recombination. Besides business intelligence, the process of acquiring and using knowledge can also be achieved through network learning, provided that industries heavily rely on external sources for their knowledge acquisition. Furthermore, regarding performance, innovation is one of the keys to improving company performance in an era that is rapidly changing. In a highly competitive, dynamic, and unstable environment, industries must strive to collect information to improve their decisions. This can be a challenge for any industry, but it is particularly challenging for insurance companies that face many market problems. This process can help managers maintain effective alignment with their environment and increase their company's performance (Alikhani et al., 2021).

From the dynamic capabilities (DC) perspective, the company's ability to compete is important (Zhang et al., 2021). The factor that contributes most to increasing

competition in a triadic industry is the increase in competitors' capabilities, thus making the role of business intelligence crucial for companies to understand competitors' capabilities. Business intelligence is an important part of environmental scanning for most companies. Research shows that business intelligence has a strong relationship with company performance, but the mechanism of this relationship has not been extensively studied in the insurance industry context. Therefore, it is important for insurance companies to conduct accurate environmental scanning in determining their business strategies, one of which involves the use of business intelligence and analytics (Zhao et al., 2022).

Regarding innovation, it is considered a key concept for organizational success (Yiu et al., 2021). Additionally, the process of knowledge acquisition through network learning is examined. Interaction with various actors who possess technical or non-technical knowledge can be important for accelerating the acquisition of this intangible resource (Sjarif et al., 2021). Ultimately, the relationships between these constructs and performance are evaluated. Since these processes can help managers maintain effective alignment with their environment and increase performance, some studies link business intelligence (and the knowledge perceived as the result of business intelligence) to business performance. By analyzing performance, the success level of a business resulting from the application of business intelligence can be understood. Therefore, it is the main goal in any organization and can be analyzed by itself or resulting from internal processes (Wu et al., 2014).

Since business intelligence involves the use of information for better decision-making, it can impact the company's innovative actions. Better information by itself does not significantly lead to increased business performance and efficiency; the key is what organizations do with this information. Innovation based on business intelligence components, as the degree of engagement and adoption of new ideas, experimentation, and creativity of a company, which may lead to new products, services, or processes, can be considered an aspect of a company's culture and help it survive in an unstable environment.

Innovation is considered an activity that management can control, engaging in experimentation and creative processes that may lead to new products, services, or technological processes (Zhu et al., 2019). The company's actions, including its innovative activities, are conditional and sometimes driven by external factors such as customer demand (market), competitors' actions, or even government

regulations (Lubishtani et al., 2022; Nuseir et al., 2021; Zhao et al., 2022). A business that has the ability to change and exploit knowledge may determine its level of innovation, such as new problem-solving methods and new products for rapid market response. Theoretically, innovation facilitates the acquisition of new opportunities by introducing new products or services to the market (Lubishtani et al., 2022). If these activities are successfully realized, they impact and increase performance. Companies with greater innovation in responding to customer needs and developing new capabilities that enable them to achieve better performance or higher profitability will be more successful. Business intelligence provides organizations the ability to understand the internal and external environment through the systematic acquisition, analysis, interpretation, and exploitation of information. Network learning, as the company's capacity to create, integrate, and reconfigure technical and non-technical knowledge generated through external links and institutions, can significantly contribute to the company's knowledge (Nuseir et al., 2021).

From the network learning approach, many researchers have suggested that the ability to exploit external knowledge is a crucial component of innovative capabilities. Efforts to learn from external sources can help discover new ideas, processes, or techniques that can be applied and enhance the development and application of innovation. Competitiveness and related performance may result from leveraging knowledge management and learning. However, few companies possess all the innovative capabilities, so seeking external resources can be very important (McNellis, 2019).

Given the importance of business intelligence in various industries, particularly the insurance industry, it can be said that business intelligence technology enables insurance company managers to manage company performance innovatively without requiring a high level of technical expertise. Therefore, it can be asserted that these tools are designed to empower sensitive industries like the insurance industry. Thus, this research seeks to answer the question of how the model of business intelligence capabilities and its role in innovation, considering the impact of network learning and performance, is structured.

2 Methods and Materials

The present study is applied in terms of its research objective and qualitative in terms of its methodology, adopting a grounded theory approach based on the Strauss

and Corbin (1998) approach. In this research, methodological triangulation was employed using various data collection methods such as literature review and examination of specialized sources and texts, as well as semi-structured interviews. Data triangulation, which involves controlling the consistency of different data sources, was also considered in this research, and more than one data source was used. The potential participants were all experts, elites, and managers in the insurance industry in 2023. The sampling method was purposive, and individuals from this group were selected to participate in the qualitative research process and interviews. The primary data source in this research was interviews, with initial interviews being exploratory and descriptive. Gradually, after each interview, coding of the interviews was conducted using the constant comparative method, where theoretical codes emerged through open coding. In this way, 14 interviews were coded, and concepts and subcategories and main categories emerged; it is worth noting that the saturation of axial categories was based on theoretical sampling, such that interviews continued with the research population until the concepts of that category were saturated and enriched. For instance, with the first 8 interviews, the category of type of change was saturated. In other categories, such as results and outcomes, data were not sufficient, so interviews continued based on theoretical sampling until the desired category was saturated. It is worth noting that theoretical sampling for interviews was not based on the number of interviewees but on their role in saturating the categories. The interviews reached theoretical saturation by the 14th interview. The duration of each interview was between 30 to 50 minutes. For qualitative data analysis, grounded theory was used in ATLAS TI software. The stages of qualitative data analysis included open coding, axial coding, and selective coding. Interviews with selected participants in the qualitative sample were conducted based on the following questions:

How is business intelligence used in the insurance industry?

How can you improve business intelligence capabilities in the insurance industry and leverage them to enhance performance and innovation?

What role does network learning play in this process? Can you provide examples of successful applications of network learning in insurance?

Have you faced specific challenges in implementing business intelligence and network learning models in the insurance industry? If so, what solutions and strategies have you provided to address these challenges?

How do business intelligence models improve decision-making performance in insurance companies?

How can you collect and analyze the necessary information and data for designing business intelligence models?

Have business intelligence and network learning models helped in the development of new products and services in the insurance industry?

What impact has the implementation of business intelligence models had on innovation and business growth in your organization?

What differences and advantages do you have compared to competitors in presenting business intelligence models?

What suggestions do you have for insurance companies that want to use business intelligence and network learning capabilities to improve their innovation and performance?

3 Findings and Results

For open coding, all interviews were entered into ATLAS.ti software, and the necessary analyses were performed to extract the relevant codes. Labeling of the codes was based on the interviews, and the researcher tried to adhere to the respondents' insights as much as necessary to avoid any potential and unintended biases. Throughout the coding process, the researcher adhered to theoretical sensitivity, which is a principle of grounded theory research, to enrich the research as much as possible. [Table 1](#) shows an example of the coding of the interviews conducted.

Table 1

Sample of Coded Interviews

Extracted Code	Interview
Provision of hardware and software infrastructure	The use of advanced hardware and appropriate software can help collect, store, and process insurance data effectively and efficiently. These infrastructures must be able to adapt to high volumes of data, process quickly, and analyze accurately.
Establishing necessary processes to adapt technology to the insurance industry	Given the continuous changes in the insurance industry and various requirements, processes must be established to quickly implement and adapt new technologies within the organization. This includes communication, training, and operational processes.

Utilizing global technology updates	To maintain competitiveness and stay up-to-date, the insurance industry must seek and apply new technologies in its products and services. This includes using technologies such as artificial intelligence, machine learning, the Internet of Things, etc.
Embedding data mining processes in the organization	Data mining, as one of the most important tools of business intelligence, can help insurance organizations identify and exploit various patterns and trends in their data. This information can lead to better decision-making, more accurate predictions, and the creation of innovative products and services.
Creating integrated information systems	Integrated information systems in the insurance industry can enhance operational processes, including risk assessment, damage analysis, capital management, and support for strategic decision-making. By aggregating and analyzing data from various sources such as customers, damages, and other resources, these systems can provide the best decision-making outcomes for the organization and improve overall performance.
Creating a coherent and systematic database	Coherent and systematic databases can provide organized and accessible information about customers, insurance, damages, and other relevant data. These databases can aid in more accurate data analysis, damage prediction, pattern recognition, and improved decision-making processes.
Identifying organizational goals	Business intelligence capabilities can help organizations identify and set their goals and develop operational plans aligned with them. By using available data and intelligent analysis, organizations can track their progress and implement necessary improvements.

Based on the dimensions of Strauss and Corbin's (1998) grounded theory model, the identified codes are categorized in [Table 2](#).

Table 2

Open Coding of Qualitative Data Based on Grounded Theory

Selected Code	Axial Category	Initial Code
Causal Conditions	Managerial Practice	Technology adoption by managers
		Managerial support
	Technical Practice	Managers' attitudes and thoughts on new technologies
		Participatory management
	Systemic Practice	Provision of hardware and software infrastructure
		Establishing necessary processes to adapt technology to the insurance industry
		Utilizing global technology updates
	Organizational Practice	Embedding data mining processes in the organization
		Creating integrated information systems
		Creating a coherent and systematic database
Identifying organizational goals		
Including business intelligence procedures in the insurance industry's processes		
Human Resource Practice	Establishing procedures for accepting innovation and creativity	
	Encouraging daily reporting	
	Supporting data-driven and intelligent innovation by employees	
	Screening human resources based on revised goals	
	Employee performance transparency based on data recording	
	Creating an environment for teamwork and collaboration acceptance	
	Supporting employee innovation and creativity	
Strategies	Incentive Policies	Providing facilities and recreational centers for employees and rewarding creative employees
		Innovative evaluation system based on intelligence and feedback
		Financial and moral encouragement for creativity in the organization
	Training and Specialization	Encouragement as a review of organizational position
		Establishing smart research and development units
		Using teams of statistical specialists
		Using network specialists
		Using data and analysis specialists
		Online education platform establishment
		Utilizing modern educational techniques
	Creating work and creative games to enhance learning	
	Intelligization	Implementing the Internet of Things
		Implementing big data systems
Implementing native artificial intelligence systems		
Establishing digitalization procedures in the insurance industry		
Implementing smart knowledge management systems		

Outcomes	Strategic Review	Customer surveys Establishing online query systems Employee participation in organizational decisions Regular review meetings for activities
	Increasing Efficiency	Improving budgeting systems Enhancing industry forecasting systems (predicting industry milestones) Improving periodic and timely reporting and analyses Enhancing organizational performance evaluation and ranking
	Improving Customer Management	Access to geographical, temporal, and locational customer information Increasing customer security and trust Improving transparency in customer communications Enhancing customer responsiveness
	Improving Strategic Position	Accelerating and improving decision-making processes Improving internal processes Identifying new opportunities Gaining new competitive advantages
	Improving Project Management	Reducing costs Increasing added value Enhancing operational profitability Improving service quality Reducing the risk of financial fraud Increasing service delivery speed
Contextual Conditions	Policies and Laws	Existence of traditional laws opposing innovation and intelligence Managers' lack of understanding of business intelligence procedures and their benefits in the insurance industry Strict and cumbersome laws for establishing innovation Legal considerations related to investment in the insurance industry Legal considerations related to participation in the insurance company
	Insurance Industry	International and national insurance laws Internal conditions of the insurance industry Structure of the insurance industry Position of the insurance industry in society Reputation of the insurance company Hierarchy of the insurance industry Resistance level of the insurance industry to adopting new technology
Intervening Conditions	Financing	Need for integrated and comprehensive investment Need for appropriate financing for damages and insurance services Need for digital product insurance groundwork Need for online travel insurance groundwork
	Security Interventions	Protecting customer information security Protecting customer privacy Need for unhackable identifiers Determining advanced access Protecting organizational financial information
	Cultural and Social Conditions	Acceptance of technology by employees and customers Need for organizational learning culture establishment Responsibility in data sharing and group cooperation Level of cooperation in knowledge extraction

4 Discussion and Conclusion

The aim of the research was to present a model of business intelligence capabilities and its role in innovation, considering the impact of network learning and performance in the insurance industry. The research findings were categorized into five main categories: causal conditions

(managerial practice, technical practice, systemic practice, organizational practice, human resource practice), contextual conditions (policies and laws, insurance industry), intervening conditions (financing, security interventions, cultural and social conditions), strategies (incentive policies, training and specialization, intelligentization, strategic review), and outcomes

(increasing insurance industry efficiency, improving customer management, enhancing strategic positioning, and improving project management). A model was identified in six categories, 18 axial codes based on 82 open codes. This model is one of the most comprehensive models of business intelligence capabilities and its role in innovation, considering the impact of network learning and performance.

Business intelligence (BI) consists of a set of processes, technologies, and systems that help organizations use their data to provide insights and a better understanding of performance and market opportunities (Sjarif et al., 2021). In the insurance industry, these capabilities are of significant importance (Huang, Savita, et al., 2022). Presenting a model capable of analyzing big data, predicting trends, and optimizing processes can significantly enhance decision-making and improve the performance of insurance companies.

In this context, network learning as an advanced artificial intelligence technique can play an important role. By using neural networks, higher accuracy in predicting risks, assessing damage, and managing risks can be achieved. Furthermore, network learning can improve the performance of automated processes in the insurance industry, leading to cost reduction and increased efficiency (Kumburu, 2023; Zhao et al., 2022).

Therefore, presenting a model that combines business intelligence and network learning can play a crucial role in creating innovation and growth in the insurance industry. These models help companies analyze risks more accurately, offer new products and services, and provide a better experience for their customers. Thus, developing and using these models is of great importance and can be effective in determining successful strategies and advancing this industry. Based on the presented model, the following practical suggestions are offered:

A model of business intelligence capabilities can be provided for analyzing insurance data. This model can use machine learning and neural network techniques to identify hidden patterns in insurance data and provide more accurate predictions in areas such as pricing insurance, detecting fraud, and improving customer relations.

Improving decision-making processes: Using business intelligence models, decision-making processes in insurance companies can be improved, leading to better operational and financial performance. For example, algorithms can be developed to optimize insurance pricing based on customer risk and other variables.

By using business intelligence tools, the customer experience in interacting with the insurance company can be improved, and personalized services can be offered. For instance, analyzing data can help provide different insurance suggestions tailored to each customer's needs and history.

Using business intelligence models and analyzing market data, market trends and changes in supply and demand can be predicted, helping insurance managers make better decisions regarding marketing strategies and products.

By utilizing artificial intelligence and machine learning technologies, smart systems can be created to automate various processes within the insurance company. These systems can be beneficial in customer relations, risk management, and financial decision-making.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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