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Logistics4.0 operation transformation determinant factors

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ABSTRACT

The phenomenal growth of e-commerce and online purchase have greatly impacted global logistics industry. As a results, integration of Logistics and Industry Revolution 4.0 is inevitable due to increasing complexities and strong needs to fulfill demanding customer responsiveness. The term Logistics4.0 is coined to reflect the integration of smart systems in industrial logistics which transformed the entire logistics operation and it is getting high focus from researchers and industry practitioners. This article focused on the influential factors which contributed towards Logistics4.0 operation transformation. The business feasibility, workforce competency and technology readiness factors were evaluated thoroughly which provided essential and critical insights to the global logistics industry as it embarked towards smart Logistics4.0.

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1. INTRODUCTION

The current challenges for logistics is the operation complexities due to huge increase in volume, customer responsiveness and transportation delivery time expectations. The previous best known practices are no longer capable to fulfill the new and future logistics requirements. Growing online purchase and e-commerce, the quantity of the products and number of shipment line items are increasing exponentially [1]. Logistics operation includes processes of moving the materials and finished goods from one site to another, starting from the supplier, manufacturer and moving to the end customer either by road, rail, sea or air. The ultimate goals are to achieve minimum transit time or most optimum route and at most economical cost. The whole inbound and outbound logistics operation includes managing the e-commerce inventory, satisfying and meet shipment orders. Inventory management, warehousing, and order fulfilment success all play a key roles and functions in optimizing e-commerce logistics. The increasing demand for highly customized products and services are the drivers in impacting logistics operation complexities [2]. Warehouse storage occupied huge

areas with multi storey racking that keep millions of products. Placing and retrieving these products require an intelligent systems and automation to manage [3].

Although there has been an increasing interest in applying Industry 4.0 in logistics systems in recent years, a huge gap nonetheless exists inside the industry regarding the standards of this subject matter and the implementation best practices, in industries and academic venues. It is really important to transforms logistics towards IR4.0 so it could overcome the problems and remove the operations constraints. The use of digital technology enabled effective planning of resources and the efficient management of warehousing and transportation structures to achieve operational performance goals in transferring data information and products between sites and departments [2]. Logistic operation transformation objective was not to replace tasks previously handled by human, but to eliminate inaccuracies and operation errors. The new system is more flexible whereby all the records and transactions are visible and can be shared readily in real time [2]. Logistics operation is transforming and embracing Industry Revolution 4.0 elements such as data automation, smart logistics, Internet of Things (IOT) technology and RFID tagging in order to improve operation productivity and efficiency [4]

The term Logistics4.0 is coined to reflect the new transformation of logistics towards Industrial revolution 4.0 (IR4.0) which brought several opportunities for a great improvement in distinctive components of internal and outside logistics, that covers performance, sustainability and responsiveness to customers [5]. Business feasibility indicated that market and client requirements of customization, flexibility and responsiveness are fully accomplished. The tremendous growth is pushing manufacturers to extend their logistics networks to encompass and coordinate all the suppliers and partners to optimize internal and external logistics business process as well as enable lightning fast decision-making process [6]. The transformation is made possible by workforce competency development that came hand in hand. Organization management team focused on re-skilling and up-skilling the workforce in order to avoid becoming limitations or roadblock during the operation transformation. Thus, providing training for employees to acquire new knowledge and competencies related to digital technology are extremely crucial [3]. The primary hassle for low-skilled personnel in the new working environment is the way to deal with the digital and automated technology. As a lot of logistics systems transformed to become semi or fully automatic, logistics operators are required to acquire new skills and abilities for effectively interface with the new software program as well as to deal with the new Artificial Intelligent systems [7]. The required new capabilities encompass technical know-how of the digital gadgets and structures, in addition to ability to cope with the complicated and smart logistics operation [3]. Technology readiness is the backbone of the Logistics4.0 operation transformation and the technologies such as Big Data, Internet of Things, and Artificial Intelligence are widely recognized elements [2]. Technology readiness also offers huge variety of guidance within the logistics sector, not only the visible hardware such as autonomous forklifts or driverless vans, but also creating new elements concerning data protection, operation efficiency and performance tracking [8].

2. METHOD

This study focused on determining the influential factors that contributed towards Logistics4.0 operation transformation. There are numerous elements that could influence the transformation. It could have a minor or major impact on the organization and business performance. A quantitative study was conducted using structured questionnaires and used cross sectional analysis of targeted respondents who involved directly in multi-national logistics operation. A research instrument in the form of self-administered questionnaires were utilized as a method to measure and analyze primary data from respondents related to the research topic and 5-point Likert scale was adapted. The findings indicated the relationship between business feasibility, workforce competency, technology readiness and logistics operation transformation. The scope of data collection is obtained from employees in logistics company which has operations in over 220 countries worldwide and it has successfully undergoing business process re-engineering and Logistics4.0 transformation.

3. RESULTS AND DISCUSSIONS

Conceptual framework for this study was developed based on the findings of the literature review. Hypothetical statement indicated that all three independent variables which are business feasibility, workforce competency and technology readiness have positive relationship with dependent variable which is logistics operation transformation. Descriptive Analysis and Correlation Test were conducted to validate the hypothesis and identify the influential determinant factors.

Table 1. Descriptive analysis

	Mean	Standard Deviation	Level of Tendency
Independent Variable			

Logistics Transformation	3.844	0.875	High
Dependent Variable			
Business feasibility	3.648	0.840	Moderate
Workforce competency	3.764	0.882	High
Technology readiness	3.868	0.904	High

Table 2. Correlations analysis

		Operational Transformation
Business Feasibility	Correlation Coefficient	0.325
	Sig. (2-tailed)	0.11
	N	64
Workforce Competency	Correlation Coefficient	0.386
	Sig. (2-tailed)	0.002
	N	64
Technology Readiness	Correlation Coefficient	0.576
	Sig. (2-tailed)	0.000
	N	64

Utilizing Spearman Correlation Test as shown in Table 3.2, Business Feasibility and Workforce Competency factors have a weak positive correlation with dependent variable while Technology Readiness factor has a moderate positive correlation with Logistics Operation Transformation.

4. CONCLUSION

This study achieved the objectives of findings the determinant factors which influenced Logistics4.0 operational transformation. Technology Readiness is proven as the most influential factor, followed by Workforce Competency and Business Feasibility factors. The outcome of this study provided vital insights, focus areas and key learnings for logistics company to embark on transforming the logistics operation towards Logistics4.0. The value of this initiative is undeniable since the current and future trend in global logistics industry is the integration with Industry Revolution4.0 and moving towards smart Logistics4.0 direction.

REFERENCES

[1] R. Martins, M. T. Pereira, L. P. Ferreira, J. C. Sá, and F. J. G. Silva, "Warehouse operations logistics improvement in a cork stopper factory," *Procedia Manuf.*, vol. 51, pp. 1723–1729, 2020, doi: 10.1016/j.promfg.2020.10.240.

[2] L. Barreto, A. Amaral, and T. Pereira, "Industry 4.0 implications in logistics: an overview," *Procedia Manuf.*, vol. 13, pp. 1245–1252, 2017, doi: 10.1016/j.promfg.2017.09.045.

[3] C. Cimini, A. Lagorio, D. Romero, S. Cavalieri, and J. Stahre, "Smart Logistics and The Logistics Operator 4.0," *IFAC-PapersOnLine*, vol. 53, no. 2, pp. 10615–10620, 2020, doi: 10.1016/j.ifacol.2020.12.2818.

[4] S. Winkelhaus and E. H. Grosse, "Logistics 4.0: a systematic review towards a new logistics system," *Int. J. Prod. Res.*, vol. 58, no. 1, pp. 18–43, Jan. 2020, doi: 10.1080/00207543.2019.1612964.

[5] W. Torbacki and K. Kijewska, "Identifying Key Performance Indicators to be used in Logistics 4.0 and Industry 4.0 for the needs of sustainable municipal logistics by means of the DEMATEL method," *Transp. Res. Procedia*, vol. 39, pp. 534–543, 2019, doi: 10.1016/j.trpro.2019.06.055.

[6] M. Woschank, D. Steinwiedder, A. Kaiblinger, P. Miklautsch, C. Pacher, and H. Zsifkovits, "The Integration of Smart Systems in the Context of Industrial Logistics in Manufacturing Enterprises," *Procedia Comput. Sci.*, vol.

200, pp. 727–737, 2022, doi: 10.1016/j.procs.2022.01.271.

[7] S. Parham and H.-J. Tamminga, "The Adaptation of the Logistic Industry to the Fourth Industrial Revolution: The Role of Human Resource Management," vol. 7, p. 13, Sep. 2018.

[8] M. Wang, S. Asian, L. C. Wood, and B. Wang, "Logistics innovation capability and its impacts on the supply chain risks in the Industry 4.0 era," *Mod. Supply Chain Res. Appl.*, vol. 2, no. 2, pp. 83–98, Feb. 2020, doi: 10.1108/MSCRA-07-2019-0015.