Determinants of Throughput Performance of Modjo Dry Port, Ethiopia

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ABSTRACT

Efficient and effective dry ports are crucial for the economic growth of a landlocked nation like Ethiopia. This study presents the assessment of the performance and the determinants factors for effective and efficient dry port performance by taking the case of Modjo dry port. Primary data were collected from 130 sample customers and 41 sample employees of the dry port, which were selected based on convenience sampling technique. The data were collected using questionnaire and were analyzed using descriptive statistics and ordinal logistics model. STATA software was used to estimate the logistic regression model. The performance of the dry port estimated using pre-defined performance indicators identified for the latent performance dimension, such as human capital, information capital, and size of the dry port, port machinery, infrastructure and reliability. Accordingly, the overall findings showed that the throughput performance of Modjo dry port was found at medium level with inter-month and annual fluctuations. The result of the study further indicated that except human capital and size of the port, information capital, service cost, port machinery, port infrastructure and reliability were functioning at medium level of performance. Human capital was found at low level of performance, whereas the size of the port was functioning at higher level of performance. Apart from this, the regression analysis of the study suggests that except infrastructure and machinery, information capital, human capital, service cost, size of the port and reliability found positive and significant determinants for the performance of the dry port at different levels of intensity and probability levels. The findings study implied that there is a possibility of improving the performance of Modjo dry port through capacitating human resources, ICT infrastructure, the size of the port and reconsidering the service cost and its reliability. Therefore, the study recommends the strategic leadership on the interventions of improving the performance of Modjo dry port.

Keywords: Throughput performance, determinants, Modjo dry port, Ethiopia

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1. INTRODUCTION

1.1. Background of the Study

Land lockedness refers to the geographical situation of a country without direct access to the sea (Arvis et al. 2014). According to this definition, there are 44 landlocked countries in the world and of these, the United Nations lists 32 as landlocked developing countries (LLDCs) that are low and middle-income countries based on the World Bank country classification with a population of nearly 440 million. Due to the lack of direct access to the sea Landlocked Developing Countries (LLDCs) are marginalized from major transportation and services (logistics, information technology) networks (World Bank-United Nations, 2014). Their international trade depends on transit through other countries. In addition, long distance to world markets, cumbersome transit procedures and inadequate infrastructure contribute to high transport and trade costs thereby reducing external trade and subsequent economic growth. Access to major markets is one of the biggest constraints to poverty reduction and economic integration of landlocked developing countries (Faye et.al. 2004). Companies in landlocked developing countries are struggling to get the goods to their destination without major delays and increases in cost (Faye et.al. 2004).

Efficient dry ports could help reduce these transport costs and make them better able to compete commercially (Gujar, 2011). To maintain the commendable economic growth that has been registered in the country over the last several years, one of the strategic measures taken by the Federal Government of Ethiopia is merging the former three public enterprises that have until recently been operating separately in a rather similar and interdependent maritime sub-

sector; namely, Ethiopian Shipping Lines S.C, Maritime and Transit Services Enterprise and Dry Port Enterprise.

The Ethiopian Shipping and Logistics Services Enterprise (ESL for short) is the result of this merger. This newly amalgamated enterprise came into being following the issuance of Regulation by the Council of Ministers (Regulation No. 255/2011), and is vested with the huge responsibility of rendering sea-transport & logistics services to the country's importers, exporters, and investors in a more effective and efficient way, by reducing transit time, cost and handoffs. Besides, a truck operating company named Comet Transport SC has recently been transferred to ESL following a government decree issued in the mid of 2014.Ethiopia, as landlocked developing country, faces a number of challenges. High transit transportation costs, limitation of technical and technological capacity, imported inflation, limited investable resources and low mobilization of domestic financial resources to finance the massive investment requirement for rapid growth. In order to ease some of the problems in the transit countries, Ethiopia has started constructing dry ports in its hinterland along the transit corridors. This will help the country to save foreign currency by mitigating demurrage charge that is paid at Djibouti port. ESLSE also offers on carriage possibilities to inland dry ports such as Modjo/Adama, Semera, Kombolcha, Dire Dawa, Mekele, Gelan and Comet (Addis Ababa).Among the dry ports, Modjo Dry port which is located approximately 70 kilometers southeast of Addis Ababa started its commercial operation in 2009 under the former Ethiopian Dry port Enterprise.

The dry port location has an access to the Express road and Djibouti Sebeta Rail way. The dry port is only involved with the operation of imported container and Ro/Ro activities that are transported through the intermodal system. Modjo dry port is the corridor for major trade transaction of the country since most of the

containers are destined to the capital. About 75% of the countries imported containers transported through intermodal system are handled by this port (ESLSE, 2015). Currently, 2014/2015, Mojo has financial growth of 555,145,650 ETB (26,435,507 USD) (Mojo dry port and terminal report, 2015).Dry ports could be a solution to this problem as it facilitates the international trade of the country with the rest of the world (IMF, 2013). With a dry port, goods being transported to a landlocked country, rather than undergoing customs procedures at the sea port, would instead be transported directly to the country's dry port, where customs clearance would take place (Gujar, 2011).

Poor trade logistics penalize importing and exporting firms and it can add about 10% to production cost. In addition to shipping cost, cost of transit of goods from port to the main land is still another burden for the trade competitiveness of the nation. Thus, given the important role of dry ports to the entire economy of the country it is worthy to examine factors that influence the performance of dry ports. Users are in the best position to determine if the port, and its partners, delivers the services required. If the delivery of services does not match expectations, the port does not deliver a value proposition to its customers, and is therefore seen as ineffective. According to Brooks and Pallis (2011) port users are able to see how ports perform on the various dimensions of port performance and are also able to identify factors which have impact on port performance. Hence, addressing user's perception on performance determinants is important and the findings could assist ports in benchmarking their performance against others they see as competitors, and therefore guide them in improving the quality of their services, which will be a significant benefit to the port users in particular and to overall economy in general. Kasypi and Muhammad (2006) noted that, the port performance is the lifeblood of ports

which deserves maximum attention from port operators. Therefore, the study of factors which drive the performance of dry ports is important when considering building a new port or upgrading an existing one and for achieving higher levels of competitiveness.

Performance measurement plays a vital role in all organizations. The function of performance measurement is to investigate how well the given activities of an organization have effectively and efficiently achieved their goals (Mentzer and Konrad, 1991) and to give guidance on how the organization can make improvements (Woo *et al*., 2011a). Port throughput measures reflect the amount of cargo or number of vessels the port handles over time. These measures are affected by many variables beyond physical capacity. For example, international and domestic demand for cargo handled by the port, competition with other ports, contractual arrangements with carriers, and changes in distant facilities. The throughput statistics included in this report are (1) cargo tonnage, (2) container TEU, and (3) vessel calls categorized by commodities carried. It is important to note that the throughput statistics presented in this report are annual totals, which can mask seasonal variations in cargo flows that place recurring stress on available port capacity. The Working Group recommended that BTS focus on annual totals and not on quarterly or monthly totals. BTS will explore methods for capturing the effects of seasonal variations on port throughput and capacity in future editions of this report (BTS, 2017).

High transit transportation costs, limitation of technical and technological capacity, imported inflation, limited investable resources and low mobilization of domestic financial resources to finance the massive investment requirement for rapid growth. Traditionally, cost accounting (or financial) principles were the main tool to measure and evaluate organizations' performance. The

problems with regard to the traditional approach have been widely documented with criticism especially for encouraging short-term decision making (Banks and Wheelwright, 1979; Hayes and Garvin, 1982; Kaplan, 1984). On top of that, using only financial measures in performance measurement is no longer sufficient to cover all related issues for the new business environment; presenting this approach is highly outdated and inadequate (Kaplan, 1984; Miller and Vollmann, 1985; Fry and Cox, 1989). As a consequence, the importance of non-financial (i.e. intangible assets) measures and the integral applications of both financial and non-financial measures for performance measurement have been continuously acclaimed (Johnson and Kaplan, 1987; Daniel and Keegan, 1989; Neely *et al*., 1995).

The study of performance measurement in ports and terminals has been attracting scholars and industrial practitioners in the past three decades. The study of port and terminal performance can be seen as a well-established segment in the port-related academic literature in terms of the number of publications (see Pallis*et al*. (2011) and Woo *et al*. (2012)). While over time they have developed in a broader and more advanced way, there are still research gaps yet to be filled.

The studies on port performance measurement traditionally focus on the efficiency and productivity of port/terminal operations (Suykens, 1983; Kim and Sachish, 1986; De Monie, 1987; Talley, 1988;Chadwin*et al.*, 1990; Roll and Hayuth, 1993; Talley, 1994;Tongzon and Ganesalingam, 1994;Tongzon, 1995a;Tongzon, 1995b;Sachish, 1996;Tongzon, 2001;Cullinane*et al*., 2002; Barros and Athanassiou, 2004;Cullinane*et al.*, 2004; Wang and Cullinane, 2006; Cruz *et al.*, 2013). In such studies, various research scopes and approaches are used for productivity comparisons or engineering and economic optimums for benchmarking purpose.

UNCTAD (1976) suggested productivity and effectiveness indicators have been used by many researchers as a means of measuring port performance. Furthermore, the suggested port performance indicators are said to be divided in two broad categories, which are financial and operational. Financial aspects measure a quantitative contribution on a port's economic activity, whereas operational aspects evaluate the effectiveness of port operations such as service time, arrival time and tons per ship-hour at berth.Multi-criteria approach is also a method used to measure dry port performance. Several studies (such as Bentaleb et al. (2015), De Icaza1 and Parnell (2018), Bagočiusa et al. (2013), Da Cruz et al. (2013), Jafar et al. (2019), Madeira Junior et al. (2012), etc.) applied Multi-criterial approach to assess port performance. Bentaleb et al.

1.2. Statement of the Problem

Over 90 percent of Ethiopia's total import-export trade is carried out through the port of Djibouti. Djibouti is the main port for sea transport in and out of Ethiopia, and situated 900 km from Addis Ababa, making the cost of in-land transportation an important factor. According to the World Bank's "Doing Business" study in 2015, it costs US$2,960 to import a container to Ethiopia (and US$2,380 to export), compared with US$800 to import and US$ 823 to export in China and US$600 and US$610to import and export respectively in Vietnam. Thus, poor trade logistics is a key contributing factor of Ethiopia's poor performance compared to the Asian countries. Annually, Ethiopia paid for port services to Djibouti 2 billion birr in 2006 (Robera, 2011:51), US$ 700 million in 2009 (UN, 2013:17), and $850 million in 2010 (Getachew, 2017:5) for port services.

According to (IMF 2014) the estimated total transit costs have been consuming over 16% of Ethiopia's foreign trade value which is about two million US$ per day. High cost of charges, reduced free time for imported cargos, the untimely availability of empty containers for export cargos and inadequacy of storage facilities remain the major factors that escalated Ethiopia's total logistic cost for its import and export trade there by affecting the country's competitiveness in the international trade. As noted by (IMF, 2014) Exporters, importers, ocean carriers, marine terminal operators, truckers, and railroads all experience additional costs when cargo and equipment does not move efficiently through the terminals and when there is congestion. Port congestion can arise from multiple causes, and those causes may vary by port or by marine terminal. These include; labor productivity issues, operators' schedule reliability, inefficiency of the transportation infrastructure connecting a marine terminal to rail and roadways, the amount of land that the port facility has to store containers and conduct operations and shortages of various types of equipment. Those factors are hardly an exclusive or exhaustive list of reasons for port congestion, but it illustrates that the problem is not caused by a single or simple set of factors.

Dry port users frequently complained about the slow pace goods and service delivered by Modjo dry port that leads to a serious congestion problem in the dry ports which has, in turn, resulted in substantial operating costs for the port and to the customers (Mohammed, 2014). There are different studies done on port performance and determinants. (eg. Mengying 2010; Hiwot 2014; Seid 2014; Khalid 2015; Elshday 2016; Yodit 2016). However, the studies are analyzed using descriptive statistics. Furthermore, the literatures did not identify indicators that determine port performance. The importance of measuring port performance and lack of previous research on factors

influencing port performance have motivated the researcher to conduct this study. Therefore, the study aims to assess the throughout put performance and its determinants of ModjoDry Port.

2. METHODOLOGY

2.1. Research Design and Approach

The research design can be thought of as the logic or master plan of a research that throws light on how the study is to be conducted. It shows how all of the major parts of the research are done. The current study adopted explanatory research design since the objective requires to find out the factors that explain the performance of Modjo dry port. The study used a mixed research approach in which both quantitative and qualitative data were collected to answer the research various research questions posted.

2.2. Data Source and Sampling Design

Data were collected from primary and secondary sources. The respondent categories for primary source were the customers (importers/exporters and transistors) In addition to the primary sources of data, the researcher also utilized secondary data related to current performance and determinants of dry port performance of Modjo dry port and it was collected from company publications.The study incorporated a population group of Modjo dry port customers (importers, exporters and transistors). Therefore, samples were drawn from the population groups. Since the total population of the study was undefined, data were collected from 130 sample customers who were identified using convenience sampling. Apart from these, further data were collected from 41 randomly identified employees of the port.

2.3. Variables and research hypotheses

Taking notes of records, conducting semi-structured questionnaires, in-depth interviews, and employing organizational survey on level of satisfaction in port services were the data gathering tools. Once the total sample size from each population was determined, the required techniques was employed, i.e. both primary and secondary methods, in order to gather relevant information regarding how the service delivery process is executed in the sector, how performance techniques applied, and what was the overall level of users' satisfaction. The primary data required from staff members were collected through a structured questionnaire as well as personal interview was made. The questionnaire consisted of closed ended and open ended types. The closed-ended questionnaire was used for surveying the level of organizational satisfaction in port services. The other source was secondary data. Information related to the entire process as well as the development activities operated each month was collected from different sources.

Table 1: Variables and Hypotheses

Variables	Type	Definition and measurement	Expected sign
Throughput performance	Dependent variable		
Size of dry port	independent variable	Total holding capacity of the port	+
Port machineries	independent variable	Machineries used by the port such as crane.	+
Infrastructure	independent variable	Infrastructural facilities	+
Information capital	independent variable	IC infrastructural facilities	+
Reliability	independent variable	Secure, free of theft ports	-
Human capital	independent variable	Employees skill, knowledge and capability performance	+

Service Cost	independent variable	Service due charge	-

Source: Own compilation, 2019

2.4. Data Analysis Technique

According to Cooper and Emory (1995), data analysis usually involves reducing accumulated data to a manageable size, developing summaries, looking for patterns, and applying statistical techniques. This section explains how the data is to be captured and analyzed. The data obtained were analyzed with the aid of the statistical package for econometrics (Stata) computer software. Multiple regressions were used to measure determinants of the dry ports performance. Apparently, ordered logistic regression model was estimated to identify the factors that affected the throughput performances of Modjo dry ports. In this research throughput performance was measured using a single-item measure. Respondents were asked to rate the performance of throughput volume on a five-point Likert scale. Since the outcome variables for throughput performance is ordered and categorical, the most appropriate econometric estimation method to apply is ordinal logistic regression (Green 2000). The ordered logit models have come in to wide use as a framework of analyzing ranked responses (Parasuraman *et al.* 1988). Furthermore, according to Williams (2008) Ordered logit models are among the most popular ordinal regression techniques. Hence, for the purpose of this study ordinal logistic regression model was employed and the functional form of ordered Logit Model for customer satisfaction is specified as follows:

$$Y* = \sum_{k=1}^{k} \beta_k \mathrm{X}_{ki} + \varepsilon_k \quad \text{.....(1)}$$

Y*= is a continuous, unobserved and unmeasured latent variable whose values determine what the observed ordinal variable Y equals

Ɛ= is a random disturbance term with zero mean and a standard normal or logistic distribution: Ɛ~N (0, 1). The continuous latent variable Y* has various threshold/cut-off points. (κ is the Greek small letter Kappa.).

The value on the observed variable Y depends on whether or not you have crossed a particular threshold/cut-off points. Thus, when M=3, what we do observed is;

$$\left.\begin{array}{l} Y = 1, \text{ if } Y^* \leq \mu_1 \\ Y = 2, \text{ if } \mu_1 < Y^* \leq \mu_2 \\ Y = 3, \text{ if } \mu_2 < Y^* \leq \mu_3 \end{array}\right\} \quad \ldots\ldots (2)$$

Where: Y, is observed in j number of ordered categories, μs are unknown threshold/cut-off point parameters separating the adjacent categories to be estimated with βs. The continuous latent variable Y* can be rewritten as;

$$Y* = \sum_{k=1}^{k} \beta_k X_{ki} + Ɛ = \ Z_i + \varepsilon_i \ \ldots\ldots (3)$$

The Ordered Logit Model estimates part of the above:

$$Y* = \sum_{k=1}^{k} \beta_k X_{ki} + Ɛ = \ E(Y*) \ldots\ldots (4)$$

Note that, because of the random disturbance term, the unmeasured latent variable Y* can be either *higher* or *lower* than Z. Note also that there is no intercept term. You then use the estimated M-1 cut off terms to estimate the probability that Y will take on a particular value. In this case since M=3, the formulas are:

$$\mathrm{P(Y = 1)} = \frac{1}{1 + e^{Zi-k1}}$$

$$\mathrm{P(Y = 2)} = \frac{1}{1 + e^{Zi-k2}} - \frac{1}{1 + e^{Zi-k1}}$$

$$P(Y = 3) = 1 - \frac{1}{1 + e^{Zi-k2}}$$

The cumulative probabilities can also be computed using the form:

$$Prob\ (Y = j) = 1 - L\ (\mu_{j-1} - \sum_{k=1}^{k} \beta_k X_k\ )$$

Where: L (.) Represents cumulative logistic distribution

3. RESULT AND DISCUSSION

3.1 Performance of Modjo Dry Port using Throughput Criteria

Throughput volume concerns the performance of the dry port in terms of entertaining as many containers as possible. Accordingly, more than 48 percent of the respondents replied that the container throughout put performance of the dry port was high; on the other hand, close to 22 percent of the respondents confirmed that the dry port containers throughout put performance were low; additionally, 23.08 percent of the respondents rated at medium the throughout put volume performance. Furthermore, the mean score of 3.46 implied that the throughout put volume performance of the port is high. Although the researcher evaluated the throughput performance indirectly collected from primary data; a four monthly secondary data were also generated. The monthly data were converted to yearly and presented here. Since the year 2008 to 2009 the performance of the throughput was significantly increasing; however the rate showed a slow increment rate after the year 2009 and lastly it went down.

The above graph shows a yearly data of container throughput, which implied the total number of output passed through the port. Here under this topic the monthly data are presented. In the year 2008 a total of 396,015 containers passed through the port, whereas 442,496 and 446,460 containers were passed

through the dry port in 2009 and 2010 respectively. Apart from these a lesser amount of containers were transferred in the year 2011, a total of 432,112 containers were delivered through the dry port. On average 39601.5 containers per month were delivered in 2008, and 44296.8 containers were delivered in the year 2009. On average 44646 and 43211.2 containers per month were transferred in the year 2010 and 2011 respectively. Overall, within these four years 1,717,555 containers were delivered through the port.

Table 2: Modjo dry port container through put performance

Month	**Container through put performance**				
	2008	**2009**	**2010**	**2011**	**Total**
July	32,156	43,305	53,304	39,890	168,655
August	37,180	51,935	55893	42,660	187,668
September	39,170	47,957	52,037	40,151	179,315
October	38,844	46,266	50,218	41,429	176,757
November	43,255	48,186	49,572	45,805	186,818
December	37,816	42,159	45,177	49,613	174,765
January	36,549	41,501	40,284	45,803	164,137
February	41,773	47,181	36,911	49,441	175,306
March	41,942	35436	33,242	37,025	147,645
April	47,330	39,042	29,822	40,295	156,489
Total	396,015	442,968	446,460	432,112	1,717,555
Mean	39601.5	44296.8	44646	43211.2	171755.5

Source: Modjo dry port (2008-2011)

3.2 Descriptive Statistics on the Determinants of Dry Port Performance

Information capital: Under this sub-topic to what extent the information capital was the concern of customers of the dry port. Close to 30 percent of the respondents said that the networks for internal and (or) external communication were poor; on the other hand, more than 35 percent of the respondents replied that the networks for internal and (or) external communication was good. Furthermore, more than 35 percent of the rest of the respondents pointed out that in the dry port, the IT infrastructure system in terms of functionality, compatibility and accessibility in operation was low.

Table 3: Description of information capital at dry port

Information capital	Scale					
	1	**2**	**3**	**4**	**5**	**Mean**
Networks for internal and/or external communication	12.31	17.69	33.85	20.77	15.38	3.09
Functionality, compatibility and accessibility in operation of IT infrastructure system	14.62	21.54	34.62	22.31	6.92	2.85
Databases, in particular, application for promoting analysis, interpretation and sharing of information and knowledge	16.15	21.54	32.31	18.46	11.54	2.87

Having capability to adopt IT based service to meet customers' specifications	8.46	17.69	30.77	23.08	20	3.28
1 = Very poor	2= Poor	3= Medium		4= High	5=Very-high	

Source: Owen survey (2019)

On the other hand, around 29 percent of the respondents mentioned that IT infrastructure system in terms of functionality, compatibility and accessibility in operation was high. More than 30 percent of the respondents also said that the data bases application, in particular, for promoting analysis, interpretation and sharing of information and knowledge was at high extent as well as the capability to adopt service to meet customers' specifications. Furthermore, the mean of information capital was 3.02 which was rated at medium level.

Human capital: In any organization the human capital quality is a critical factor for the success and performance of organization. 18.46 & 23.08 percent of respondents rated very poor and poor regarding the workforces' knowledge and skills to perform their job; whereas, 15.38 and 17.69 percent of the respondents rated at high and very high level the employee's knowledge and skills to perform their job. The rest 25.38 percent of the respondents replied that the knowledge and skill of employees to accomplish their job was medium. Apparently, more than 27 percent of the respondents confirmed that employees were loyal and committed; however, 35.39 percent of the respondents rated the employee's commitment and loyalty at poorest level; the rest 36.92 percent of the respondents replied that there was a medium level commitment and loyalty in the dry port. In the dry port the work forces of the organization strive to upgrade and enhance the capability work performance in pursuit of meeting customer expectation; this was confirmed by more than 27 percent of the respondents; on the other hand, around 43.8 percent of the respondents didn't see any effort made by the employees to enhance work performance that could meet customer expectations. In this regard, 30 percent of the respondents rated the commitment and effort made by employees at medium level.

Generally, more than 28 percent of the respondents had a positive observation towards the human capital of the organization, around 40 percent of the respondents had a complaint on the human capital of the organization, and the rest 30.76 percent of the respondents put at medium level the human capital of the organization in terms of service delivery. Furthermore, the mean score of human capital is 2.77 which lies between poor and medium level; however, in most literature below 2.8 is considered as poor level; therefore, overall the human capital of the organization was rated poor (Table 4).

Table 4: Human capital at the dry port

Human capital	Scale					
	1	2	3	4	5	Mean
Workforces' knowledge and skills to perform their job is:	18.46	23.08	25.38	15.38	17.69	2.90
Workforce's commitment and loyalty is	22.31	13.08	36.92	19.23	8.46	2.78
Work forces strive to upgrade and enhance the capability work performance	23.85	19.23	30	21.54	5.38	2.65
Total	**21.54**	**18.46**	**30.767**	**18.71**	**10.51**	**2.77**
1 = Very poor 2= Poor	3= Medium			4= High	5=Very-high	

Source: Owen survey, 2019

Service cost: For any trader cost is a sensitive issue since it has a direct implication on the profitability of the business. In relation with this, around 33.08 percent of the sampled customers were not well satisfied with the charge made for goods storage; by contrast, the majority (36.16%) of the respondents replied that the service charge made for storage of goods were proportional and good; the rest, i.e. 30.77 percent of the respondents rated the cost of goods storage at medium level. Apparently, customers also added that as a result of additional costs such as loading, unloading and stuffing costs 37.22 percent of the respondents were not happy; this implies customers perceived that the amounts they pay for those services are high.On the other hand, more than 27 percent of the respondents confirmed that the service delivery payment was proportional and it deserved for the job. Further, 35.38 percent of the respondents perceive the loading and unloading related payments at medium level. The dry port terminal also charges for cargo handling and close to 24 percent of the respondents replied that the cargo handling payment satisfied

them. Conversely, 50 percent of the sampled customers were not well satisfied with cargo handling payment. Considering the service payment close to 40 percent perceived the payment negatively, around 29 percent of the sampled customers perceived the payment positively and the rest 29.80 put the charge of service cost at medium level. Additionally, the mean of service cost was 2.81 which lies between poor and medium levels but it is more close to medium level (Table 5).

Table 5: Perception towards service cost

Service Cost	Scale					
	1	2	3	4	5	Mean
Satisfaction with cost of goods storage	10	23.08	30.77	21.54	14.62	3.07
Satisfaction with cost of (loading/unloading, Stuffing/Unstuffing,warehouse charge)	16.15	20.77	35.38	17.69	10	2.84
Satisfaction with cost of cargo handling charge of a terminal.	22.31	27.69	26.15	14.62	9.23	2.60
Satisfaction with total service cost	15.38	29.23	26.92	20.77	7.69	2.76
Total	**15.96**	**25.1925**	**29.805**	**18.655**	**10.385**	**2.82**
1 = Very poor 2= Poor	3= Medium		4= High		5=Very-high	

Source: Owen survey, 2019

Size of dry port: The size of the port obviously determines the storage capacity of the dry port; accordingly, more than 64 percent of the respondents replied that the storage capacity of the dry port was good Nevertheless, 10 percent of the respondents confirmed that the dry ports storage capacity was not good

enough and rated a low level; the rest 26.15 percent of respondents rated the storage capacity of the dry port at medium level. The customer respondents were also asked about the availability of warehouse and container fright station. More than 60 percent of the customers replied that there was enough warehouse and container fright station. To measure the size of the dry port two questions were used and the grand statistics shows that the capacity of the dry port rated very poor by 1.92 percent of the customers, poor by 9.61 percent of the respondents, medium by 31.53 percent of the respondents, high by 34.61 percent of the respondents and very high by 22.30 percent of the respondents. In addition to these, the mean of dry port size was 3.65 which imply that customers are well satisfied with the size and capacity of the dry port (Table 6).

Table 6: Perception toward size of the dry port

Size of Dry port	Scale					
	1	2	3	4	5	Mean
Storage capacity	0	10	26.15	38.46	25.38	3.79
Availability of warehouse and container fright station	3.85	9.23	36.92	30.77	19.23	3.52
Total	**1.92**	**9.61**	**31.53**	**34.61**	**22.30**	**3.65**
1 = Very poor 2= Poor 3= Medium 4= High 5=Very-high						

Source: Owen survey, 2019

Port machineries: This part assesses the situations of part machineries. More than 40 percent of the customer respondents responded that in the dry post container handling machineries and equipment's were available at enough extent. On the other hand, 32.12 percent of the respondents confirmed that there were no enough containers handling equipment in the port. The rest 26.92

percent of the respondents neither agreed nor disagreed with regard to the availability of container handling mechanism. Around 34 percent of the respondents also mentioned that the operational effectiveness of machineries were very high.

Table 7: Accessibility of port machineries

Port machineries	Scale					
	1	2	3	4	5	Mean
Availability of container handling equipment's	12.31	20	26.92	27.69	13.08	3.09
Operational effectiveness of machineries	13.85	16.15	36.15	25.38	8.46	2.98
Functionality of dry port machineries	11.54	20.77	36.15	23.08	8.46	2.96
Total	**12.56667**	**18.97333**	**33.07333**	**25.38333**	**10**	**3.01**
1 = Very poor	2= Poor	3= Medium		4= High	5=Very-high	

Source: Owen survey, 2019

More than 30 percent of the respondents replied that the operational effectiveness of machineries were low; in this regard around 36.15 percent of the respondents neither agreed nor disagreed. Furthermore, 32.54 percent of the respondents confirmed that the dry port machineries were well functional, but more than 32 percent of the respondents responded that the dry port machineries were not well functional. In this regard, 36.15 percent of the respondents were neither agreed nor disagreed. Summarizing the whole questions in to one concerning the port machineries 12.56 percent of the customer respondents rated it as very poor, 18.97 percent of the respondents rate poor, 18.97 percent

of the respondents rated medium, 25.38 percent of the respondents rated high and the rest 10 percent rated very high. Furthermore, the port machinery had a mean score of 3.01 which implies that in terms port machineries the dry port was rated at medium level (Table 7).

Dry Port Infrastructure: Infrastructure in this research context means that to what extent the dry port had enough infrastructural facilities. More than 45 percent of the sampled customers replied and rated the availability of port infrastructure at high level, where as 23.08 percent of the respondents rated the port infrastructure at low level. With regard to port infrastructure, 31.54 percent of the respondents rated at medium level. 29.23 percent of the respondents also mentioned that the quality of telecommunication infrastructure and IT service could be rated at high level; 36.93 percent of rated at poor level; the rest, i.e. 33.85 rated at medium level.

Table 8: Infrastructure and facilities at the dry port

Infrastructure	**Scale**					
	1	2	3	4	5	Mean
Availability of port infrastructure	8.46	14.62	31.54	26.92	18.46	3.32
Quality of telecommunication and IT service	13.85	23.08	33.85	20	9.23	2.87
Total	**11.155**	**18.85**	**32.695**	**23.46**	**13.845**	**3.095**
1 = Very poor 2= Poor	3= Medium			4= High	5=Very-high	

Source: Owen survey, 2019

In general, 11.15 percent rated the port infrastructure at very poor level, 18.85 rated at poor level, 32.69 rated at medium level, 23.46 percent rated the port infrastructure at high level and the rest 13.84 rated at very high level. In addition to these, 3.09 was the mean of port infrastructure which lies on medium level; this implies the port's infrastructure is leveled at medium level (Table 8).

Reliability of Modjo Dry Port Service: More than 41 percent of the respondents replied that there was high rate of incidence of cargo damage.Around 30 percent of the respondents rated at low level the incidence of cargo damage in the dry port. The rest 27.69 percent of the respondent rated the incidence of cargo damage at medium level. Apparently, there is high rate of cargo theft; this was confirmed by 30.77 percent of the customers, but more than 47 percent of the respondents rated the cargo theft in the dry port at low level; the rest 22.31 percent of the respondents rated the cargo theft level at medium level. In addition to these, 35.38 percent of the customers replied that cargos were delayed at higher extent in the dry port, whereas more than 42 percent of the respondents replied that cargos didn't delay. The remaining 22.31 percent rated the delay of cargos at medium level. Apart from these, the dry port security is good; this was confirmed by around 23 percent of the respondents. Close to 34 percent of the respondents rated the security at low level while 43.08 percent rated at medium level. Generally, 19.04 percent of the respondents rated the reliability at very poor level, 19.42 percent of the respondents rated at poor level, 28.84 percent of the respondents rated the reliability ate medium level and the rest 18.62 and 14.03 percent of the respondents rated the reliability at high and very high level. Furthermore, the grand mean score of reliability was 2.88; the mean score indicates that the reliability of the dry port is rated at medium level (Table 9).

Table 9: Description of port service reliability

Reliability	Scale					
	1	2	3	4	5	Mea
Incidence of cargo damage	13.85	16.92	27.69	19.23	22.31	3.19
Incidence of cargo theft	27.69	19.23	22.31	20	10.77	2.66
Delay(Dwell time and turnaround time)	22.31	20	22.31	19.23	16.15	2.86
Dry port security	12.31	21.54	43.08	16.15	6.92	2.83
Total	**19.04**	**19.4225**	**28.8475**	**18.6525**	**14.0375**	**2.88**

1 = Very poor 2= Poor 3= Medium 4= High 5=Very-high

Source: Owen survey, 2019

3.3 Determinants of the Performance of Modjo Dry Port

One of the assumptions underlying ordered logistic regression is that the relationship between each pair of outcome group is that same, in other words, ordered logistic regression assumes that the coefficients that describe the relationship between, say, the lowest versus all higher category of the response variable are the same as those that describe the relationship between the next lowest category and all higher category etc. and this is called proportional odd assumption. In order to test the proportional odd assumption brant test was performed; accordingly, if the variables become significant it is the indication of the assumptions are violated; however, if the variables are not significant it means that the assumption is not violated; accordingly, this assumptions are fulfilled (Table 10).

As shown in the previous sub topic all of the assumption was fulfilled except throughout put performance was estimated using ordered logit model. The

dependent variable port performance was represented by throughput performance.

Table 10: Ordinal logistic model test

	Brant test of parallel regression assumption		
Variables	chi2	p>chi2	df
All	14.81	0.832	21
Information capital	17.61	0.501	3
Human capital	16.11	0.301	3
ServiceCost	2.74	0.434	3
Size	1.19	0.755	3
Machinery	2.68	0.444	3
Infrastructure	1.18	0.757	3
Reliability	11.92	0.108	3

Source: Own computation, 2019

Port performance measurement is a challenging issue for most ports. The increased use of containerization and supply chains, the development of new production-distribution-consumption systems, and the increased specialization of the different port markets have all affected port organization management and operation. Understanding the levels of performance achieved is at the core of the strategy of port authorities and operators, in order to deploy strategies that address the needs of port users, increase competitiveness, and thus market shares. The notion of port performance is notably associated with operational issues, i.e. the efficient use of infrastructure, superstructure, and all other resources used. This association has for long affected the structuring of port performance measurement frameworks. The majority of the indicators, or relevant exercises, applied are constructs dealing with the operational productivity of the assets, equipment and productivity factors available (Brooks and Schelling, 2013).

The regression finding, as presented in Table 11, shows that among seven independent variables five of them had shown a significant effect on throughout put performance; and all of the variables information capital, human capital, service cost, size of port and reliability showed a significant and positive effect on throughout put volume performance. Information capital had a significant and positive effect on throughout put performance of the dry port. As observed in the table below, the coefficients of this variable is positive as well as the odds ratio is greater than one. Furthermore, given all the other variables in the model held constant, odds ratio greater than one suggested that, the dry port is more likely perform as the information capital increases. Along with the regression analysis the perception of the employees were also considered, although the regression output indicates information capital determines highly the throughput performance, the descriptive analysis coming from employee's shows a moderate response of human capital towards throughput performance. The description shows the networks data base is applied for internal and external communication at moderate level; while the application of databases for promoting analysis, interpretation and sharing of information and knowledge is at its developing stage.

Human capital also had a positive and significant effect on throughout put performance; the variable human capital had a positive coefficient and odds ration greater than one. Considering other variables in the model held constant as the human capital of the dry port increases it has more likely performance of throughout put volume. Human capital is a critical factor for most companies' profitability and their performance. In line with the regression analysis, the information generated from employees in a descriptive form shows in the dry post there is high access of training and education opportunities that helps to enhance the work forces capability which ultimately shows on the human

capital development of the port. Apparently, the dry port employee's knowledge and skill is high which helps to perform their job well and the commitment of the employees is also appreciable. The combination of good training and skill development program supported by the commitment of the employees makes to have a difference on the throughput performance of the dry port. According to Amah (2006), the goal of human capital management is to make available to the organization qualified manpower to carry out its activities, so that the organization's goal can be achieved. Of all the resources, an organization needs to function properly. Human capital is the only resource that can be motivated, taught, developed and appraised to obtain maximum performance. Eletu and Ukoha (2017) also found out that development is significantly associated with corporate performance; this implies that skills development is considerably important in enhancing corporate performance and expressions towards work in the organization. The nature of services provided by shipping companies forces them to be transnational companies serving more than one country. In general, these companies have access to international capital markets and they are able to hire the best workers from all over the world, although under some restrictions sometimes (Clark, Dollar, and Micco, 2001).

Service cost had also a significant and positive effect on throughput performance; in addition to this variable it had an odds ration greater than one which implies that as the service charged by the dry port increases its throughout put performance more likely to be high. Strandenes & Marlow (2016) states that changes in port pricing have implications for competitiveness of short shipping. Efficient ports strengthen short sea shipping competitiveness with respect to road transport. Thus, port pricing strategies that give incentives to increase port efficiency seem appropriate. Port efficiency is an important

determinant of handling cost. Countries with inefficient ports have higher handling costs. Also, countries with good infrastructure have lower seaport costs. The clear negative relationship shows that countries where ports are considered the most efficient are at the same time the ones whose ports charge the least. In turn, some countries are the worst ranked in terms of their efficiency and also present the highest charges per services (UNIDO, 2016). Ports are congested at times and congestion pricing has been advocated to obtain efficient exploitation of port capacities. The main part of the congestion costs is, however, related to the opportunity cost of vessel time. This reflects both the alternative income that the vessel forgoes by postponing the next fixture and the capital costs of the cargo. The latter of course depends on whether selling the goods is postponed or whether port congestion merely implies that storage time on board the vessel replaces storage time on land (Strandenes & Marlow, 2016).

The size of the port is also contributing positively for the throughout put performance; this variable had a positive and significant effect on throughout put volume. Moreover, the odds ratio greater than one suggests as the size of the port increases it's throughout put performance are more likely to increase. In support of this, the descriptive data collected from employees shows that the storage capacity of the dry port is rated at good level which is also supported by availability of good warehouse and container fright station. The combination effects of the good port size and good storage facilities make the port to have a significant contribution for its throughput performance. Most ports of the world have to provide covered transit warehouses for break-bulk cargo, container freight stations for Less than Container Load (LCL) cargoes, tanks for liquid bulk storage yards for open storage, space and warehouses for long term storage. The facilities have costs for initial capital outlay, maintenance and

operations. Space requirements for shed and open storage capacity are always difficult to determine because of the different characteristics of cargoes presented, and the time cargo will dwell in storage. The port's commercial strategy will also determine the amount of transit space required. If transit space is readily available, the port will attempt to attract cargo by offering a low tariff on storage. Alternatively, if transit space is limited or expensive the port will impose extra dues on storage to speed up delivery times and reduce time in transit (Indian Ports Association, 2013).

Reliability of the port also had a positive effect on throughout put performance. The analysis suggests that odds ratio greater than suggests that as the reliability of the port increases the throughout put performance are more likely to increases. In support of the regression analysis, the port is reliable in terms of security, delay, cargo theft and damage; this means in the dry port there is minimum rate of cargo theft, high security, and damage of containers and products. The low number of cargo theft incidents reported signals either that the utilization of freight is systematically low among goods owners who report incidents, or that the security levels at maritime transport facilities are relatively higher than those at other relevant target transport chain locations from the perpetrators' point of view. The first conclusion is less likely than the second, as the majority of reports come not from different parts. This would signal that the low numbers of incidents represent a relatively low risk for cargo theft at maritime transport facilities in general (EP, 2007).

Table 11: Ordered logistic regression estimation result

Ordered logistic regression Log likelihood = -98.749589					Number of obs = 130 LR chi2(7) = 157.45 Prob> chi2 = 0.0000 Pseudo R2 = 0.6436	
Throughout put	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
Information capital	.0787596	.0336052	2.34	0.019	.0128946	.1446246
Human Capital	.0908914	.0386255	2.35	0.019	.0151868	.166596
Service cost	.1253339	.0558147	2.25	0.025	.015939	.2347287
Size of the port	.2281823	.076416	2.99	0.003	.0784098	.3779548
Machinery	.003225	.1060699	0.03	0.976	-.2046683	.2111182
Infrastructure facility	-.1091646	.112936	-0.97	0.334	-.3305151	.1121858
Reliability	.4894916	.1119115	4.37	0.000	.2701491	.7088341
/cut1	10.70872	2.071744			6.648179	
/cut2	14.76926					
/cut3	14.97695	2.463954			10.14769	
/cut4	19.80621					
	18.36342	2.726592			13.0194	
	23.70745					
	22.45413	2.944186			16.68363	
	28.22463					

Source: Own computation, 2019

4. CONCLUSION AND RECOMMENDATION

The dry port concept is based on a seaport directly connected by truck or rail to inland intermodal terminals, where shippers can leave and/or collect their goods in intermodal loading units as if directly at the seaport. In addition to the transshipment that a conventional inland intermodal terminal provides, services such as storage, consolidation, depot, maintenance of containers, and customs clearance are also available at dry ports. The dry port implementation itself certainly is not a straightforward solution for seaport terminal congestion or for

better seaport inland access; however, it could be part of the solution. As the dry port is key logistics channel to the country it contributes to overall poor logistics performance of the country. Thus, the focus of this research was to assess the performance and determinants of Modjo dry port.

The research was conducted to assess the performance and Determinants of dry Port at Modjo Dry Port. Specifically, this research was conducted to assess the performance of Mojo dry port and to identify the determinants of performance of Mojo dry port. As a methodology explanatory research design were employed and data were collected both from customers and employees. Both descriptive and inferential statistics were used to analyze the data such as ordinary least square. The findings of the study generated from the descriptive statistics revealed that human capital of the dry port is rated at poor level; however, information capital, service cost, port machinery, port infrastructure and reliability were rated at medium level. The findings of the study further revealed that the size of the port was rated at higher level. Apart from these the regression analysis of the study suggests that except infrastructure and machinery the other entire variable had a positive and significant effect. Accordingly, the variables information capital, human capital, service cost, size of the port and reliability had a positive and significant effect on throughput performance of the dry port.

The overall assessment of the performance of Modjo dry port was found as moderate, implying it is still functioning with limited capacity. This further indicates that the contribution of the dry port to the overall economy is still limited. Based on the findings, the researcher forwards the following recommendations:

- ✓ The ICT infrastructure of the port needs to be re-engineered and handled by IT specialists who will then integrate various internal systems as well as external systems. When both internal and external systems are integrated, it will streamline the port operations, business processes and reduce some of those barriers like long cargo dwell time, delays in custom and clearance processes, long waiting time of vessels etc.
- ✓ The dry port should have iterative training, which can be short and long term training for employees. The training should be actual skill and which can fill the knowledge gap.
- ✓ In order to increase the reliability of Modjo dry port, the management should have to focus on decreasing cargo damage and cargo theft that leads to high financial risk on customers and also the dry port.
- ✓ In order to increase the throughput volume, customers should receive their containers early. To do so they should have to afford the cost for the service. So the dry port service charges which the port always attempt to negotiate for a lower price are a key driver to attract customers.
- ✓ Strategic leadership along with proper short and lone run intervention to capacitate the port is very crucial to improve the efficiency and effectiveness over time.
- ✓ Finally, but strongly, I recommend other researchers to conduct a more in depth study on the same or related topic of this study by using more preferably other methods of research like longitudinal studies.

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