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BUSINESS INTELLIGENCE ADOPTION IN LOGISTICS: AN EMPIRICAL SWOT/TOWS-BASED STRATEGIC ANALYSIS

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Purpose: This study examines the adoption of Business Intelligence (BI) in logistics enterprises and aims to identify internal and external determinants of BI adoption using a SWOT framework and to assess how BI supports digital transformation in logistics.
Design/methodology/approach: A qualitative research design was applied, combining a literature review with empirical data from 30 logistics professionals. Responses were analyzed using thematic analysis with hybrid inductive/deductive approach. A weighted SWOT matrix was developed to assess strengths, weaknesses, opportunities, and threats, and to derive strategic implications for BI adoption.
Findings: Key internal and external factors influencing the effective implementation of Business Intelligence (BI) tools in logistics operations were identified. Inter-action analysis between these factors showed that defensive strategy is recommended for the logistics sector regarding the adaptation of BI solutions.
Research limitations/implications: The study is limited by its qualitative scope and geographically concentrated sample. Further quantitative and cross-country research is recommended to validate the relationship between BI maturity and logistics performance.
Practical implications: Organizations should invest in analytical capability development training programs to bridge the gap in analytical competencies among staff, integrated data infrastructures, and coherent BI strategies to strengthen competitiveness and long-term resilience.
Social implications: Enhanced BI-driven efficiency contributes to reduced resource waste, improved supply chain reliability, and more sustainable logistics operations.
Originality/value: The study provides a weighted SWOT/TOWS empirical assessment of BI adoption in logistics, offering strategic insights grounded in expert evidence.
Keywords: Business Intelligence (BI), Logistics Management, Digital Transformation, Technology Adoption.
Category of the paper: Research Paper.

1. Introduction

In recent years, digital transformation has become a strategic priority for logistics enterprises, which face mounting pressure for speed, accuracy, and adaptability driven by more demanding customer expectations and increasingly complex supply chain structures. Within this context, Business Intelligence (BI) is increasingly recognized as a capability that allows logistics organizations to convert operational data into timely, actionable knowledge. Despite the growing interest in BI adoption, the internal and external factors that determine its successful implementation, particularly within a logistics-specific setting, remain insufficiently understood, which constitutes the rationale for the present study.

This study aims to identify and assess the internal and external factors influencing the adoption of BI in the logistics sector, and to determine the strategic direction indicated by their interaction, using a weighted SWOT/TOWS methodology. The qualitative research design combining a literature review with an empirical survey among 30 logistics professionals was applied, with results processed through a weighted SWOT/TOWS analysis. Compared with existing, largely descriptive studies on BI adoption, the present analysis introduces a quantified weighting mechanism into the SWOT/TOWS framework applied specifically to a Logistics 4.0 context, which underlines the novelty of the results presented. The following section reviews the current state of the research field concerning BI adoption in logistics and positions this study within it.

1.1. Selected issues of BI adoption

In recent years, the logistics sector has undergone a profound transformation driven by rapid technological development (Vicente et al., 2024). The globalization of supply chains combined with rising customer expectations influence overall design of those (Golabek et al., 2021). The era of linear, stable logistics operations has given way to highly dynamic, data-intensive networks, where timely, accurate, and informed decision making has become a key factor in determining the competitive advantage (Kozhamkulova et al., 2024). Research conducted by Kozhamkulova et al. (2024) reveals that advanced decision-making processes within logistics supply chains can be supported by Intellectual Decision-Making System (IDMS). Such approach can be incorporated within existing Logistic Business Process Management System (LBPSMS). Research emphasizes profound impact of IDMS on decision making process within supply chains. In this context, Business Intelligence (BI) solutions are becoming strategic tools that enable logistics organizations not only to monitor and control operational processes, but also to predict, optimize, and automate them in increasingly complex environments (Iliashenko et al., 2022). Research conducted by Pancić et al. (2023) presents that the Business Intelligence has a direct and major influence on firm performance. Moreover, research by (Pancić et al., 2023) proved that the adoption of big data analytics and blockchain

technology signified and positively mediated the relationship between business intelligence and firm performance.

The role of Business Intelligence (BI) is to fill the gap between raw data and decision-making process (Bolsunovskaya et al., 2023). BI tools enable organizations to transform data into structured knowledge through KPI dashboards, visualizations, data modelling, predictive forecasting, and prescriptive optimization. Their application is no longer limited to the highest management level. According to research conducted by Srikanth research (Srikanth Yerra, 2025) one from the BI solutions which is Microsoft Power BI connects with databases such as SQL Server and cloud platforms like Microsoft Azure, allowing businesses to track inventory levels, predict demand, and streamline warehouse operations using interactive BI dashboards. These technologies are increasingly being implemented in everyday logistics processes, providing planners, dispatchers, warehouse managers, and transport coordinator with real time and accurate information (Srikanth Yerra, 2025).

BI tools are conditioned by logistics process data availability. The quality of data provided for creation of BI dashboards and further analysis is also essential fac-tor (Sorour, Atkins, 2024). The inclusion of BI tools in the decision-making process requires continuous efforts to increase the degree of digitization of processes within the supply chain (Mesa et al., 2022). The study of low-code and no-code platforms has shown that there are many tools on the market that allow users to quickly create applications without using code or with its minimal use. Thanks to this, users without programming skills can create their own solutions and streamline their business processes (Domański et al., 2023). The digitization of supply chains has a positive impact on decision-making based on iterative simulations. Optimization of liquid transport services using ArcGIS tools has shown that data availability and appropriate aggregation is an essential condition (Dubisz et al., 2025). Research conducted by Adamczak et al. (2025) indicates that improvement of process parameterization and inclusion of data exploited within the Internet of Things (IoT) network allows not only for better decision-making, but also for the mitigation of the carbon footprint of logistics processes. Structured and aggregated data can feed dashboards of KPIs supported by BI tools.

Current research trends emphasize the significant role of BI tools in the decision-making process. Continuous improvement of the degree of digitization of logistics processes is important to enable the adoption of advanced BI solutions. Therefore, it allows for visualization and dynamic determination of KPIs that are crucial from perspective of decision-making process.

However, the adoption of Business Intelligence solutions is not just a technological process. It is a profound, organizational transformation that affects data management, employee competencies, operational culture, and strategic planning. It requires organizations to rethink how they collect, store, share, and interpret information. Effective BI adoption requires not only technical infrastructure, but also the development of analytical maturity which is a transition from descriptive reporting to diagnostic, predictive, and prescriptive functions.

The analysis of research data confirms that Business Intelligence systems are becoming a critical element of digital transformation in transport and logistics enterprises. Drawing on the case study by (Vicente et al., 2024) and the qualitative findings presented in this research, the results consistently demonstrate that BI tools significantly influence operational efficiency, strategic decision-making, and competitive advantage within Logistics 4.0 environments.

In the Portuguese logistics operator examined by (Vicente et al., 2024), sixty-one experts from five departments, including logistics, transport, finance, innovation, and central services, participated in two Delphi rounds. The consensus results revealed that BI is perceived as a key strategic asset when aligned with the company's goals and management priorities. Top management support and employee engagement were identified as decisive factors for successful BI adoption. Respondents emphasized the need for investment in data infrastructure and user training to optimize BI use. BI adoption has led to improved data transparency, process monitoring, and decision speed, particularly in logistics operations such as transport scheduling and warehouse control. Leadership commitment to innovation was found essential for sustaining BI-driven competitiveness. The findings confirm that BI contributes to more accurate performance tracking, cost reduction, and greater operational agility.

At the operational level, BI tools facilitate real-time visibility across supply chain processes, optimization of route planning and resource allocation, reduction of delays, stockouts, and excess inventory, as well as improved coordination with suppliers and customers through shared analytics platforms (Jafari et al., 2023). At the strategic level, BI enables scenario modelling and risk forecasting, data-driven decision-making that reduces uncertainty, integration of performance information into long-term planning, and support for innovation and strategic agility (Jafari et al., 2023). Respondents also reported faster decision cycles and higher confidence in analytical outcomes, echoing (Jafari et al., 2023), who found that BI has the greatest positive impact on supply chain integration and agility.

Despite these benefits, several limitations were observed. Among the most significant challenges observed by Iliashenko et al. (2022) were technological barriers, including data fragmentation and incompatibility among legacy systems; financial constraints, as BI adoption often requires significant investment; hu-man and organizational challenges, such as lack of analytical skills and cultural resistance to data-driven practices; and security and privacy concerns, particularly regarding sensitive logistics and customer data. These challenges are consistent with the barriers noted by Iliashenko et al. (2022) and the SWOT analysis within this research, which underlines that cultural adaptation and continuous user training are as critical as the technology itself.

1.2. Research Gap and Research Questions

Research conducted by (Muniswamaiah et al., 2019) proves that data analytics and Business Intelligence (BI) are essential components of decision support technologies that gather and analyze data for faster and better strategic and operational decision making in an organization.

Organizations with low BI integration reported a Supply Chain Agility Score (SCAS) of 58. This figure increased to 73 at medium BI maturity and peaked at 88 for high integration (Usman, Moinuddin, 2025). This trend aligns with the findings of (Wamba et al., 2017), suggesting that real-time data visibility and advanced forecasting tools significantly enhance supply chain responsiveness and resource reallocation. Despite the increasing usage of BI solutions in logistics, there is still limited insight into how these systems are adopted and used within logistics-specific operational and decision-making context. Existing studies rarely address the distinctive characteristics of logistics operations such as time-critical decisions, complex supply chain coordination, and high process interdependence. Empirical evidence documenting practical experiences with BI adoption in logistics remains partial, especially regarding identifying strengths, weaknesses, opportunities, and threats related to BI adoption in this sector. As a result, there is insufficient understanding of the internal and external factors that influence the effective adoption of BI solutions in logistics companies.

Based on conducted literature research following Research Questions has been outlined:

RQ1: What internal and external factors influence the successful adoption and integration of Business Intelligence tools in logistics operations?

RQ2: What is the recommended strategy for adapting BI solutions in the logistics sector?

2. Methods

2.1. Research Design

The research process initiates with the clarification of the scope, establishing the boundaries of the investigation. This foundational phase operationalizes the study's objectives into two distinct Research Questions (RQs) tailored to the logistics sector:

RQ1 – Identifies the strengths, weaknesses, opportunities, and threats of BI implementation, and explores mitigation strategies for the identified risks.

RQ2 – Determines the most effective strategic approach for adaptation of BI solutions within the logistics sector.

Following the formulation of research questions, the methodology focuses on two concurrent data collection streams which are literature review and qualitative research. The review of existing academic and industry literature was conducted to identify current practices and examples of Business Intelligence (BI) usage and adaptation processes within logistics companies. Additionally, primary data was collected through a dedicated online survey consisting of both closed-ended and open-ended questions, allowing participants to provide structured responses as well as more detailed qualitative insights.

Furthermore, the findings from the primary qualitative research are analyzed and then compared with the findings from the literature review. This step in-volves triangulating empirical data with established theoretical frameworks to validate results and identify gaps or consistencies.

Based on the synthesized results from qualitative research and literature comparison, an analysis is conducted with usage of SWOT. This framework is used to categorize findings into Strengths, Weaknesses, Opportunities and Threats. This analysis supports providing a structured assessment of BI adaptation in the target sector.

The final stage involves definitive conclusions from the SWOT/TOWS analysis and prior findings. These conclusions form the basis for practical recommendations for logistics companies, regarding the adoption and usage of BI solutions. To visualize the logic behind this research, Figure 1 presents further research steps covered within this paper.

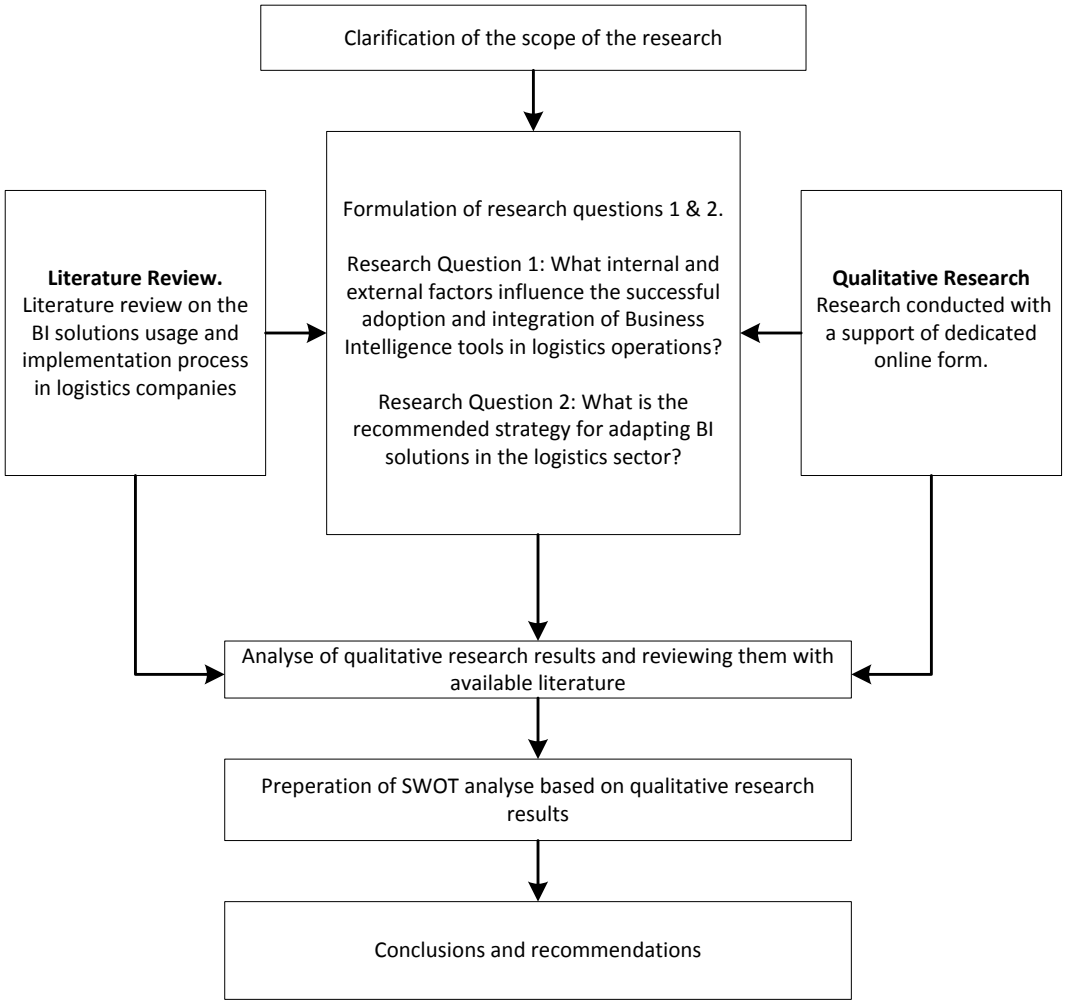

Figure 1. Research methodology.

Source: own elaboration.

The methodological steps presented in Figure 1 were systematically applied throughout the empirical phase of the study. After formulating the research questions and reviewing the relevant literature, the empirical study began with the development of a qualitative questionnaire designed to collect primary data consistent with the study's objectives. The questionnaire was then distributed to selected participants, and the collected responses formed the basis for subsequent stages of data analysis and interpretation, as described in the following sections.

2.2. Data Collection and Data Analysis

As stated in Research Methodology section, this study employed a qualitative research approach to explore the adoption, usage, and impact of Business Intelligence (BI) solutions in logistics companies. Qualitative research was selected as the most appropriate approach due to the exploratory nature of the study and the need to obtain in-depth insights into complex organizational processes, operational challenges, and decision-making practices. The analysis has been further parameterized to determine the significance of the responses obtained. Therefore, a Likert scale has been employed in the evaluation of the results. Research conducted by Tu (2018) indicates a high degree of applicability of the Likert scale in analyzing quantitative research results in the field of Internet of Things (IoT) adaptability within supply chains. The extensive application of this scale in research validates the results obtained.

This approach allowed respondents to participate at their convenience and provide thoughtful, reflective answers (Chambers, 1997). Electronic interviews produced rich textual data suitable for rigorous qualitative analysis and enabled inclusion of geographically dispersed professionals from multiple logistics companies. The qualitative design captured participants' responses while accounting for geography, group structure, and economic sector.

The research was conducted among 30 representatives of various logistics companies. Table 1 shows the size of the companies from which the experts came. Approximately 43% of the experts came from large enterprises with more than 250 employees.

Table 1.
Distribution of responses categorized by size of the company

Size of the company	Number of survey participants
Micro enterprise (less than 10 employees)	0
Small enterprise (from 10 to 49 employees)	10
Medium enterprise (from 50 to 249 employees)	7
Large enterprise (more than 250 employees)	13

Source: Authors' own work.

The research covered employees of companies whose activities are based on logistics operations. These were companies involved in warehousing, goods transport, and e-commerce. Research participants represented logistic oriented companies of various scopes of operation. Summary of the expert's logistics company types were transportation companies, warehousing oriented companies, supply replenishment companies. All of those operate as Third Party Logistics (3PL) services suppliers.

The data collection tool used in this study allowed research participants to choose one of four preset answers and add free-text explanations, which encouraged elaboration on individual experiences, operational examples. To ensure a structured and systematic analysis, participants were categorized according to their level of knowledge and experience with BI solutions. This categorization was designed to provide context for interpreting responses and to allow comparison of perspectives across all levels of experts. Definition of each expert group is presented in Table 2.

Table 2.
Explanation of the participants' process awareness

Process awareness of participants involved in research	Description
No knowledge of BI solutions	Respondents with no prior exposure to or familiarity with BI tools or concepts. Answers and comments of participants from this group were not included in further analyses.
Incomplete knowledge	Individuals with fragmentary or superficial understanding of BI, often informed by general impressions or indirect experiences. Answers and comments of participants from this group were not included in further analyses.
Basic knowledge	Participants familiar with fundamental BI functions and capabilities but lacking extensive experience in practical application. Answers and comments of participants from this group were not included in further analyses.
Extended knowledge and skills	Respondents with comprehensive understanding and hands-on experience using BI solutions. Insights from this group illuminated advanced operational applications, process optimizations, and organizational impacts.
Expert level knowledge and skills	Specialists proficient in BI tools, methodologies, and adoption strategies, capable of providing deep technical insights and strategic perspectives. This group's responses were particularly valuable in identifying advanced analytics opportunities, integration strategies, and organizational best practices.

Source: Authors' own work.

The purpose of conducting the categorization was to identify the most experienced participants, whose responses possess the highest substantive value. Additionally, the categorization aimed to distinguish less experienced experts, to as-sign lower analytical significance to their responses in the SWOT analysis. The process also enabled the determination of the structure of the group participating in the study and provided insights into the overall level of familiarity with Busi-ness Intelligence (BI) tools among employees of the enterprises. Figure 2 represents the structure of experts involved in this qualitative research. Breakdown of expert's structure refers to their knowledge level.

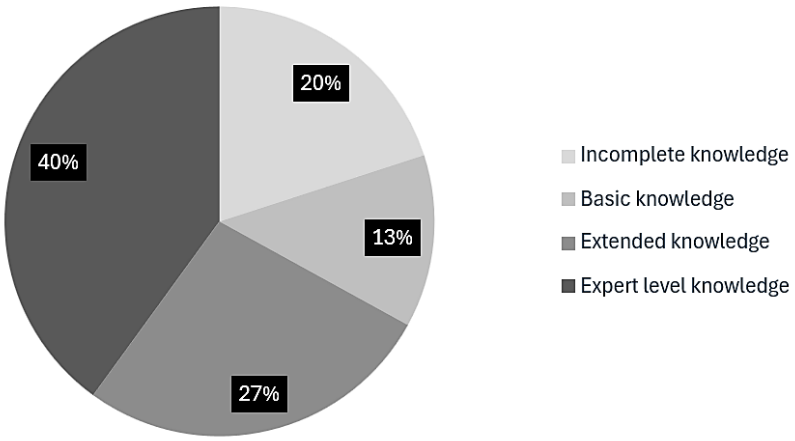

Figure 2. Respondents' level of knowledge about Business Intelligence solutions.

Source: Authors' own work.

20 respondents, representing 67% of qualitive research participants, had expert or advanced knowledge of BI. Their responses were considered in further conclusions and in the preparation of the SWOT analysis. A total of 30 respondents from companies operating in the logistics industry with varying levels of BI solution utilization took part in the survey. Table 3 presents the numerical distribution of participants' knowledge in the field of BI.

Table 3.
Distribution of responses categorized by level knowledge

BI knowledge level	Number of survey participants
No knowledge	0
Incomplete knowledge	6
Basic knowledge	4
Extended knowledge	8
Expert level knowledge	12

Source: Authors' own work.

The study involved a series of steps. A preliminary set of questions was created and adapted for further qualitative research. A crucial element was the selection of study participants. It was important that their responses reflected their aware-ness, knowledge, and use of BI tools in logistics. The data from the responses was then collected and subjected to thorough analysis. The results were used in the section containing the conclusions. Figure 3 presents detailed framework of the research below.

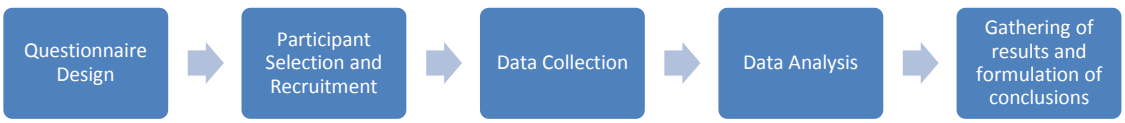

Figure 3. Qualitative research framework.

Source: Authors' own work.

Questionnaire Design – The questionnaire was developed based on a thorough review of the literature on BI in logistics and preliminary consultations with subject-matter experts. Questions were designed to explore three key dimensions: operational usage, decision-making impacts, and barriers/challenges to adoption.

Participant Selection and Recruitment – Respondents were recruited from large logistics companies known to implement or explore BI solutions. Selection criteria emphasized diversity in organizational size, operational scope, and respondent roles to capture a broad range of experiences.

Data Collection – Participants were invited to complete the electronically assisted questionnaire at their convenience, allowing ample time for reflection. Responses were collected in textual form, enabling detailed qualitative coding and thematic analysis.

Data Analysis – Responses were analyzed using thematic analysis, a systematic approach to identifying, analyzing, and reporting patterns within qualitative data. The analysis involved coding textual data, grouping codes into categories, and synthesizing them into broader themes related to BI usage, benefits, challenges, and best practices. Special attention was given to cross-group comparisons to explore how perceptions and experiences varied by respondent expertise.

To ensure methodological transparency and analytical consistency, the qualitative responses collected from selected participants of the interview were analyzed using a structured thematic approach. The coding process was designed to identify patterns in expert opinions regarding the adoption, impact, and challenges of BI solutions within logistics organizations.

The coding framework was developed through a hybrid inductive/deductive approach described in more detail by (Naeem et al., 2023). First of all, broad analytical categories were derived from the research questions, literature review, and open-ended answers of interview participants. These predefined categories served as a basis for structuring the qualitative data. Afterwards, during the analysis of the experts' responses, additional themes and subcategories emerged from the data and were incorporated into the coding structure to better reflect the respondents' perspectives.

The final coding scheme consists of three hierarchical analytical levels:

- Primary analytical dimensions (Level 1) – statements and opinions of experts from categories:
  - General knowledge about BI.
  - User Experience.
  - Benefits and Opportunities.
  - Challenges and Barriers.
  - Future Perspectives.
- Thematic categories (Level 2) – selection of keywords based on statements and opinions of experts' analysis.
- Operational codes and indicators (Level 3) – conversion of keywords into the codes which allowed to assign the results to SWOT matrix.

Table 4 presents a structured coding procedure based on statements and expert quotations, keywords, a summarized code, and the corresponding SWOT category.

Strengths (S) highlighted the benefits and internal capabilities of BI adoption, s uch as improved decision making (S1), operational efficiency (S2), wide BI applications (S3), high employee BI knowledge (S4), and improved internal data quality (S5).

Weaknesses (W) identified internal challenges and limitations, including uneven BI expertise across departments (W1), operational efficiency (W2), data sharing barriers due to system fragmentation (W3), limited use of advanced analytics (W4), and the lack of a consistent BI strategy (W5).

Opportunities (O) focus on potential areas for growth and enhancement, such as integrating BI with automation technologies to streamline logistics operations (O1), gaining competitive advantage through effective BI use (O2), establishing an integrated data environment (O3), developing predictive analytics and AI capabilities (O4), and strengthening employee BI skills through training pro-grams (O5).

Threats (T) address external risks and organizational constraints, including technology volatility requiring continuous system updates (T1), cultural resistance to data-driven decision-making (T2), high implementation costs (T3), the risk of incorrect decision-making from data misinterpretation (T4), and data security concerns arising from increased reliance on analytics (T5).

Table 4.
Structure coding procedure

Statement/Expert quotation	Keywords	Code	SWOT category
"Thanks to BI dashboards we can monitor logistics performance almost in real time, which improves strategic planning and operational decision-making"	BI dashboards, real time, strategic planning, operational decision-making	Improved decision-making	S1
"Using BI reports helped us identify bottlenecks in transport planning and warehouse operations"	BI reports, identify bottlenecks, transport planning, warehouse operations	Operational efficiency	S2
"BI tools support many logistics activities, including demand forecasting, route optimization and warehouse analysis"	BI tools, demand forecasting, route optimization, warehouse analysis	Wide BI applications	S3
"Many employees are familiar with BI platforms and can independently analyze operational data"	employees, BI platforms, independently analyze, operational data	High BI knowledge	S4
"The availability and quality of internal logistics data has improved in recent years"	availability, quality, internal logistics data	Improved internal data quality	S5
"The level of BI knowledge varies across departments (some teams use it actively while others struggle with dashboards)"	BI knowledge, varies across departments, struggle with dashboards	Uneven BI expertise	W1
"BI tools are implemented only in selected areas of the organization, which limits the overall benefits"	BI tools, selected areas of the organization, limits the overall benefits	Incomplete BI adoption	W2

Cont. table 4.

"Data sharing between logistics units is sometimes problematic due to system fragmentation"	Data sharing, logistics units, system fragmentation	Data sharing barriers	W3
"Most analyses focus on basic reporting rather than predictive or advanced analytics"	basic reporting, predictive, advanced analytics	Limited advanced analytics	W4
"Different departments implement BI solutions independently because of not consistent BI strategy"	departments, independently, lack of a consistent BI strategy	Lack of BI implementation strategy	W5
"Combining BI with automation technologies could improve logistics operations"	BI, automation technologies, improve logistics operations	Logistics process automation	O1
"Organizations that effectively use BI gain a clear competitive advantage in the logistics market"	use BI, competitive advantage, logistics market	Increased competitiveness	O2
"Integrating data from multiple systems and external sources would improve logistics analytics"	Integrating data, multiple systems, external sources	Integrated data environment	O3
"Predictive analytics and AI could support demand forecasting and improve logistics planning"	Predictive analytics, AI, demand forecasting, logistics planning	Development of predictive analytics	O4
"Training programs could improve employees' ability to use BI tools effectively"	Training programs, employees, BI tools	BI skills development	O5
"The rapid pace of technological change means BI systems must be continuously updated"	technological change, BI systems, continuously updated	Technology volatility	T1
"Some employees resist shifting toward a data-driven decision-making culture"	employees, resist, data-driven decision-making culture	Cultural resistance	T2
"Adaptation of BI solution requires financial resources"	Adaptation, BI solution, financial resources	High BI adaptation cost	T3
"If users misinterpret the data, BI reports may lead to incorrect managerial decisions"	misinterpret the data, BI reports, incorrect managerial decisions	Risk of incorrect interpretation	T4
"Increasing reliance on data analytics also increases concerns related to cybersecurity and data protection"	data analytics, cybersecurity, data protection	Data security risks	T5

Source: Authors' own work.

Results of the response analysis were incorporated into SWOT matrix. Below Table 5 shows experts' answers categorization for each category. It was further supplemented with the actual weight of each parameter decided by answers from experts in the survey. The weight assigned to each parameter within a given SWOT category was calculated as the relative share of expert responses coded to that specific factor, expressed as the number of responses assigned to the factor divided by the total number of responses classified within the same category. This normalization procedure ensured that the weights within each category summed to 1.00 and reflected the relative importance experts attributed to each identified strength, weakness, opportunity, and threat.

Table 5.
SWOT matrix of BI adoption in logistics based on expert responses

	Strengths	Weight		Weaknesses	Weight
S1	Improvement of strategic and operational decision-making processes	0.30	**W1**	Uneven level of BI expertise	0.45
S2	Increased operational efficiency	0.20	**W2**	Partial/incomplete adoptions within the organization	0.10
S3	Wide range of BI applications in logistics	0.10	**W3**	Potential data sharing issues	0.10
S4	High level of BI knowledge among logistics company employees	0.30	**W4**	Limited use of advanced analytics	0.10
S5	Enhanced quality and availability of internal data	0.10	**W5**	Lack of a consistent strategy for implementing BI across the organization	0.25
	Sum	1.00		Sum	1.00
	Opportunities	**weight**		**Threats**	**Weight**
O1	Automation of logistics processes	0.30	**T1**	Technology volatility	0.20
O2	Increased competitiveness using BI	0.35	**T2**	Organizational resistance to changing work culture	0.30
O3	Integration of data from multiple sources	0.10	**T3**	Costs of implementing comprehensive BI solutions	0.15
O4	Development of predictive analytics and AI	0.10	**T4**	Risk of misinterpreting data	0.15
O5	Education and development of employee competencies	0.15	**T5**	Data security	0.20
	Sum	1.00		Sum	1.00

Source: Authors' own work.

The following research involved a thorough analysis of the experts' responses. Table 6 analyzes interactions connected to strengths and opportunities. For each parameter indicated by the experts, a value of '1' was assigned to indicate mutual interdependences. In the case of no interdependence identified, a value of '0' was selected. For each parameter, the number of interactions was calculated, and their number was referred to the defined weights. As a result, the coefficient of weight and interaction was determined for the expert's parameters identified as strengths and opportunities.

Table 6.
Strengths and Opportunities parameter coefficient of weight and interaction calculation

Strengths / Opportunities	O1	O2	O3	O4	O5	Weight	Number of interactions	Weight and interaction product	Rank
S1	1	1	1	1	1	0,30	5	1,50	1
S2	1	1	0	1	0	0,20	3	0,60	3
S3	1	1	1	1	1	0,10	5	0,50	4
S4	0	1	1	1	1	0,30	4	1,20	2
S5	1	1	1	1	1	0,10	5	0,50	4
Weight	0,30	0,35	0,10	0,10	0,15				
Number of interactions	4	5	4	5	4				
Weight and interaction product	1,20	1,75	0,40	0,50	0,60				

Cont. table 6.

Rank	2	1	5	4	3				
Total interactions							**22**		
Sum of products								**4,30**	

Source: Authors' own work.

Subsequent calculation was made for Strengths and Threats parameters identified during the research. Detailed information has been presented in the following Table 7. It has been observed that coefficient shows a higher value compared with S/O parameters comparison.

Table 7.
Strengths and Threats parameter coefficient of weight and interaction calculation

Strengths / Threats	T1	T2	T3	T4	T5	Weight	Number of interactions	Weight and interaction product	Rank
S1	1	1	0	1	1	0,30	4	1,20	2
S2	0	1	1	1	1	0,20	4	0,80	3
S3	1	1	1	1	1	0,10	5	0,50	4
S4	1	1	1	1	1	0,30	5	1,50	1
S5	1	1	1	1	1	0,10	5	0,50	4
Weight	0,20	0,30	0,15	0,15	0,20				
Number of interactions	4	5	4	5	5				
Weight and interaction product	0,80	1,50	0,60	0,75	1,00				
Rank	3	1	5	4	2				
Total interactions							**23**		
Sum of products								**4,50**	

Source: Authors' own work.

Table 8 presents the results of the comparison between weaknesses and opportunities identified in the research. The calculated coefficients made it possible to rank the weaknesses according to how strongly they interact with the opportunities.

This ranking shows which weaknesses have the greatest impact with the identified opportunities. The total number of interactions shown in the table is higher than in previous comparisons which shows stronger correlation between the analysed parameters.

Table 8.
Weaknesses and Opportunities parameter coefficient of weight and interaction calculation

Weaknesses / Opportunities	O1	O2	O3	O4	O5	Weight	Number of interactions	Weight and interaction product	Rank
W1	1	0	0	1	1	0,45	3	1,35	1
W2	1	1	1	1	1	0,10	5	0,50	3
W3	0	1	1	1	0	0,10	3	0,30	5
W4	0	1	1	1	1	0,10	4	0,40	4
W5	1	1	1	1	1	0,25	5	1,25	2
Weight	0,30	0,35	0,10	0,10	0,15				
Number of interactions	3	4	4	5	4				

Cont. table 8.

Weight and interaction product	0,90	1,40	0,40	0,50	0,60				
Rank	2	1	5	4	3				
Total interactions							**20**		
Sum of products								**3,80**	

Source: Authors' own work.

Table 9 presents the comparison between weakness and threats identified during the research. The obtained results made it possible to rank the weaknesses according to their level of interaction with the threats. This ranking shows which weaknesses have the strongest influence in relation to the identified threats. The overall number of interactions is the higher compared to previous comparisons, which suggests a strong level of interdependence between the analyzed parameters.

Table 9.
Weaknesses and Threats parameter coefficient of weight and interaction calculation

Weaknesses / Threats	**T1**	**T2**	**T3**	**T4**	**T5**	**Weight**	**Number of interactions**	**Weight and interaction product**	**Rank**
W1	1	1	1	1	1	0,45	5	2,25	1
W2	1	1	1	1	1	0,10	5	0,50	3
W3	1	1	1	1	1	0,10	5	0,50	3
W4	0	1	1	1	1	0,10	4	0,40	4
W5	1	1	1	1	1	0,25	5	1,25	2
Weight	0,20	0,30	0,15	0,15	0,20				
Number of interactions	4	5	5	5	5				
Weight and interaction product	0,80	1,50	0,75	0,75	1,00				
Rank	3	1	4	4	2				
Total interactions							**24**		
Sum of products								**4,90**	

Source: Authors' own work.

In order to ensure analytical consistency, the interactions identified within the TOWS framework were examined using a methodological approach analogous to that applied in the SWOT analysis. Specifically, pairwise relationships between internal and external factors were systematically evaluated to determine both the frequency and the weighted significance of their interactions. The resulting syn-thesis, presented in Table 10, provides a structured comparison across four strategic archetypes: aggressive (SO), competitive (WO), conservative (ST), and defensive (WT).

Table 10.
Selecting a strategy based on the analysis results

	Opportunities (O)	**Threats (T)**
Strengths (S)	Aggressive Strategy	Conservative Strategy
Total interactions	38	37
Sum of products	8,00	7,30
Weaknesses (W)	Competitive Strategy	**Defensive Strategy**
Total interactions	32	**43**
Sum of products	6,30	**8,60**

Source: Authors' own work.

The collected information was analyzed in the subsequent part of the study. Further conclusions were drawn based on SWOT/TOWS analysis. The coefficient of weight and interaction calculated for each category of parameters allowed for the identification of the conditions for the use of BI tools. Capturing the practical perspective of experts from logistics sector is essential to ensure the relevance and usability of the research results.

3. Results and Discussion

The defensive strategy received the highest score, showing that most logistics companies currently operate in an environment with many external threats and internal challenges. This means that companies are focused on stability, reducing risks and improving efficiency rather than seeking aggressive strategy of implementation.

Experts pointed out that defensive strategy reflects the current stage of BI development in logistics. Many organizations use BI mostly for monitoring, reporting, and improving internal visibility rather than for advanced predictive analytics. Despite this cautious approach, the results show that the use of Power BI tools already helps companies make better decisions, improve process transparency, and reduce errors in daily basic operations.

Across all participating companies, BI was identified as a standard component of management and operational practice. However, the depth of BI integration varied: most organizations used descriptive and diagnostic analytics, such as standard dashboards and key performance indicators, while only a limited number implemented predictive and prescriptive analytics powered by artificial intelligence or machine learning.

The dominance of the defensive approach suggests an important level of adaptation of BI solutions in supply chains that value stability and control. It also shows that companies are preparing solid analytical foundations for future growth when market conditions become more favorable.

Results of the research confirm that Business Intelligence provides tangible operational and strategic benefits, while it is full potential, will be realized through deeper digital integration, enhanced analytical maturity, and sustained organizational commitment to data-driven transformation.

These results directly address the research questions. The set of strength, weakness, opportunity, and threat factors identified and weighted in Table 5 answers RQ1, providing a structured picture of the internal and external factors that influence BI adoption in logistics operations. The clear dominance of the defensive strategy in the SWOT/TOWS analysis answers RQ2, indicating that a cautious, stability-oriented approach is the strategy currently recommended for BI adoption in the logistics sector.

4. Summary

The research confirms that the defensive approach is the primary strategic recommendation for the sector regarding the implementation and use of BI solutions. While this strategy also focuses on caution and stability, it also creates real potential for building a new form of competitive advantage in the future.

Results of qualitative research show that BI tools play a key role by allowing organizations to visualize data, monitor logistics processes in real time and make faster operational and strategic decisions. The research also identified that the main barriers to BI adoption are uneven knowledge levels, excessive costs, and challenges in data integration. These barriers can be overcome through systematic training and consistent digital strategies.

In the long term, defensive orientation can be transformed into a strategic advantage. By continuously improving their analytical proficiency and digital tools, logistics companies can turn operational stability into a strong and lasting competitive advantage.

In addition to the strategic conclusions presented above, several limitations of this study should be acknowledged. The most significant limitations of the research conducted include the territorial coverage of the experts. Nevertheless, increasing the number of experts participating in the research might increase the overall quality of the results and have a positive impact on the conclusions.

Because of the reason that data is sourced from experts representing different logistics companies, the results reflect a variety of organizational realities. Some of the assumptions might appear to contradict one another, however they highlight two different sides of same case, and their coexistence is a direct result of the diverse panel of experts consulted for analysis prepared in this study.

This study was conducted among experts from the logistics industry in Poland. However, identifying a broader European perspective and conducting the survey among experts from Western Europe is also essential for further research. Appropriately conducted research will allow to cover not only the local Polish context, but the entire European context, which will increase the value of the obtained results. It could also be relevant to assess the perspective of experts from other sectors of the economy.

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