A CONCEPTUAL DEVELOPMENT STRATEGY FOR RAIL FREIGHT IN SRI LANKA

Lakna L. Warnapura[1], Amal S. Kumarage[2]
Department of Transport Management and Logistics
Engineering, University of Moratuwa
[1]lakna.warna@gmail.com, [2]amalk@uom.lk

ABSTRACT – Due to the inability of the rail industry to compete, road transport has become the preferred mode of freight movement in Sri Lanka. However, road transport has reached a bottleneck and is seeking an alternative freight transportation solution. Thus, the development of rail freight in Sri Lanka is a current necessity, as rail freight is widely utilized for freight transportation worldwide. As a result, a strategy must be developed with the utmost care, as it will have far-reaching effects and require substantial investments. To develop strategy for Sri Lanka, a mathematical model-based approach based on global learning has been chosen.

Keywords: Railway; Freight; Strategy; Quantitative Model; Global

1. INTRODUCTION

The most popular method of transporting freight in Sri Lanka is by road. However, highly congested roads, smaller vehicle capacities, longer travel times, and increased costs have compelled freight forwarders to seek an alternative solution. It has been proved that the railway is the most cost-effective, reliable and speedy mode of transporting freight, hence it is widely utilized in several nations across the globe [Amos, 2009; Watson, Ali and Bayyati, 2019]. In Sri Lanka, however, the railway's role to the freight transport sector is small. Currently, it represents barely 1 percent of the market [*Sri Lanka Railway*, 2023]. Organizational challenges, financial instability, and political concerns have hampered the railway's volume and service quality. Therefore, Sri Lanka must revitalize its rail freight industry.

The revitalization strategy has a broad Impact on Sri Lankan communities. The government, as the entity responsible for execution, freight forwarders, as the direct beneficiaries, and road users, as the indirect beneficiaries, are the primary impacted parties. Developing rail freight in Sri Lanka requires increased planning and investment. It also requires substantial organizational, operational, and policy modifications. Therefore, the revitalization strategy must be carefully designed using the appropriate method, taking into account every necessary macro scale element.

Examining the literature for existing models in the rail freight industry reveals that their focus is on qualitative factors and their scope is limited to technical elements, rather than macro elements (Storm, 2001; Marinov, Zunder and Islam, 2010].   Therefore, the objective of this research is to provide a method for developing a strategy for rail freight in Sri Lanka considering a quantitative and macro scale aspects.

2. METHODOLOGY

The Sri Lankan rail freight sector, from its inception to the present, has been thoroughly reviewed to comprehend the problem. Thereafter global study has been carried out to identify best practices, success stories and failure stories Given the significant disparity between Sri Lanka's rail freight state and the global scenario, it was determined to create the strategy through global learning to reach global standards. To enhance the accuracy of the strategy, a method based on mathematical model has been selected for its development.

Sri Lanka Society of
Transport and Logistics

3. THE CONCEPTUAL METHOD

During the initial phase, a problem analysis is performed. Using a graphical analysis, the current position of Sri Lanka in the world rail freight industry is determined. As illustrated in figure 1, the performance of rail freight in Sri Lanka lags considerably behind that of the global performance which is led by China, the United States, Russia and India. The Sri Lankan rail freight industry has even failed to outperform its Asian counterparts. Problem, root cause, and the significance of the root cause must next be investigated. On the basis of the problem analysis, it is necessary to identify the crucial aspects that must be addressed by the strategy in order to resolve the existing problems. Using the problem knowledge and understanding, a subsequent strategic concept for Sri Lanka is developed.
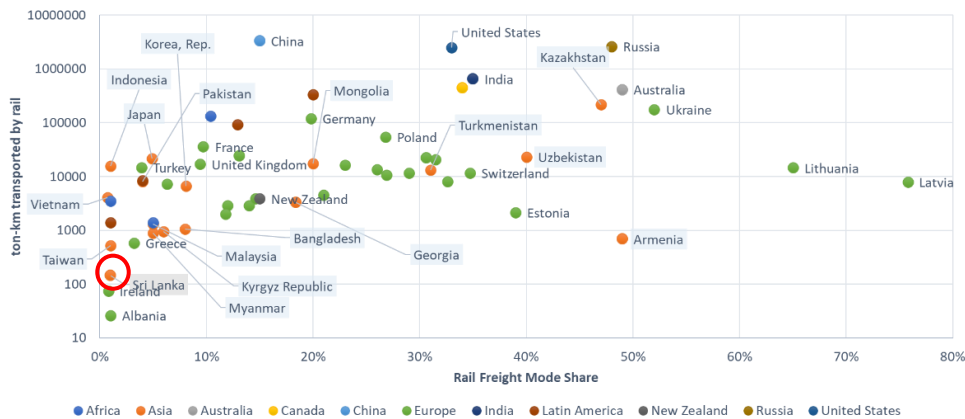

Figure 1. Rail Freight Performance around the world

The railway industry is diverse, and different nations have adopted a variety of strategic initiatives to improve their railway industries. In a number of European nations, railways are vertically separated, with infrastructure ownership and operation being separated (Laabsch and Sanner, 2012)]. Freight railways in nations such as the United States and South Africa are purely profit-driven, whereas in many Asian nations it is viewed as a public good [American Journal of Transportaion, 2019]. In order to capture the diverse global rail freight market, a thorough analysis was conducted to develop Sri Lanka's strategy.

The generalized model adheres to an outline that captures the required aspects that the model must address. The outline also serves as the foundation for selecting influential factors, which was accomplished through an extensive literature review. To improve the accuracy of the model, a quantitative method has been selected for its development. As a result, a multiple nonlinear regression analysis has been conducted in order to develop the model. As shown in Equation 1, the form of the multiplicative model is as follows.

$$Y = a*X_1^b * X_2^c * X_3^d * X_4^e * X_5^f * X_6^g * X_7^h * X_8^i * X_9^j * X_{10}^k * 10^{l*D1} *$$
$$10^{m*D2} * 10^{n*D3} * 10^{o*D4} * 10^{p*D5} * 10^{q*D6} * 10^{r*D7} * 10^{s*D8} \qquad (1)$$

X – Numeric Variables, D – Dummy Variables

In the initial stage of the model, the severity of the errors was evaluated. Here, the factors requiring additional research and redevelopment are identified. Thereby, 18 variables out of fifty variables tested were accepted by the model. Once the model has been developed with an acceptable level of error, it is examined for multicollinearity and heteroscedasticity to determine its precision. Failure in the tests necessitated a redesign beginning with the selection of factors.

The model is then validated using a distinct set of test samples to assess its applicability and accuracy. In the subsequent step, the quantitative model developed in the preceding steps is interpreted and comprehended in order to reach the required decisions and conclusions. Consequently, a framework for achieving the objective is constructed. Sri Lanka's target position in the global rail freight industry and its final strategy are derived

Sri Lanka Society of
Transport and Logistics

from the verified model and strategic framework. This serves as the application for the model. Additionally, it is essential to confirm that the established strategy addresses the issue in its entirety. Thus, the problem analysis and strategic concept development served as inputs for the strategy development.
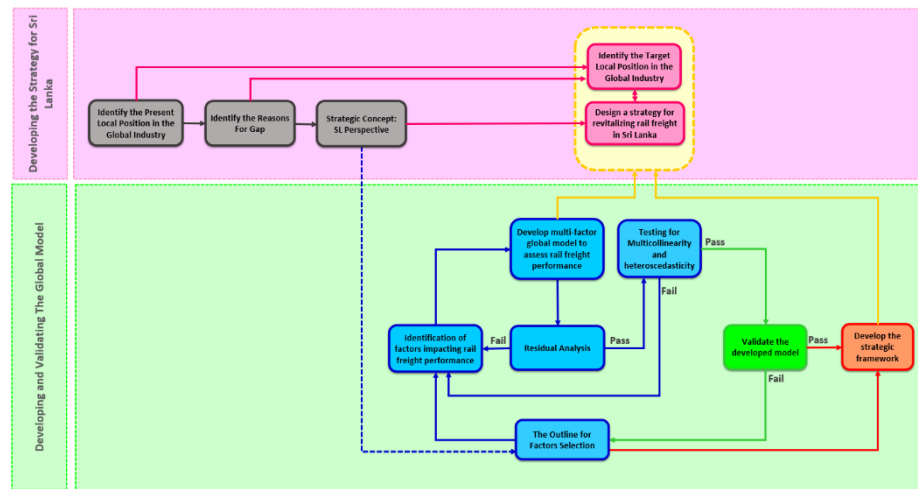

Figure 2. The Conceptual Method

4. CONCLUSION

Developing rail freight in Sri Lanka has become a current necessity due to the inability of road transportation. To meet demand. However, it must be thoughtfully designed as it affects larger communities and requires substantial investments. The significant performance gap between Sri Lanka's and global freight industries prompted the development of a strategy based on global learning to bring Sri Lanka's freight industry to global standards. To develop the strategy with greater accuracy, a mathematical model-based approach has been chosen. The multiplicative generic model is the output of the multiple nonlinear regression analysis used to assess the performance of rail freight.

ACKNOWLEDGEMENT

REFERENCES

1. Amos, P. (2009) Freight Transport for Development Toolkit, Freight Transport for Development Toolkit.
2. Laabsch, C. and Sanner, H. (2012) 'The impact of vertical separation on the success of the railways', Intereconomics, 47(2), pp. 120–128.
3. Marinov, M., Zunder, T. and Islam, D. M. Z. (2010) 'Concepts, models and methods for rail freight and logistics performances: an inception paper', in 12th World Conference on Transport Research.
4. Railroads are USA's most profitable industry with a 50% profit margin (2019) American Journal of Transportation. Available at: https://ajot.com/news/railroads-are-usas-most-profitable-industry-with-a-50-profit-margin (Accessed: 25 April 2023).
5. Sri Lanka Railway Overview (2023) Sri Lanka Railways. Available at: http://www.railway.gov.lk/web/index.php?option=com_content&view=article&id=138&Itemid=176&lang=en (Accessed: 25 April 2023).
6. Storm (2001) Analysis and Recommendations for Revitalization of Rail Freight Transport In Sri Lanka.
7. Watson, I., Ali, A. and Bayyati, A. (2019) 'Freight transport using high-speed railways', International Journal of Transport Development and Integration, 3(2)

Sri Lanka Society of
Transport and Logistics