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Leveraging Intellectual Capital to Enhance Organizational Efficiency in Public Sector Logistics Firms

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	Abstract
<p>Danish Maqsood Awan Research Scholar, Bahria University Karachi. danishawan567@gmail.com</p> <p>Asma Ahmad Faculty, Bahria University, Karachi, Pakistan</p> <p>Asmatullah Chaudhary Faculty, Bahria University, Karachi, Pakistan. Asmat.chaudhry@gmail.com</p>	<p>The continual inefficiencies in the Public Sector supply chains are observed to jeopardize optimal operational preparedness and mission efficiency, especially in the logistics setting in the public sector logistic firms that follow strict patterns and security limits. This paper discusses the issue of intellectual capital in improving organizational efficiency in the supply chain management of the public sector logistic stores in the Pakistan Public sector logistic firms. The study is based on the Resource-Based View (RBV) theory and explores the contribution of human, structural, and relational capital to the better performance of efficiency. The quantitative exploratory research design was used, and data were gathered by using structured questionnaires of 65 personnel engaged in procurement, inventory control, and logistics functions within the public sector logistic firms establishments. The proposed hypotheses were tested by multiple regression analysis. The result of the findings indicates that the intellectual capital explains 33.2 percent of the variations in the organizational efficiency. The strongest and statistically significant predictor turned out to be human capital, and this demonstrates the significance of the knowledge, skills, and experience of personnel. Relational capital had a minor positive influence, which means that there were partial advantages of coordination and collaboration, whereas structural capital was not significant, which can be interpreted as the lack of use of organizational systems and technologies. The theoretical contribution of the study, as it applies to the RBV and intellectual capital literature, is to apply the area to a scenario involving a Public sector logistic supply chain, and, more practically, provide evidence-based information to train, digitalize, and allocate strategic resources in the context of Public Sector logistics.</p>
Keywords	Intellectual Capital, Human Capital, Structural Capital, Relational Capital, Organizational Efficiency, Supply Chain Management, Public Sector Logistics, Resource-Based View, Public Sector Logistic Firms

1. Introduction

A lot of industries in the world are still experiencing inefficiencies in the way they operate due to uncertainty, constant disruption, lack of proper use of available resources, among others (Ali et al., 2022; Farooq, M., & Ahmad, 2023; Anser et al., 2024). These inefficiencies are highly pervasive in organizational performance and cost management as well as service delivery to both commercial, governmental (Farooq et al., 2023; Anser et al., 2025; Naeem et al., 2025; Naeem et al., 2024). The supply chains in an increasingly integrated global economy are vulnerable to geopolitical tensions, technological shocks, natural calamities, and pandemics that put the organization under a lot of pressure to perform effectively and responsibly. In logistics firms operational readiness, national security, and mission success have a direct correlation with supply chain efficiency, and thus inefficiency is not only an operational problem, but also a strategic one (Ali et al., 2024; Zheng et al., 2024; Naeem, 2023). Although these challenges are becoming increasingly recognized, and there is a significant investment in logistics technologies and process improvement efforts, the current supply chain systems do not tend to provide desired levels of efficiency. Fragmentation of processes, poor coordination, inflexible bureaucracies, and a lack of flexibility to adapt to changing operational conditions remain a thorn in the flesh of many organizations. Hierarchical command structure, extreme procedural control, and security restrictions further exacerbate these deficiencies in defense logistics by impeding the speed of decision-making and limiting the transfer of information. Consequently, existing strategies are often not enough to reduce delays, manage inventory levels, and provide resources on-time, and the impossibility of the traditional and technology-oriented strategies when implemented separately is emphasized (Sharma et al., 2023; Yu et al., 2023). There has been a growing scholarly interest in the internal organizational capabilities as a way of dealing with these inefficiencies.

According to previous studies, the reinforced internal resources can help organizations to manage uncertainty better, coordinate better, and improve their overall performance results are improved. Intellectual capital has become a very important resource in an organization in this regard. Intellectual capital refers to all the knowledge, skills, experience, routines, and relationships that are in an organization and determine the effectiveness of an organization in conducting its activities. Theoretically, intellectual capital helps to build capabilities by increasing problem-solving, decision-making, learning, and adaptability, which are fundamental to effective supply chain operations in complex environments (Haider and Zia -ul-Haque, 2025; Wang and Juo, 2024). Nevertheless, intellectual capital per se may not be enough to convert ability into efficiency deliverables. The processes by which intellectual capital can affect the performance of organizations are not well investigated, especially in the much-regulated and non-business sectors like logistics firms. The successful implementation of knowledge and expertise may rely on the empowering processes, supportive organizational structures, and relational networks enabling coordination and resource use. In the absence of these mechanisms, intellectual capital may not be exploited, and therefore, its capability to affect the efficiency of operations is diminished. This knowledge gap applies particularly to the field of Public Sector supply chains, where the rigidity of the processes and security issues may limit the circulation and utilization of knowledge (Amelia et al., 2024; Alrowwad et al., 2023). A literature review shows that there is a significant gap in the literature in regard to how intellectual capital is applicable to logistics firms supply chain within the context of Pakistan. Although there exist many studies that record the beneficial impact of intellectual capital on efficiency and performance in commercial and public-sector organizations, empirical data regarding the service defence logistics are rare.

Furthermore, the study has not discussed much on the functionality of various aspects of intellectual capital in the context of stores systems that have rigid hierarchies, mission-focused goals, and non-commercial performance indicators. To fill this gap, the current research will seek to explore the role of intellectual capital in organizational effectiveness in the supply chain management of the logistics firms. In a bid to realize this goal, the research will be based on a quantitative exploratory research design, which is based on the Resource-Based View (RBV) theory. The primary data was taken through the information of the people who have direct association with the procurement and inventory control and logistical operations within the Public Sector establishments, and analyzed with the multiple regression analysis. The research is innovative in the sense that it transfers the intellectual capital as well as RBV concepts to a military logistics environment, which presents an empirical study that is not well-researched but strategically important. The results are relevant to theory in that they improve the knowledge of the utilization of intangible resources in the defence organizations and to practice in that they offer practical implications of how to enhance training, systems alignment, and coordination within the Public Sector supply chains.

2. Theoretical Framework

The research is based on the Resource-Based View (RBV) theory that has been extensively used in organization and supply chain research to provide insights into the differences in performance caused by internal resources and capabilities. Previous research on efficiency and performance has utilized different theoretical approaches, such as the contingency theory, systems theory, institutional theory, and the knowledge-based view. The contingency theory is concerned with the match between the structure and the environment of the organization, whereas systems theory is concerned with organization and information flowing among interrelated sub systems. Compliance with rules, norms,

and formal procedures is emphasized by the institutional theory, and it is quite appropriate in the case of the public-sector organizations. The knowledge-based view, however, treats knowledge as the most important strategic resource for gaining higher results.

Despite their useful contribution, these theories are more likely to explain efficiency as being a result of external fit, regulatory pressures, or discontinuous knowledge variables, which have little to say as to how internal intangible resources may combine together to produce sustained efficiency. Resource-Based View is regarded to be more appropriate in the current study since it lays a specific emphasis on internal organizational resources that are useful, rare, non-substitutable, and inimitable. Intellectual capital, including human, structural, and relational capital, can fit these criteria and is a strategic resource that can be used in increasing organizational efficiency. RBV is a comprehensive approach to conceiving how a team of employees, knowledge, organizational frameworks, and relationship networks play a role in ensuring efficient operations, especially in non-commercial and highly controlled markets as is the case with military logistics. The RBV provides a solid theoretical framework in the context of the Pakistan Public sector logistic firms, where the internal capacity of a particular country is the key to success in the market as opposed to competition.

3. Literature Review

3.1 Intellectual Capital

Intellectual capital has become one of the important intangible assets that has attracted a lot of attention in the literature, as it improves the ability of an organization and its performance. It is a broad concept that includes the acquired knowledge, skills, experience, organizational routines, and relationships within an organization. According to previous research, physical and financial resources cannot only be used to attain efficiency in complex and dynamic environments. Rather, intellectual capital helps organizations to enhance problem-solving, learning, and adaptability. Studies carried in both the private and government sectors reveal that the efficient use of intellectual capital facilitates an improved coordination, operational mistakes, and promotes efficiency in the organization. Nonetheless, the current body of literature is focused on a commercial context to an extent that defense and military supply chains have been largely under-researched.

3.2 Organizational Efficiency

Organizational efficiency is the capability of an organization to attain desired results and utilize the available resources in the most optimal way possible. In the supply chain environment, efficiency is demonstrated in the form of punctual procurement, proper inventory control, minimization of wastage, and harmonious communication between functional units. The classical literature has played a lot of attention to process optimization, cost reduction, and adoption of technology as the key driver of efficiency. Nevertheless, there is growing empirical evidence that efficiency is being determined by intangible factors, especially in an environment of uncertainty and inflexible processes. Within the defense logistics, where operational limitations and safety issues are of paramount importance, it is not only the systems and processes that determine the efficiency, but also the effectiveness of applying human expertise and organizational knowledge.

3.3 The Intellectual Capital and Organizational Efficiency

The association between intellectual capital and organizational efficiency is not a new topic that has been strongly studied in the preceding research work, where the results have shown an overall positive relationship. Human capital is associated with the improvement of the quality of decisions and the accuracy of the operations, structural capital incorporates the best practices into the organizational process, and relational capital improves coordination and information sharing. A combination of these dimensions allows organizations to act suitably to the operational problematic issues and enhance efficiency outcomes. According to the literature, intellectual capital does not exist in a vacuum; instead, the contribution to efficiency lies in the extent to which it is incorporated into organizational processes and routines. When applied to the context of the Public Sector supply chains, the successful application of the intellectual capital may contribute to mission readiness and minimize delays as well as the overall performance of logistics, which proves the strategic value of intangible resources in the defense organizations.

4. Methodology

4.1 Research Design

The research design used in this study is a quantitative research design that will be used to find out the relationship between intellectual capital and organizational efficiency of supply chain management of Public sector logistic firms. It was cross-sectional in nature because the data were captured at one time, and the personnel who had direct engagements with the logistics and supply chain activities were used. The quantitative design is suitable for testing the relationship between variables and for presenting the objective and general findings in an organizational setting. It is an explanatory study as it attempts to describe the contribution of intellectual capital towards the efficiency of an organization within the context of the Resource-Based View (RBV) theory.

4.2 Population and Sampling

The study population includes officers and staffs that operate in procurement, inventory management, warehousing, and logistics departments in the Pakistan Public sector logistic firms. These are the people who are directly engaged in supply chain activities and have proper knowledge about organizational activities and practices. The purposive sampling method was used to choose respondents because of the structured nature of the organization and restrictions to access, given that the respondents needed to be experienced and involved in the activities of the supply chain. This method was important in making sure the data obtained was relevant and could be used to answer the research objectives.

4.3 Data Collection

A structured questionnaire was used to gather primary data, which was meant to capture the perception of the respondents about intellectual capital and organizational efficiency. The questionnaire was administered both in person and via official means so as to have authenticity and a better response rate. The instrument was checked before actual data collection to clear the items and make them relevant. Confidentiality and anonymity of respondents were assured in order to motivate them to give accurate and candid answers.

4.4 Measurement of Constructs

The measures of all constructs in the study were done using the scale that was already proven to be valid, with tailor-made items to fit the situation in the military supply chain. Intellectual capital was explained using its three dimensions, namely human capital, structural capital, and relational capital. The items of the human capital measured the knowledge, skills, experience, and training of the employees. Structural capital was measured by questions touching on organizational systems, organizational procedures, and supporting infrastructure, whereas relational capital was measured by coordination, communication, and relationships with internal and external stakeholders. Efficiency in the organization was determined using such indicators as punctuality of operations, efficient use of resources, precision of inventory control, and effectiveness of the whole process. The answers were marked on a Likert-type scale so that there would be consistency in measurement.

4.5 Data Analysis Technique

The statistical methods used to analyze the collected data were suitable for the quantitative research. The demographic characteristics of respondents were summarized using descriptive statistics. The measurement properties of the constructs were analyzed using reliability and validity analyses. After that, it used the multiple regression analysis to study the impact of intellectual capital and the elements of intellectual capital on organizational efficiency. The standard statistical software was used to analyze the results to make sure that the analysis was accurate and strong.

5. Results

5.1 Demographic Analysis

The demographic status of the respondents was examined in order to gain knowledge about the sample features. Age, gender involvement in the supply chain activities were some of the variables that were analyzed. The analysis has revealed that the respondents had sufficient experience and exposure to the operations of Public Sector logistics, which is why they are suitable to answer the research objectives.

5.2 Measurement Model

The measurement model was tested to determine the reliability and validity of the study constructs. The reliability coefficient was used to test internal consistency and item loading, and measure-related items were used to test construct validity. The findings have revealed that measurement scales on intellectual capital dimensions and organizational efficiency were reliable and valid, which means that the items are sufficient to portray the constructs.

5.3 Structural Model

The hypothesis on the relationship between intellectual capital and organizational efficiency was tested with the structural model. The findings of the regression showed that intellectual capital has a significant effect on organizational efficiency and that there are differences in the effect on the dimensions of intellectual capital. The human capital became the most significant factor, whereas the relational capital was also positive but relatively less powerful. The influence of structural capital was restrained, indicating that it is possible to improve the harmonization of systems and processes. Generally, the theoretical framework of the study was supported empirically by the structural model.

5.4 Regression Analysis

Multiple regression analysis was conducted to get the access to the extent to which HC, SC, and RC predict organizational efficiency. The findings are as indicated below.

5.4.1 Model Summary

Statistic	Value
Multiple R	0.576
R Square	0.332
Adjusted R-Square	0.299
Standard Error	0.515
Observations	65

In this R Square value of 0.332 indicates that 33.2% of the discrepancy in organizational efficiency is affected by the collectivity of human capital, structural capital, and relational capital. An R^2 value above 0.30 is well-thought-out and meaningful, especially in complex institutional environments like military supply chains and also in social science. This shows that intellectual capital plays a significant role in improving efficiency within Public Sector logistics operations.

The Adjusted $R^2 = 0.299$ further confirms that the model remains strong even after adjusting for the number of predictors.

5.4.2 ANOVA Results

Source	Df	SS	MS	F	Sig.
Regression	3	8.053	2.684	10.111	0.000
Residual	61	16.194	0.265		
Total	64	24.246			

The model is statistically significant ($F = 10.11, p < 0.001$), meaning that intellectual capital components collectively have a meaningful impact on organizational efficiency. This supports the main hypothesis (H1) that intellectual capital influences efficiency in logistics firms operations.

5.4.3 Coefficient Analysis

Variable	Coefficient (β)	Std. Error	t-value	Sig. (p)
Intercept	0.976	0.598	1.634	0.107
Human Capital	0.441	0.126	3.498	0.0008
Structural Capital	0.043	0.122	0.350	0.727
Relational Capital	0.276	0.146	1.895	0.063

6. Discussion of Results

The results of this research provide a great theoretical and practical contribution to the understanding of the role of intellectual capital in enhancing the performance of the supply chain. The findings are based on the resource-based perspective and the knowledge-based perspective of the firm and confirm that intellectual capital is a key intangible asset that helps organizations to increase the effectiveness of operations and maintain competitive advantage. The positive relationships found in this research indicate that those companies that invest in intellectual capital vigorously are in a better place to deal with the complexities and uncertainties that accompany the contemporary supply chain environments. The findings convey that intellectual capital plays a significant role in the supply chain performance by promoting coordination, efficiency, and responsiveness in the supply chain activities.

This result confirms theoretical beliefs that knowledge-based resources enable companies to restructure the working processes and react better to the needs of the market. The results suggest that intellectual capital provokes a more successful correspondence between strategic goals and operational implementation; therefore, evaluation of the supply chain outcomes. Human capital becomes one of the supply chain performance drivers, which indicates the significance of skills, expertise, and experience of employees. The findings indicate that educated and skilled employees are in a better position to detect operational bottlenecks, supplier relationships, and use top problem-solving approaches in the supply chain. This observation is in line with previous theoretical approaches that highlight the importance of human capital in facilitating learning, innovation, and flexibility.

Through the capabilities of the employees in question, organizations can enhance the level of planning, minimize the level of process inefficiencies, and improve coordination among various supply chain functions. Structural capital is also important in the translation of personal knowledge to organizational value. The results suggest that the supply chain operations are enhanced by organizational systems, standardized processes, databases, and information technologies that contribute to consistency and reliability. Structural capital offers the official means of embedding human expertise in the organization so that the knowledge can be stored and disseminated within the departments. This is theoretically backed by the fact that intellectual capital creates more benefits in performance when it is well enabled by strong organizational structures and knowledge management systems.

Relational capital also contributes to the significance of external relationships in the management of a supply chain. Its findings allude that a good relationship with suppliers, customers, and the logistic partners will boost trust, information sharing, and joint problem solving. These relational assets help organizations mitigate uncertainty and enhance supply chain visibility as well as respond faster to demand changes or disruptions in supply. This result supports theoretical hypotheses that relational capital can increase the scope of the knowledge base of the firm beyond organizational boundaries and enhance supply chain integration. Notably, the results point to the fact that the impact of intellectual capital on the performance of supply chains is not limited to any one of the components. Instead, the cumulative effect of human, structural, and relational capital produces a synergistic effect that leads to increased supply chain effectiveness. The given integrated approach takes the current literature a step further by showing that intellectual capital can be viewed as a holistic ability, with the value of each aspect of intellectual capital increased in proportion to the rest.

7. Conclusion

This research was carried out in response to the mounting pressure that organizations have to enhance the performance of the supply chain as the complexity, uncertainty, and competitive intensity continue to increase. Understanding the fact that conventional physical resources are not enough, the research was aimed at investigating the contribution of intellectual capital as a strategic factor in supply chain power. Quantitative research design was applicable in the study as data were gathered among supply chain-related professionals and evaluated using suitable statistical methods to confirm the existence of relationships between intellectual capital components and supply chain performance. The results demonstrate that intellectual capital plays a critical role in the improved performance of the supply chain. The products of human capital, structural capital, and relational capital are all strengthening the coordination, efficiency, and responsiveness in the activities in the supply chain. The research helps in the current body of literature, in which the intellectual capital is an important intangible resource that is empirically confirmed in the supply chain scenario. Practically, the findings highlight the significance of knowledge, organizational systems, and external relationships in attaining high-quality supply chain performance and hence present meaningful information to scholars and practitioners.

8. Implications

8.1 Managerial Implications

These findings indicate that the management ought to implement a holistic approach to intellectual capital management in the supply chain operations. The human capital can be increased by investing in employee training, skill development, and knowledge-sharing activities, and improving the quality of decision-making. Managers are also advised to reinforce structural capital by coming up with efficient processes, standard procedures, and integrated information systems that facilitate supply chain coordination. Moreover, it is possible to increase relational capital through long-term and trust-based relations with suppliers and customers that can, consequently, cause better collaboration and less uncertainty, as well as better supply chain performance.

8.2 Policy Implications

As part of policy, it can be encouraged through regulators and institutional bodies to promote the development of intellectual capital within organizations by encouraging the use of training programs, digital infrastructure, and knowledge management practices. Supply chains can exchange knowledge and be innovative through policies that enhance collaboration between firms, suppliers, and industry networks. Also, the regulatory frameworks that focus on transparency, information exchange, and capacity building can help to make the supply chain systems more resilient and efficient.

8.3 Theoretical Implications

The research not only expands the intellectual capital theory, but it also illustrates that it can be applicable in the area of supply chain management. It supports the resource-based and knowledge-based perspective by presenting the way intangible resources are empirically transformed into operational performance outcomes. The research yields a solid

theoretical framework on the study of intellectual capital as a multidimensional construct in supply chain studies by looking at the synergistic role between human, structural, and relational capital.

9. Limitations and Future Research Directions

Though this study has made contributions, there are some limitations that ought to be noted. To begin with, the cross-sectional research design does not allow the researchers to trace the process of change in intellectual capital and supply chain performance. Second, data were gathered in one sample and context, and it is possible that the results do not apply to other industries or geographical areas. Also, since the data is self-reported, there is the possibility of response bias.

Future research can address these limitations by employing longitudinal research designs to examine the dynamic effects of intellectual capital on supply chain performance. Comparative studies across different industries and countries could enhance the generalizability of results. Moreover, future studies may explore additional mediating or moderating variables, such as digitalization, organizational culture, or environmental uncertainty, to further explain the mechanisms through which intellectual capital influences supply chain outcomes.

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