Assessment of Logistics Operations Performance of Modjo Dry Port, Ethiopia

Meron Tamrat Assefa
Regional Operations Associate, United Nations Capital Development Fund
Addis Ababa, Ethiopia
merontamrat@yahoo.com

Seid Mohamedbirhan Nuru
Mekelle University, Ethiopia
Center for Supply Chain Improvement, University of Derby, U.K.
seyomoha@gmail.com

Simon Peter Nadeem
Center for Supply Chain Improvement, University of Derby, U.K.
S.Nadeem@derby.ac.uk

Abstract

The purpose of the study was to assess the performance of logistics operations of Modjo Dry Port (MDP), Ethiopia analyzing six dimensions, container handling equipment, customs operations, delivery time, quality of infrastructures, staff competence, and safety. The study employed a descriptive research design and proportionate stratified and purposive sampling techniques. 126 questionnaires were distributed among the management and terminal operations staff and the response rate was 95%. SPSS was utilized for the frequency distribution statistical analysis. The results identified MDP as poor in terms of delivery time, with 66% of the respondents indicating a delay in the delivery time. 88% of the respondents believed that the port performance in terms of staff safety is unsatisfactory. Container handling equipment, customs operations, port infrastructure, quality of logistics services, and the skill level of port staff are poor. The performance of the MDP in terms of operational effectiveness of loading and unloading and congestion of container operation was found to be average. It is recommended that the dry port apply an automated shipment and cargo container tracking system, make further investments in container handling equipment, and ensure the provision of adequate safety and health management systems while promoting private sector participation to enhance its operational performance.

Keywords:
Dry Port, Logistics Performance, Delivery Time, Port Infrastructure, and Safety

1. Introduction

Countries involved in international trade differ in their logistics performances (Takele et al. 2019). Logistics services are getting equal importance as price competition in the global trade these days. With the increase of investments in logistics-related infrastructure, logistics performance will also increase (Luttermann and Kotzab 2020). As logistics is one of the enablers and core pillars of the economy to develop related policies and improve systems, it is vital to regularly assess its performance (Kabak et al. 2018).

Naturally, Land Locked Countries (LLC) have severe difficulty in their logistics performance and are international trade disadvantageous. Focusing on improving trade facilitation, therefore, is one of the mechanisms to set off the constraints from lack of free access to seaports (Wilmsmeier and Sanchez 2009). Landlocked developing countries are struggling to get the goods to their destination without significant delays and cost increases (Faye et al. 2004). Due to lack of direct access to the sea, their international trade depends on transit through other countries. Besides, longer distances to the world markets, cumbersome transit procedures, and inadequate infrastructure contribute to high transport and trade costs, thereby reducing external trade and subsequent economic growth (Arvis et al. 2014). LLCs

persistently face the challenge of physical isolation, supply chain-related restrictions from the sea, and the high costs of dealing with the rest of the world (Wornalkiewicz and Kutsenko 2020).
Ethiopia is one of the 44 LLCs in the world, heavily dependent on the neighboring country's port (Port of Djibouti) for over 95% of its foreign trade. The trend in the import and export trade in Ethiopia shows significant improvement over the last two decades. According to the World Bank report (2019), the import volume that was 1,853 million US dollars in 1999 has reached 19,928 million US dollars in 2020 growing at an average annual rate of 14.50%, and the export raised from 940 million US dollars in 1999 to 7,624 million US dollars in 2018 growing at an average annual rate of 12.31%. This evolution, therefore, has resulted in a growing necessity for a world-class logistics operation in international trade. However, import/export cargo flows are penalized by a variety of logistics problems ranging from poor transport infrastructure to the lack of modal choices and interfaces, inadequate handling and loading/ facilities, inadequate traffic arrangements and transit protocols, as well as time-consuming customs procedures (Bekele 2019).

To counter these challenges/ difficulties associated with the lack of sovereign seaports access and alternative transit corridors, the dry port concept emerged. Dry ports also evolved out of the difficulties that faced existing seaports, i.e., congestion due to trucks and haulage vehicles (Woxenius et al. 2004). According to Werikhe and Zhihong (2016), a dry port is an inland intermodal terminal directly connected via rail or truck to one or more seaports and can substitute certain port services in certain areas. It is part of the supply chain facilitating storage, networking, and distribution options from the point of origin, through various economic activities, to the point of consumption (Klomperee, 2000). The effective operation of dry ports is essential for the success of trade logistics activities. The reason for dry port development may be entirely financial (profit) or economic (Cullinane et al. 2012). However, the common rationales behind the development of dry ports are decongesting seaports and reducing logistical costs (Abdoulkarim et al. 2019) Currently, there are 8 dry ports in Ethiopia handling imported cargoes. Modjo is the leading dry port in the country, 75 kilometers from Addis Ababa, Ethiopia located at about 2 km from the Addis Adama Road junction to Shashamene (Moyale Corridor) and built on 158 hectares. It handles 80 percent of the country's import-export market along the Ethiopia-Djibouti trade corridor. A schematic diagram of MDP link with Djibouti port is articulated in figure 1.

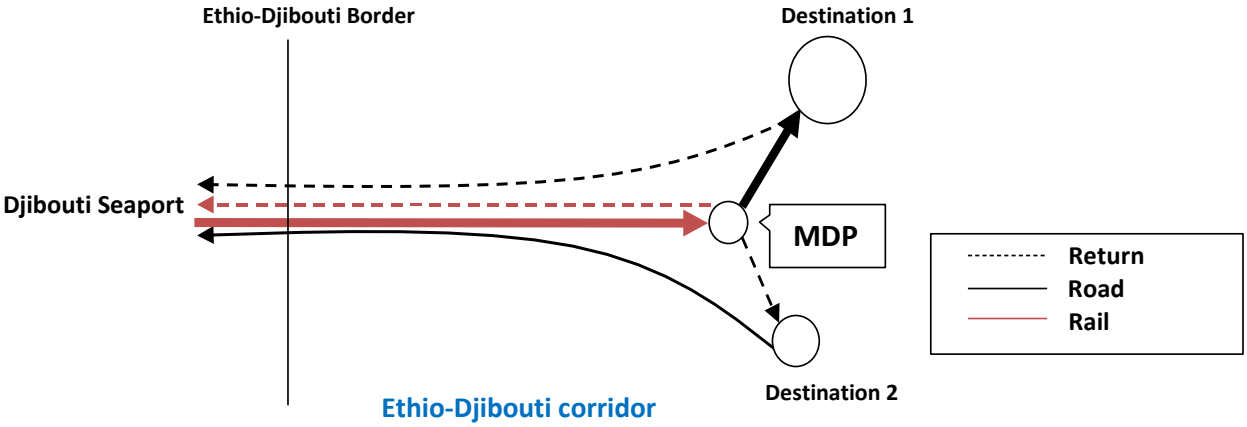

Figure 1: MDP link with Djibouti Port, by Road and Rail

Despite the Ethiopian government's initiatives to realize the importance of logistics and the impact of its performance on international trade, improvements in the logistics system have not materialized yet. Based on the Arvis et al. (2014) report, all the six key dimensions of logistics performance measured suggest that Ethiopia's trade logistics are significantly weak and need to be enhanced. In a study made by Tekalign (2015), the findings showed that the country's overall logistics performance indicators in terms of time and cost are found at a very low level compared to international standards. Based on the Ethiopian National Logistics Strategy (ENLS) document, 2019, it takes on average four months to import cargo into Ethiopia under the current logistics system while the average global standard is one month. In terms of containerized general cargo, port dwell time at the port of Djibouti is 37 days and 59 days at MDP, Ethiopia. Regarding port dwell time, the cargo dwell time is 10 times higher than the average global standard

of 3 days. Since the implementation of MDP, there have been reports that there was heavy congestion due to lack of capacity and shortage of transporters which led to failures in picking up shipments quickly enough. The delay in picking up containers severely hampered the effectiveness of the dry ports. These problems lead to the question of whether the dry port has been performing efficiently and has achieved the intended purpose. Therefore, it is timely to assess its logistics operations performance and recommend solutions based on the findings of the research.

Khaslavskaya & Roso (2020); Miraj et al. (2021) indicated that dry port logistics operations performance has been largely ignored in the research literature. Research on the efficiency of the dry ports using limited indicators such as dwell time and congestions has been conducted. However, to the best knowledge of the researcher, not many studies investigated dry port logistics performance considering all performance dimensions. Bekele (2019) researched the performance of Modjo and Kality dry ports in Ethiopia using the SCOR model applying reliability, responsiveness, agility, and cost performance parameters. Therefore, the novelty and contribution of this study is that it analyzes the logistics performance of MDP in terms of container handling equipment, customs operations, delivery time, quality of infrastructures, staff competence, and safety. Assessing the logistics operations performance enables the stakeholders to identify its effectiveness and efficiency as well as bottlenecks that hinder them from achieving their goals.

1.1. Aim and Objectives

This study aims to assess the logistics operations performance of MDP, Ethiopia. To achieve this aim, the following objectives are defined:

- **a.** To assess policy regulation areas containing the basic inputs of the supply chain (customs operations, container handling equipment, quality of port infrastructure, competence of port staff, and safety)
- **b.** To evaluate service offering performance outputs (quality of logistics services: time and cost)

2. Research Methodology

Research design: the study applied a descriptive research design to describe, compare, contrast, and interpret the existing facts to reveal the logistics operations performance of MDP, Ethiopia.

Population: employees working in the MDP were the study's target population. Out of the total employees, 183 (162 employees working in terminal operation and 21 employees in management-related areas) were relevant to this study.

Sampling: utilizing Taro Yemane's (1967) sample size determination formula (n = N/ 1+N(e)^2), 126 terminal operation and management sample respondents were considered in the study (Pamela et al. 2017). A proportional stratified sampling technique was applied to select sample respondents from management and terminal operation employees. A simple random sampling technique to select 111 respondents from the terminal operations group and a purposive sampling technique to select 15 respondents from the management-related group was applied.

Data collection: applying a cross-sectional research design and a mixed research strategy, the study used primary and secondary data. A self-administered questionnaire composed of both closed and open-ended questions was distributed to collect primary data from 126 sample respondents. A Likert rating scale was used to assess and quantify the data from primary sources. Despite the challenges to get secondary data from concerned organizations in Ethiopia, published and non-published sources from Ethiopian Shipping and Logistics Services Enterprise, Ethiopian Maritime Affairs Authority, and World Bank were applied.

Data analysis: to make the analysis meaningful, clear, and easily interpretable, frequency distribution techniques were applied. SPSS version 23 was utilized for the statistical analysis of the data in the study. The data collected using the questionnaire were sorted for completeness, checked for any errors and omissions, summarized in tables, and were statistically analyzed. Secondary data were analyzed and presented using charts and tables. Analysis was conducted focusing on six dimensions (mentioned earlier) of dry port logistics operations performance.

To evaluate the feasibility of the data collection instrument, a pilot study was conducted by distributing questionnaires to 30 randomly selected respondents, ideas for enhancement were obtained, and finally, the questionnaire improved. The next step was testing the validity and reliability of the questionnaire. Based on the guidelines suggested by George and Mallery (2010), Cronbach's Alpha ranging from 0.8 to 0.89 indicate good reliability. The reliability statistics of all variables Cronbach's alpha results in 0.859. Therefore, the responses generated for all the variables used in this research indicates good reliability enough for data analysis.

Ethical considerations: the study was guided by strict adherence to research ethics which do not allow the researcher to engage in deception or invasion of privacy. The respondents' rights were respected in a way not to respond to the questions which are not clear from the onset, consent was sought, and confidentiality was guaranteed as an integral part of the research. The research was conducted with utmost honesty avoiding distortions and misleading data manipulation, seeking collaborative support which is duly acknowledged, and endeavoring to arrive at conclusions based on objective inferences that are merely guided by the collected data.

3. Data Analysis, Discussion, and Interpretation

The study aims to assess the logistics operations performance of MDP, Ethiopia. This section presents the data analysis including the descriptive statistics results, discussion, and interpretation. 126 hand-delivered questionnaires were distributed and picked up in person. The response rate was 95%. Data are presented, and results are discussed for the dry port logistics operations performance dimensions in two broad categories: policy regulation areas containing the basic inputs of the supply chain and service offering performance output.

3.1. Demographic Information

Three demographic characteristics were considered in the study and responses are summarized in figure 2. Most of the respondents who took part in the study were with the occupation of terminal operators (20%), college diploma and degree holders (61%), and range of 6–9-years work experience (52%). Respondents at the clerical level, with a Ph.D. level of education (2%) and having the occupation of truck driving (6%) had minimum involvement in the study.

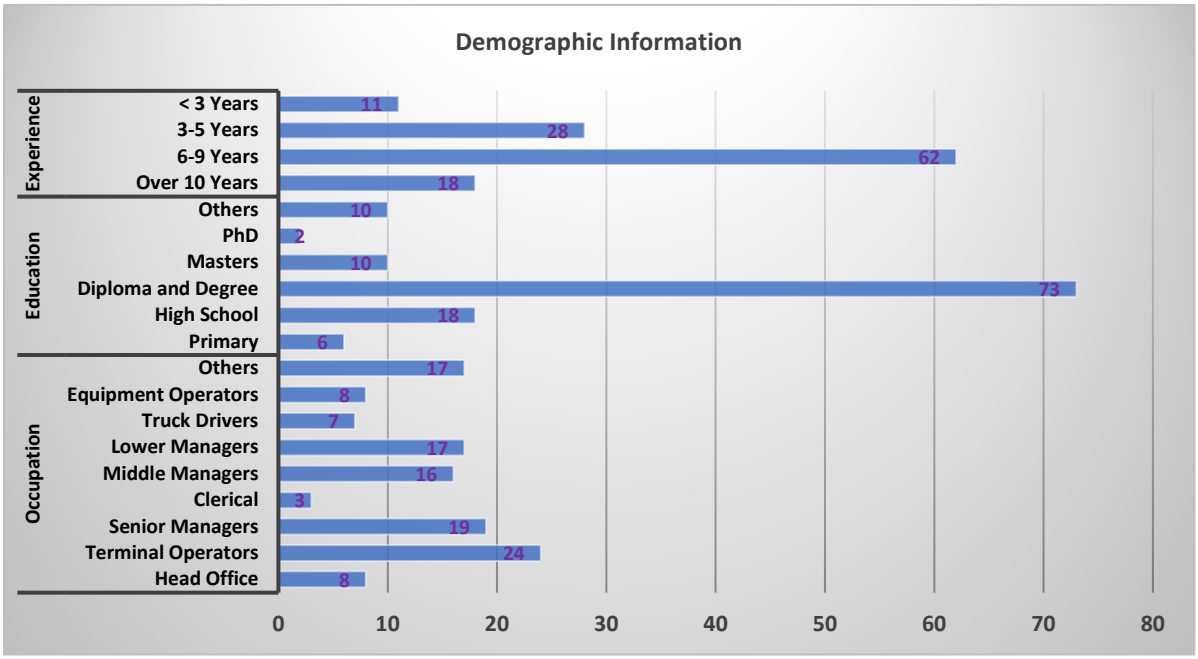

Figure 2: Demographic Characteristics Data

3.2. Policy Regulation Areas and Basic Inputs Dimensions

To assess the logistics operations performance of MDP using six dimensions, a total of 29 indicators were considered within those six dimensions. In the eyes of the respondents, there was satisfactory logistics performance in container handling equipment, customs operations, quality of port infrastructure, quality of logistics services, and quality of port staff and safety of MDP. Moreover, most of the respondents reported that they neither agreed nor disagreed on the issue of delivery time. Table 2, Figure 3 and figure 4 depicts the reaction of the respondents on how they view the operations performance of MDP by showing their level of agreement in terms of the six dimensions and 29 corresponding indicators. Results related to each dimension are discussed in the subsequent paragraphs.

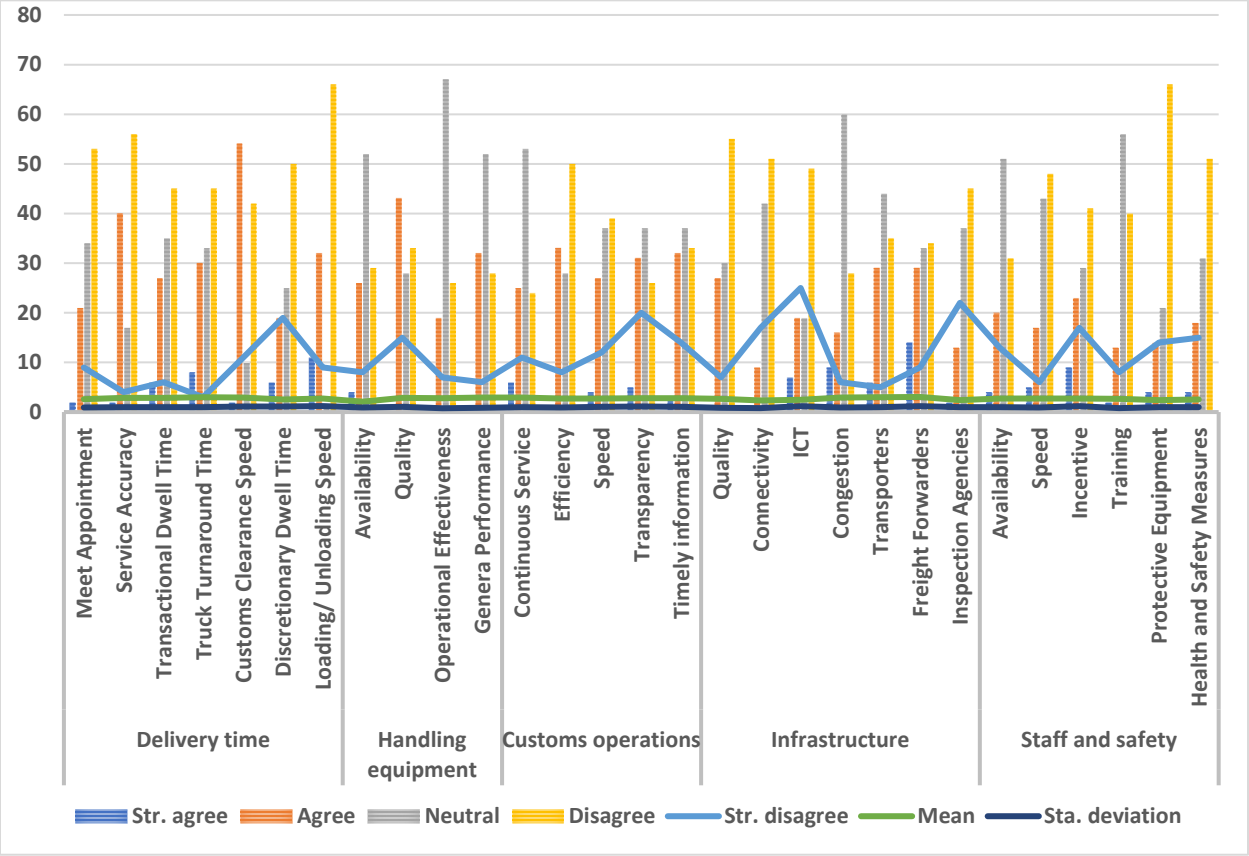

Figure 3: Results of Descriptive Analysis of Input Dimensions

A dry port is an effective alternative to solve problems related to congestion in many port areas (Facchini F. et al. 2020). **M**eeting the appointment, service accuracy, transactional dwell time, truck turnaround time, customs clearance speed, discretionary dwell time, and loading-unloading speed are the indicators applied to measure delivery time. Respondents were asked to reply about their level of agreement on each parameter. For the truck's turnaround time the mean value of 2.96 was found to be the highest. With the lowest standard deviation of 0.92, the values in the appointment meeting indicator tend to be close to the mean value. Looking at the cumulative result, 66% and 34% of the respondents replied that the operations performance of MDP in terms of delivery time is unsatisfactory and desirable, respectively. Based on the interview's responses, even though attempts have been made to address inefficiencies and minimize logistics costs in MDP by applying different strategies, the changes are not matching to the desired level of efficiency.

Considering availability, quality, effectiveness, and general implementation as indicators to measure handling equipment in MDP, results suggest that majority of the respondents replied neither agree nor disagree with all indicators. The mean value of the indicators under handling equipment ranges from 2.09 to 2.95 and operational effectiveness demonstrates the minimum standard deviation value of 0.77. To take advantage of economies of scale of dry ports, sufficient related equipment, modernizing and upgrading operations, and active involvement of the private sector are recommended (Jeevan J. et al. 2018).

The researcher has also assessed if MDP can qualify the minimum facility requirement as per the United Nations Conference on Trade and Development. Accordingly, the researcher proved that the MDP fulfills the minimum requirements such as, undertaking customs control and clearance, serving as temporary storage during a customs inspection, having container handling equipment for 20-foot and 40-foot containers, offices of an operator, offices of

clearing and forwarding agents, complete enclosure, fencing, and security system, efficient communication facilities and container freight station with loading and unloading services.

Service continuity, speed, efficiency, timely information, and transparency as indicators to measure customs operations in MDP, in general, were found to be unsatisfactory based on the data gathered from respondents. Based on the study conducted by Changa Z. et. al. (2018) in Chinese dry ports, operations related to customs impede dry port efficiency. Trade plays an important role in economic growth. Rigidity within the customs clearance and the subsequent congestion affect the competitiveness of manufacturers (Jeevan J. et al. 2018). Dry port performance predominantly depends on the quality and quantity of logistics operations infrastructure (Cezar-Gabriel and Ciortescu 2010). Taking quality, connectivity, information communication technology, congestion, transporters, freight forwarders, and inspection agencies as indicators into account, the logistics infrastructure of MDP was assessed. Poor network infrastructure and bureaucratic customs processes are some of the challenges identified in Brazil's dry ports (Rodrigues T. et al. 2020). Staff and safety measures in MDP were measured applying availability, speed, incentive, training, protective equipment, and health and safety processes indicators. The role of the government in formulating policies suitable for dry ports is imperative. Regardless of the magnitude, dry ports' performance can be attributed to the quality and adequacy of related policies and regulations (Cullinane K. et al. 2012). Reliability Statistics of All Variables are assembled in the table 1.

Table 1: Results of Descriptive Analysis and Reliability Test

No.	Dimension	Mean	Std. D	Co. Coe.	P-Value	CA	CA (Sta. Item)	Dwell time in days (2014 – 2019)	
1	Delivery Time	2.85	0.58	0.367	0.000**	0.726	0.730		
2	Container Handling	2.87	0.91	0.457	0.000**	0.798	0.799	2014	52
3	Customs Operations	2.8	0.71	0.432	0.000**	0.723	0.722	2015	59
4	Quality of Port Infrastructure	2.48	0.73	0.350	0.000**	0.752	0.791	2016	60
5	Quality of Logistics Services	2.8	0.85	0.367	0.000**	0.770	0.769	2017	55
6	Quality of Port Staffs	2.73	0.76	0.497	0.000**	0.863	0.849	2018	54
7	Safety of the Port	2.47	0.9	0.433	0.000**	0.753	0.760	2019	38
Reliability Statistics of All Variables						0.859	0.844		

Container dwell time describes how long a shipping container stays at a dry port terminal. Monitoring container dwell time is one of the best ways ports can improve their operations and know how much of their space is being used now and will be used in the future. The average container dwell time in MDP from 2016 to 2019 is 53 days. 60 days in 2016 and 38 days in 2019 respectively, are the maximum and minimum container dwell-times registered. Results imply that there is improvement in minimizing container dwell time. The shorter the container dwell time, the higher the potential utilization of the port terminal (Fazi and Roodbergen 2018).

3.3. Service Offering Performance Outputs Dimensions

The primary advantages of establishing dry ports are lower transportation costs, more value-added services at the customer's doorstep, faster transportation of units to/ - from the seaports, faster customs clearance, simplified documentation, and lower storage rates (Violeta Roso and Kent Lumsden, 2010). Service time and operations cost are the dimensions assessed to measure the operations performance of MDP concerning service offering. Loading and unloading containers to and from trucks and warehouses take 18 hours on average. Full container delivery service time of 24 hours per container is the maximum service time from the MDP operations. The mean service time for logistics operations in MDP is 4.8 hours. Based on the interview data from the management body of MDP, immediate improvements are required to enhance the logistics operations. Jeevan et. al., (2018) mentioned that improvements in dry ports deliver cost and time benefits, which supports the responses from the management of MDP. In addition, the development and improvement of dry port operations have an impact on competitiveness (Adolf K. Y. Ng & Jose L. Tongzon, 2010).

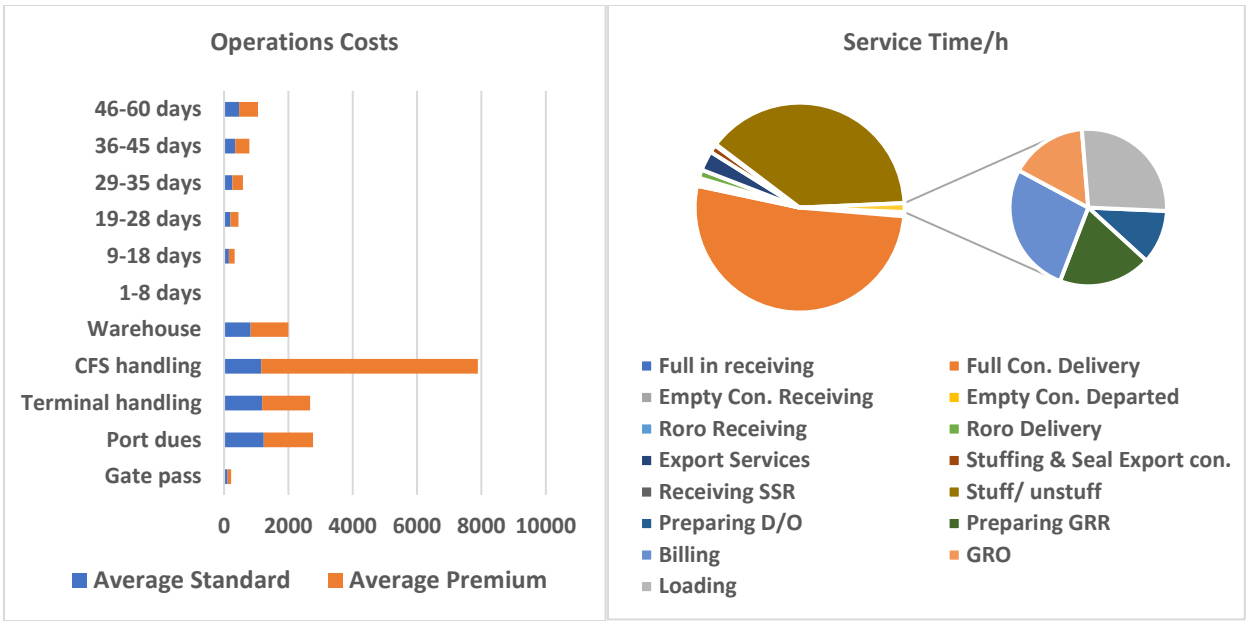

Figure 4: Results of Descriptive Analysis of Output Dimensions

Table 2: Results of Descriptive Analysis of Output Dimensions

Descriptive Analysis Results				
	Mean	St. Dev.	Minimum	Maximum
Operations' Service Time	4.8	2.06	0.07	24

The tremendous increase in transport cost and lead time created concern and raised the demand for the development of dry ports in West and Sub-Saharan Africa countries (Augustin and Akossiwa 2018). According to a report by the Ethiopian Mistry of Transport and Ethiopian Shipping and Logistics Service Enterprise in 2016, MDP has been experiencing significant operational constraints. Lack of proper management system of the facility was leading to delays in locating containers and increasing congestion around the facility because of poor traffic flow patterns, lack of parking spaces for trucks, absence of facilities, and readiness to handle inbound and outbound railway traffic. This goes well with the data collected through interviews indicating the occurrence of congestions in the dry ports. Considering two dry ports in Africa, Isaka Dry Port in Tanzania and Matsapha Dry Port in landlocked Swaziland, results showed significant improvement in customer service, cargo safety, delivery time, lowering transport cost, customs clearance efficiency, and reducing congestion at the seaport (Roso and Lumsden 2010).

4. Conclusions, Recommendations, and Future Research Directions

The research focused on assessing the logistics operations performance of MDP. This paper provides relevant information to different stakeholders to consider in developing strategies for enhancing dry port operations. Based on the data collected and analyzed, the following conclusions and recommendations are drawn.

The logistics operations performance of MDP in terms of delivery time, customs operations, and quality of port infrastructure are unsatisfactory and most of the respondents agreed that there is not enough container handling equipment. Regarding the rank and operational effectiveness of loading and unloading machines and congestion of container operation, MDP is average and most of the respondents agreed that improving infrastructure minimizes the congestion problem. MDP was found undesirable in terms of safety and weak in the quality of staff.

It is important to consider that all the operations are highly interconnected and that changes in one indicator of an operation also have an impact on other operations. Likewise, the performance of logistics operations of Modjo Dry Port, seen as the pillar of the system, has a significant impact on the overall logistics and economic performance of the country.

Despite significant investments, the dwell times have not been improved for the past six years. Elongated dwell time could negatively affect container terminal operations and would also cascade down the line resulting in inflated storage fees, higher inventory holding costs, and tied up working capital to the customers. To improve the dwell time, MDP could make use of an automated shipment and cargo container tracking system that can help track goods movement, monitor accurate dwell time at the dry port, and take corrective actions on time. It is advised the port diligently work on the improvement of the dry port infrastructure and conduct a study to find out the factors that are creating congestions. It could be because of the volume, insufficient gate capacity, insufficient road capacity, or drivers not carrying proper documents. Once the issues are substantiated, it would be easier to overcome current challenges and achieve operational efficiency.

Creating a sense of safety and security for employees would positively affect their motivation and, as a result, would indirectly affect the operations performance of the dry port. Hence, the port is required to provide enough safety equipment and adopt health and safety management systems for its employees. The port is recommended to promote the participation of the private sector to develop the storage and warehouse services and outsource some of the functions to enhance its operational performance. The port could enhance its operation's performance by improving the availability and effectiveness of cargo and container handling equipment. Development in infrastructure, information sharing, regulations, logistics performance, and customs clearance procedures could overcome the problems.

A major limitation of this study is the fact that it only analyses one dry port (MDP). However, a comparative study with other dry ports within the African region and outside would provide a more comprehensive overview and might result in further recommendations. Furthermore, the research is purely quantitative and does not incorporate qualitative aspects. Future research can include qualitative analysis. This study only assessed logistics operational activities in the MDP, Ethiopia. Data were collected from the terminal operation and management employees only excluding different stakeholders.

Acknowledgments

The research is supported by Kuehne Foundation, LEED Program.

References

Takele TB, Tolcha TD. Optimal transit corridors for Ethiopia. *Journal of Transport and Supply Chain Management*, 12;15:11, Jul 2021.

Luttermann S, Kotzab H, Halaszovich T. The impact of logistics performance on exports, imports and foreign direct investment. *World Review of Intermodal Transportation Research*, 9(1):27-46, 2020.

Kabak Ö, Ülengin F, Ekici ŞÖ. Connecting logistics performance to export: A scenario-based approach. *Research in Transportation Economics*, 70:69-82, Oct 2018.

Wilmsmeier G, Sanchez RJ. The relevance of international transport costs on food prices: endogenous and exogenous effects. *Research in Transportation Economics*. 2009 Jan 1;25(1):56-66.

Faye ML, McArthur JW, Sachs JD, Snow T. The challenges facing landlocked developing countries. *Journal of Human Development*, 5(1):31-68, March 2004.

Arvis JF, Mustra MA, Ojala L, Shepherd B, Saslavsky D. Connecting to compete. Trade Logistics in the Global Economy. *The Logistics Performance Index and Its indicators Available at*, Mar 312014.

Wornalkiewicz W, Kutsenko M. Innovative logistic solutions. *Journal of Modern Economic Research,* 15;2(3):53-63, Sep 2020.

Woxenius J, Roso V, Lumsden K. The dry port concept–connecting seaports with their hinterland by rail. *InICLSP Conference Proceedings*, (pp. 305-319), Sep 2004.

Werikhe GW, Zhihong J. Dry Ports Development in East Africa. A Benchmarking Approach. In2016 Eighth *International Conference on Measuring Technology and Mechatronics Automation (ICMTMA),* (pp. 231-239). IEEE, Mar 11, 2016.

Klomperee J. Improvement of port operation, service efficiency, and competitiveness, to meet the logistical needs of clients: a case study of Bangkok port container terminals, 2000.

Cullinane K, Bergqvist R, Wilmsmeier G. The dry port concept–Theory and practice. *Maritime Economics & Logistics*, 14(1):1-3, Mar 2012.

Abdoulkarim HT, Fatouma SH, Munyao EM. Dry Ports in China and West Africa: A Comparative Study. *American Journal of Industrial and Business Management*, 9(03):448, Mar 2019.

The Dry Port Concept – Connecting Seaports with their Hinterland by Rail - *Scientific Figure on ResearchGate*. Available from: https://www.researchgate.net/figure/A-seaport-with-a-distant-dry-port_fig2_281275033, Jan 2022.

Tekalign Y. Regional security dilemma for Ethiopia's quest for access to the sea. *African Security Review*, 28(3-4):189-206, Jul 2019.

Khaslavskaya A, Roso V. Dry ports: research outcomes, trends, and future implications. *Maritime Economics & Logistics*, 21:1-28, Feb 2020.

Miraj P, Berawi MA, Zagloel TY, Sari M, Saroji G. Research trend of dry port studies: a two-decade systematic review. *Maritime Policy & Management*, 19;48(4):563-82, 2021.

Bekele R. Determinants of Throughput Performance of Modjo Dry Port, Ethiopia. *Journal of Business and Administrative Studies*, Vol. 11, No. 2, 2019.

Pamela AC, Umoh GI, Worlu G. Human resource planning and organizational performance in oil and gas firms in Port Harcourt. *Human Resource Planning*, 3(9), 2017.

Facchini F, Digiesi S, Mossa G. Optimal dry port configuration for container terminals: A non-linear model for sustainable decision making. *International Journal of Production Economics*, 219:164-78, Jan 2020.

Jeevan J, Chen SL, Cahoon S. The impact of dry port operations on container seaports competitiveness. *Maritime Policy & Management*, 46(1):4-23, Jan 2019.

Chang Z, Yang D, Wan Y, Han T. Analysis on the features of Chinese dry ports: Ownership, customs service, rail service, and regional competition. *Transport Policy*, 82:107-16, Oct 2019.

Cezar-Gabriel C. Performance assessment in operating dry ports. *Ann Faculty Econ*, 1(2):934-8, Dec 2010.

Almeida Rodrigues T, de Miranda Mota CM, Ojiako U, Dweiri F. Assessing the objectives of dry ports: main issues, challenges, and opportunities in Brazil. *The International Journal of Logistics Management*. 2020 Nov 19.

Cullinane K, Bergqvist R, Wilmsmeier G. The dry port concept–Theory and practice. *Maritime Economics & Logistics*, 14(1):1-3, Mar 2012.

George D, Mallery P. SPSS for Windows step by step. A simple study guide and reference (10. Baskı). GEN, Boston, MA: Pearson Education, Inc. 2010.

Fazi S, Roodbergen KJ. Effects of demurrage and detention regimes on dry-port-based inland container transport. Transportation Research Part C: Emerging Technologies, 89:1-8, Apr 2018.

Roso V, Lumsden K. A review of dry ports. *Maritime Economics & Logistics*, 12(2):196-213, Jun 2010.

Ng AK, Tongzon JL. The transportation sector of India's economy: dry ports as catalysts for regional development. *Eurasian Geography and Economics*, 51(5):669-82, Sep 2010.

Augustin DS, Akossiwa DL. SWOT Analysis for developing dry ports in Togo. *American Journal of Industrial and Business Management*, 8(06):1407, Jun 2018.

Roso V, Lumsden K. A review of dry ports. *Maritime Economics & Logistics*, 2(2):196-213, Jun 2010.

https://tcdata360.worldbank.org/countries/ETH

Biographies

Meron Tamrat Assefa is working for the United Nations Capital Development Fund as a Regional Operations Associate in Addis Ababa, Ethiopia. Meron is an Experienced Regional Operations with a demonstrated history of working in an international organization. Skilled in Budgeting, Analytical Skills, Project management, Procurement, and Operations. Strong support professional with a Master of Business Administration from Mekelle University.

Seid Mohamedbirhan Nuru is an academic staff in the College of Business and Economics, School of Management, Mekelle University, Ethiopia and is currently associated as a post-graduate visiting researcher with the Centre for Supply Chain Improvement at the University of Derby, U.K. Seid is a beginner in research and has more than thirteen years of experience in teaching and community services as well as management and administration in public and private universities in Ethiopia. He has published a few articles in peer-reviewed scientific journals. He has some experience in presenting and participating in International Conferences. Seid's reach focus and expertise are in the areas of Logistics Performance, Marketing, Business Management, Development Studies, and Supply Chain Management.

Simon Peter Nadeem is a Lecturer in the College of Business, Law and Social Sciences, and is associated as a researcher with the Centre for Supply Chain Improvement at the University of Derby, U.K. Simon has proven proficiency in research and teaching as well as management and administration. He has published in high-ranking peer-reviewed scientific journals such as the International Journal of Production Research (IJPR) and Production Planning and Control (PPC). He has presented and published in International Conferences such as POMS, APMS,

INCOM, IEOM and has contributed chapters and case studies in academic books. Simon's research focus and expertise are in the areas of Circular Economy, Lean, Operations Management, Supply Chain Management, Sustainability, and Innovation.