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A MULTI-CRITERIA DECISION-MAKING APPROACH TO TRANSPORT AND LOGISTICS BASED ON BUSINESS INTELLIGENCE

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Abstract:

In an ever-evolving world, transport and logistics businesses are facing a variety of challenges. From changing customer expectations to competition from large e-commerce players, the industry is being pushed to its limits. The current study can make revolutionize the industry which has the great potentiality for business with BI. Fortunately, business intelligence can give transport and logistics companies the necessary insights they need to thrive. In this article, we have explored how business intelligence (BI) can help transport and logistics companies stay competitive in today's market. Study objectives include identifying ways to streamline transportation and logistics operations, reduce costs, and enhance overall efficiency. The study evaluates the BI technologies available, as well as how they can

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improve operations, reduce costs, and increase customer satisfaction. Business intelligence is a tool that has become invaluable in many industries, and transport and logistics are no exception. Business intelligence allows companies to collect data on their operations, analyze it, and gain insights into their operations in order to make better decisions. This study will explore how BI can be used in the industry to optimize operations, reduce costs, and improve customer service. The study findings indicate that the Business intelligence tools give transport and logistics companies the ability to see their operations in a new light, understand their customers better, and make informed decisions that drive to succeed. A data quality issue and high implementation costs are two major factors that pose challenges when using business intelligence (BI) tools, since accurate and reliable data is essential for generating insightful insights and making informed decisions.

Keywords: MCDM- Multi-Criteria Decision making, Transport, Logistics, Business Intelligence, Trends

INTRODUCTION

Transportation and logistics is a vast and complex industry, made up of many different moving parts. Business intelligence (BI) helps companies make sense of all the data generated by these moving parts, so that they can make informed decisions about how to optimize their operations. BI tools collect and analyze data from multiple sources, including transportation management systems (TMS), GPS tracking devices, warehouse management systems (WMS), and more. This data is then used to generate reports and dashboards that provide insights into things like fleet utilization, asset utilization, delivery times, and more. By understanding what's happening within their transportation and logistics operations, companies can make changes to improve efficiency and effectiveness. Many BI platforms also include features like predictive analytics and machine learning, which can help companies anticipate future trends and needs. This can be especially helpful in the ever-changing world of transportation and logistics, where planning for future demand is essential to success.

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BI In Transport and Logistics

(Balint & Toma, 2015) mentioned the development of new intelligent transport systems is vital for the growth and evolution of the economy because several companies from around the world have to transfer goods between them, communicate and establish new connections. Business Intelligence (BI) has had a significant impact on the transport and logistics sector in global trade and international business. Business intelligence (BI) is a technology-driven process for improving business performance by making better decisions. BI encompasses a wide variety of tools and techniques to collect, store, access, analyze, and share data to support decision-making. In the transport and logistics industry, BI can be used to improve operational efficiency, optimize asset utilization, and reduce costs. For example, BI can be used to track and analyze trends in shipments, traffic patterns, fuel consumption, and maintenance costs. By understanding these trends, transport and logistics companies can make adjustments to their operations to improve performance and save money.

BI can be used to monitor customer satisfaction levels and identify potential areas of improvement. For instance, analyzing customer feedback data can help transport and logistics companies identify issues with specific routes or services. This information can then be used to make changes that improve the customer experience and increase satisfaction levels.

Benefits of BI in Transport and Logistics

(Grabińska & Ziora, 2019) said that the application of BI systems in the field of logistics brings many benefits for the company as the improvement of the whole decision-making process which is related to logistics in the areas of the supply chain activities. There are other benefits, which includes improvement of performance in different areas of business activity. In the fast-paced and constantly changing world of transport and logistics, having a competitive edge can make all the difference. Business intelligence (BI) tools can give your company that edge, by providing insights into your operations that can help you optimize performance, improve customer service, and make better decisions. BI tools can help you track and analyze data on everything from shipment volumes and routes to delivery times and fuel consumption. This information can be used to identify areas where your company is excelling and areas where there is room for improvement. By understanding your transport

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and logistics operations at a granular level, you can make informed decisions that will help your business run more efficiently and effectively.

Additionally, BI tools can help you monitor trends in the transport and logistics industry as a whole. This information can be used to anticipate changes in demand or identify new opportunities for growth. With BI on your side, you'll always have an up-to-date picture of the transport and logistics landscape, so you can adjust your operations accordingly. In short, business intelligence tools give transport and logistics companies the ability to see their operations in a new light, understand their customers better, and make informed decisions that drive success.

Application of Business Intelligence In Transport and Logistics

(BI) is a term that describes the process of turning data into insights. By understanding how BI can be used in transport and logistics, businesses can make better decisions about everything from route planning to fleet management. There are many different ways that BI can be used in transport and logistics. One common way is to use BI to track and analyze vehicle maintenance data. This information can be used to help identify trends and improve preventive maintenance schedules. Additionally, GPS data can be used to monitor fleet performance and optimize routes. Another way that BI can be used in transport and logistics is through customer segmentation. By understanding who their customers are and what they need, businesses can create targeted marketing campaigns and improve the overall customer experience. Additionally, BI can be used to track shipping data and identify areas for improvement.

Ultimately, the goal of using BI in transport and logistics is to improve efficiency, save money, and provide a better service for customers. When done correctly, BI can give businesses a competitive edge in an increasingly complex and competitive market.

Key Trends in Digital Transformation of Logistics

The trends in the business intelligence of transport and logistics are driven by the need to manage and analyze large amounts of data, improve efficiency, and optimize the supply chain. As technology continues to evolve, new trends and technologies have emerged,

enabling logistics managers to gain even deeper insights into their operations and make better decisions.

1 Information and communication technologies are being used in the field of logistics to reduce costs and increase efficiency from both a provider and consumer perspective.
2 Digital platforms are being developed in order to increase the speed of cargo delivery and to expand the scope of activities.
3 Digital tools are introduced at all stages of the service provision process, including unmanned drones, robotic equipment, etc.
4 Cloud-based BI tools can be accessed from anywhere, making it easier for logistics managers to collaborate and share insights. By expanding the practice of sharing warehouses and vehicles among various participants in the logistics services market, it is possible to increase the efficiency of each party and that of the market. Under the pressure of new technology, the logistics sector can revolutionize dramatically. AI-powered systems can help optimize shipping routes, predict demand, and monitor shipments in real-time.
5 Predictive analytics is becoming increasingly important in the transport and logistics industry, enabling logistics managers to anticipate demand, optimize inventory levels, and plan for future transportation needs. The analysis of Big Data sets opens truly unlimited possibilities in logistics sector. In order to improve the level of service and modernize the effectiveness of providers, this will serve as a push towards modernization.

Aim of the Study

The aims of the study is to identify the opportunities to streamline transport and logistics operations, reduce costs, and improve overall efficiency. The study seeks to provide insights into the use of multi-criteria decision-making approaches to improve transport and logistics operations. The study also aims to provide recommendations for decision-makers in the transport and logistics sector on how to leverage business intelligence techniques to improve their operations. It seeks to identify opportunities for collaboration and information sharing among different stakeholders in the Transport and logistics sector to promote the adoption of data-driven decision-making processes.

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Objectives

1) To understand how business intelligence techniques can be utilized to optimize transport and logistics operations.

2) To evaluate the effectiveness of different business intelligence techniques and tools and identify best practices that can be adopted by organizations in the transport and logistics sector.

Research Questions

1) What does business intelligence mean for the transport and logistics industry?

2) How BI can be used across all aspects of the industry from fleet management to warehousing and delivery?

LITERATURE REVIEW

According to (Zhao & Huang, 2009) the development of E-Commerce depends on the different levels of logistics services. This is mainly due to the strong ability on dealing with data, BI has taken an vital role in logistics management. (Nwaubani, 2011) mentioned BI can aid in the standardization and distribution of goods. Logistics as well as play a critical role in the supply chain-thereby confronting many strategic partners which can contribute a central role in the maximum optimization of supply chain by ensuring consistently competitive advantages. The research of (Liu et al., 2017) mentioned that the application of BI system, can propose a layered structure of collaborative BI system for intelligent management in the hospital logistics, create a data warehouse for the collaborative BI system, can improve data mining techniques like supporting vector machines and swarm intelligence firefly algorithm to solve main challenges in hospital logistics collaborative BI system, researched the collaborative techniques oriented to data and business process optimization to benefit the business processes of hospital logistics management. The study conducted by (Jin & Kim, 2018) mention that study has a positive long-run impact by informing companies in the logistics industry, also in other industries with the possibility of increasing the efficiency and productivity of their existing infrastructure without additional investments. (Ceyhun,

2020) said that the maritime and logistics sector moves toward fully digitalisation. For leading shipping businesses in commercial logistics and maritime nations, AI has become a significant source of rivalry. Although though using artificial intelligence takes a significant upfront investment, in the long run it is profitable because costs are reduced.

Furthermore, it was found in the research (Zhou et al., 2021) that the growth of e-commerce necessitated the establishment of a regional hub for a large-scale logistics company in order to guarantee the regular creation and delivery of a large number of packages into various delivery vehicles by dawn and by noon. As a result, the effectiveness of the sorting process directly affects the level of service the business offers. The study is a fantastic illustration of how developing technologies are being used in the logistics sector. Large firms employ comprehensive BI systems to assist strategic management choices, according to (Iliashenko et al., 2022), which connects multiple sources of information. These digital systems allow for the prediction and modelling of numerous scenarios, aiding in decision-making, in addition to offering analysis of large volumes of data. Digital transport and logistics organisations can overcome a number of significant obstacles with the aid of BI systems.

METHODOLOGY

The study uses a mixed research method where the core purpose of mixed methods is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems and complex phenomena than either approach alone. The research methodology for the study is based on two main approaches, theoretical and empirical, thus it consists of two stages. First, we used a theoretical approach to gain in-depth knowledge about the main trends in new technologies and how BI are impacting the development of transport and logistics in the global trade and international business.

The most relevant articles in the scientific literature is synthesized with the essential information about the new technologies like big data, cloud computing, Business Intelligence are taken and then it is analyzed. The second part of our research consisted of conducting an online survey using a convenience sampling on 50 people. Our questionnaire is structured in two main parts: the first one consists of questions aimed at collecting basic data about the demographic and company and the second part with detailed examining of implementing the

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business intelligence in transport and logistics. An in-depth case study method also chosen for the study as the study required a mixed approach of methods to get the results of the questions.

In-depth Research through Case Studies

Business intelligence (BI) is critical for transport and logistics companies in order to maintain efficient operations and gain a competitive advantage. BI can help organizations to track and monitor KPIs, understand trends, improve decision making and forecast demand.

There are many different ways in which BI can be used in transport and logistics, and various case studies demonstrate the benefits that can be achieved. For example, UPS has used BI to streamline its package delivery operations, DHL has used it to optimize its supply chain management, and FedEx has used it to improve its customer service. BI can therefore provide significant benefits for transport and logistics companies of all sizes.

The transport and logistics sector is under immense pressure to deliver goods and services on time, and at a reasonable cost. In order to survive and thrive, businesses in this sector must make use of all the available data to make informed decisions. This is where business intelligence comes in. Business intelligence tools can help businesses in the transport and logistics sector track their performance, identify areas of improvement, and benchmark themselves against their competitors. By making use of data from various sources, businesses can gain valuable insights into their operations and make better-informed decisions.

There are many different business intelligence tools available on the market, but not all of them are suitable for the transport and logistics sector. To find the right tool for your business, you need to understand your specific needs and requirements. Only then can you identify the features that are most important to you. Once you have selected a few potential solutions, it is important to trial them out before making a final decision. This will allow you to see how well they fit into your existing systems and processes, and whether they offer the features and functionality you require.

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ANALYSIS AND FINDINGS

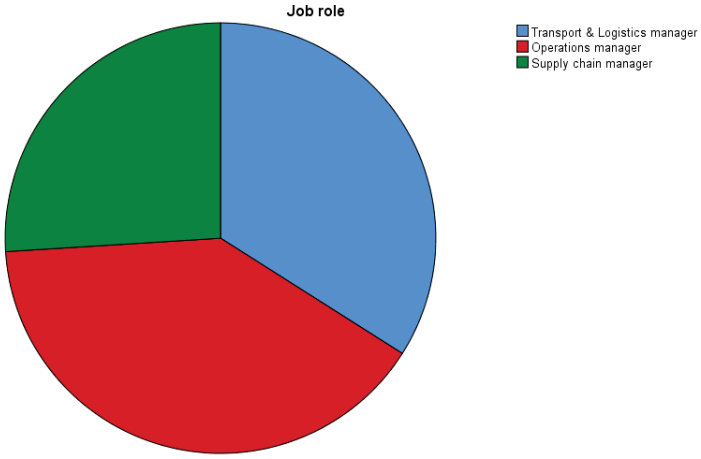

Fig. 1: Frequency Distribution of Respondents According to Job Role

This figure presents the frequency and percentage of job roles in a sample of 50 individuals. There are three job roles presented in this table: Transport & Logistics manager, Operations manager, and Supply chain manager. Out of the 50 respondents, 17 (or 34%) identified as Transport & Logistics managers, 20 (or 40%) identified as Operations managers, and 13 (or 26%) identified as Supply chain managers. The valid percent refers to the percentage of responses that were valid and were included in the analysis.

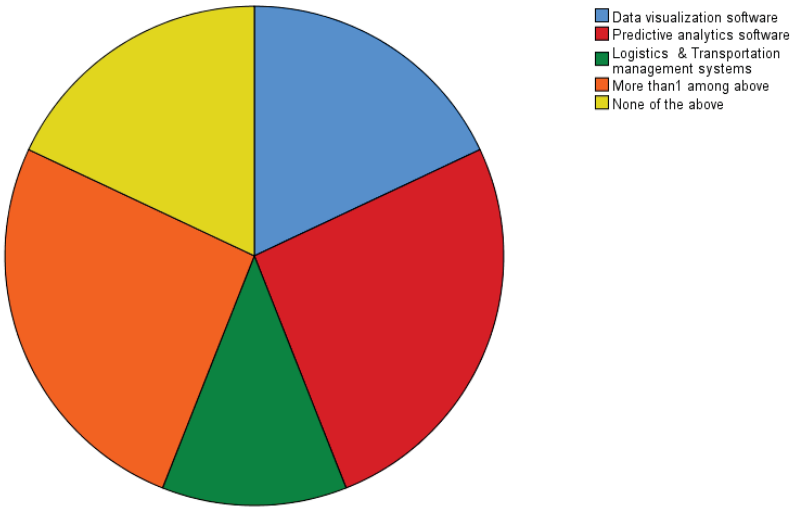

Fig. 2: Types of BI tools used by respondents

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This figure 2 presents the frequency and percentage of responses to a question asking what specific business intelligence tools individuals have used or are currently using in a sample of 50 individuals. There are five categories of BI tools presented in this table: data visualization software, predictive analytics software, logistics and transportation management systems, more than one of the above, and none of the above. Out of the 50 individuals, 9 (or 18%) reported using data visualization software, 13 (or 26%) reported using predictive analytics software, and 6 (or 12%) reported using logistics and transportation management systems. Additionally, 13 (or 26%) reported using more than one of the above tools. Meanwhile, 9 (or 18%) reported not using any of the above tools. The valid percent refers to the percentage of responses that were valid and were included in the analysis.

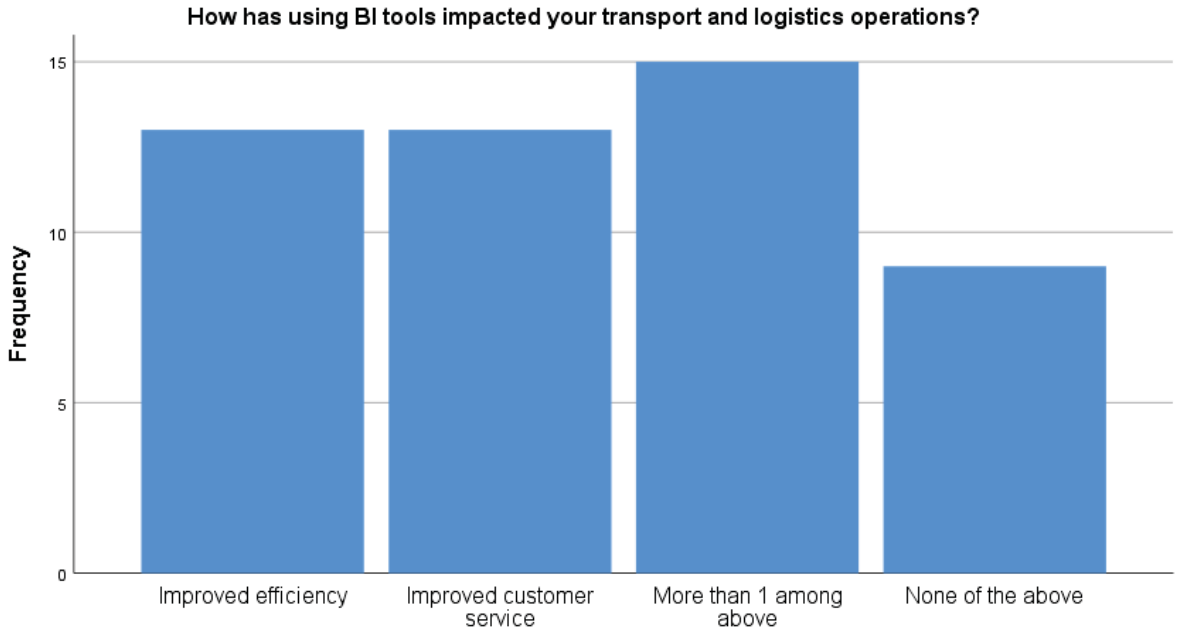

Fig. 3: Impact of BI tools usage in the Business

This figure 3 presents the frequency and percentage of responses to a question about the impact of using business intelligence (BI) tools on transport and logistics operations. The responses are grouped into four categories: improved efficiency, improved customer service, more than one of the above, and none of the above.

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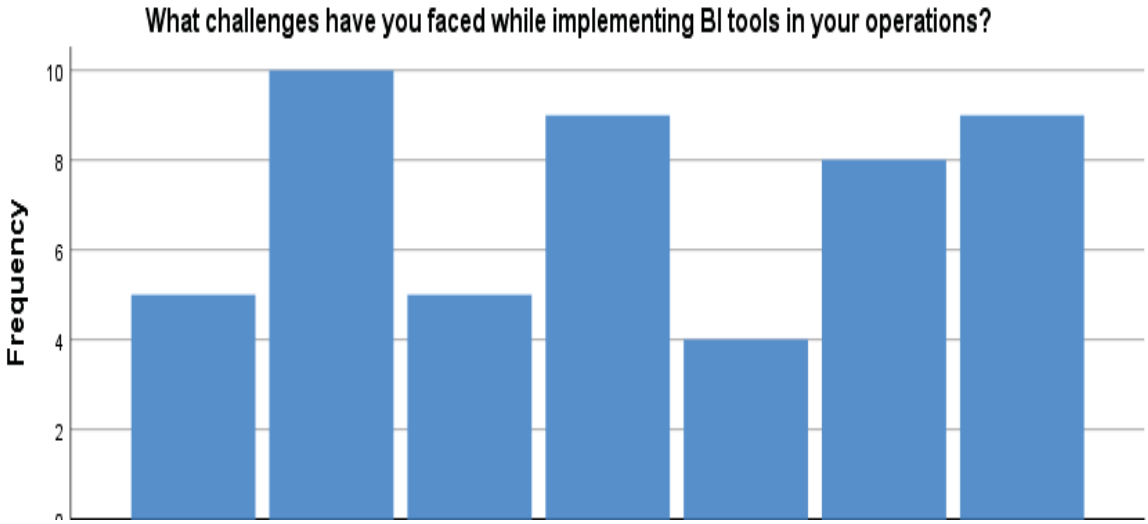

Fig. 4: Challenges faced in the implementation of the usage of BI tools

The responses are grouped into six categories starting from lack of technical expertise, data quality issues, integration with existing systems, cost of implementation, employee resistance to change, more than one amongst the above and the last category was none of the above. A seventh category, none of the above, was also included. Out of the 50 respondents surveyed, 10% (5) cited lack of technical expertise as a challenge faced during implementation. Meanwhile, data quality issues were identified as a challenge by 20% (10) of the respondents. Integration with existing systems was a challenge for 10% (5) of the respondents, while 18% (9) of the respondents cited cost of implementation as a challenge. 8% (4) of respondents identified employee resistance to change as a challenge. Additionally, 16% (8) of respondents faced more than one challenge during implementation. Finally, 18% (9) of respondents did not face any of the listed challenges.

Table 1: Frequency Distribution of Respondents According to Job Role

Job role					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Transport & Logistics manager	17	34.0	34.0	34.0

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	Operations manager	20	40.0	40.0	74.0
	Supply chain manager	13	26.0	26.0	100.0
	Total	50	100.0	100.0	

This table presents the frequency and percentage of job roles in a sample of 50 individuals. There are three job roles presented in this table: Transport & Logistics manager, Operations manager, and Supply chain manager. Of the 50 individuals, 17 (or 34%) identified as Transport & Logistics managers, 20 (or 40%) identified as Operations managers, and 13 (or 26%) identified as Supply chain managers. The valid percent refers to the percentage of responses that were valid and were included in the analysis. The cumulative percent shows the running total of valid percentages up to a given point. For example, the cumulative percent of Operations managers and Transport & Logistics managers combined is 74%, which means that 74% of the sample identified as one of these two job roles. The cumulative percent of all three job roles is 100%, which means that all responses were included in the analysis.

Table 2: Types of BI tools used by respondents

What specific BI tools have you used or are you currently using?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Data visualization software	9	18.0	18.0	18.0
	Predictive analytics software	13	26.0	26.0	44.0
	Logistics & Transportation management systems	6	12.0	12.0	56.0
	More than1 among above	13	26.0	26.0	82.0
	None of the above	9	18.0	18.0	100.0

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	Total	50	100.0	100.0	

This table presents the frequency and percentage of responses to a question asking what specific business intelligence tools individuals have used or are currently using in a sample of 50 individuals. There are five categories of BI tools presented in this table: data visualization software, predictive analytics software, logistics and transportation management systems, more than one of the above, and none of the above. Out of the 50 individuals, 9 (or 18%) reported using data visualization software, 13 (or 26%) reported using predictive analytics software, and 6 (or 12%) reported using logistics and transportation management systems. Additionally, 13 (or 26%) reported using more than one of the above tools. Meanwhile, 9 (or 18%) reported not using any of the above tools. The valid percent refers to the percentage of responses that were valid and were included in the analysis.

Table 3: Impact of BI tools usage in the Business

Impact of BI tools in your transport and logistics operations?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improved efficiency	13	26.0	26.0	26.0
	Improved customer service	13	26.0	26.0	52.0
	More than 1 among above	15	30.0	30.0	82.0
	None of the above	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

This table presents the frequency and percentage of responses to a question about the impact of using business intelligence (BI) tools on transport and logistics operations. The responses

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are grouped into four categories: improved efficiency, improved customer service, more than one of the above, and none of the above.

Table 4: Challenges faced in the implementation of BI Tools

What challenges have you faced while implementing BI tools in your operations?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lack of technical expertise	5	10.0	10.0	10.0
	Data quality issues	10	20.0	20.0	30.0
	Integration with existing systems	5	10.0	10.0	40.0
	Cost of implementation	9	18.0	18.0	58.0
	Employee resistance to change	4	8.0	8.0	66.0
	More than 1 among above	8	16.0	16.0	82.0
	None of the above	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

The responses are grouped into six categories: lack of technical expertise, data quality issues, integration with existing systems, cost of implementation, employee resistance to change, and more than one of the above. A seventh category, none of the above, was also included. Out of the 50 individuals surveyed, 10% (5) cited lack of technical expertise as a challenge faced during implementation. Meanwhile, data quality issues were identified as a challenge by 20% (10) of the respondents. Integration with existing systems was a challenge for 10% (5) of the respondents, while 18% (9) of the respondents cited cost of implementation as a challenge. 8% (4) of respondents identified employee resistance to change as a challenge. Additionally,

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16% (8) of respondents faced more than one challenge during implementation. Finally, 18% (9) of respondents did not face any of the listed challenges.

Conclusion- Future Perspectives

Business Intelligence in Transport and Logistics is a rapidly growing field that can bring considerable value to businesses across the transport and logistics industry. By leveraging advanced data analytics techniques, companies are able to increase efficiency, make more informed decisions, reduce costs, improve customer service levels and ultimately become more competitive in their respective markets. As technology continues to evolve over time, we look forward to witnessing further advancements in this domain and exploring new ways of leverage. BI is not limited to only these areas; it has a huge scope in going business intelligence for success. The objective of a multi-criteria decision-making approach to transport and logistics based on business intelligence can help organizations in the transport and logistics sector make informed decisions by considering multiple criteria simultaneously. The approach utilizes business intelligence techniques to collect and analyze data from various sources, such as customer preferences, operational efficiency, and cost-effectiveness. The study concludes that a multi-criteria decision-making approach helps decision-makers to identify and prioritize alternatives based on various criteria and make optimal decisions that align with the organization's goals and objectives. By utilizing this approach, organizations can optimize their transport and logistics operations, reduce costs, and improve customer satisfaction.

Data quality issues and cost of implementation are the two major factors which was found to be the challenge when using business intelligence (BI) tools, as the accuracy and reliability of the data are essential for generating meaningful insights and making informed decisions. To overcome data quality issues, it is essential to implement data governance practices and establish data quality standards. Data governance involves the creation of policies and procedures for managing data, while data quality standards define the criteria for acceptable data quality. Additionally, implementing data validation checks, regular data audits, and using data cleaning techniques can help to ensure that the data is accurate, consistent, and complete.

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