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Analyzing of Information and Communication Technology Based on Operational Performance of Supply Chain Management for Shipping Industry at Dares Salaam Port in Tanzania

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Abstract:- This study has analyzed the impact of ICT adoption on the operational performance of supply chain management in shipping industry. The study employed a descriptive study design, whereby the target population was stakeholders in Shipping Operations at Dar es Salaam Port. A sample of 125 stakeholders used to analyze the study problem. Data collected using questionnaire and interview, and descriptive statistics and correlation matrix used to analyze data. The findings are that there was moderate adoption of ICT at the Dar es Salaam Port whereby some stakeholders fully integrated, others partially integrated, and some not integrated at all. Professional competency on use of ICT also found to be low among some stakeholders. However, it revealed that there was reduction of costs of operations for those integrated, increase of speed of goods and service delivery, some efficiency in information sharing and there was development of trust in shipping activities. The study concluded that there is significant positive relationship between adoption of ICT and operational performance in Supply Chain Management in Shipping Industry when there is fully ICT adoption. The study recommends that strategies Shipping Stakeholders adopt full ICT adoption .for attaining Operational Performance in Shipping Supply Chain management.

Keywords:- *Information and Communication Technology, Operational Performance of Supply Chain, Management for Shipping Industry, Dar es Salaam Port.*

I. INTRODUCTION

In Tanzania, the application of ICT has increased significantly over the past ten years. Many organizations have adopted the use of ICT in their operations, especially with networked computers and internet access; these include insurance companies, universities, schools, banks, hospitals, hotels, and transportation companies. With the presence of internet and computers in organizations, it has helped in simplifying work and increasing operational performance (Isote, 2013). However; in Tanzania, the application of ICT in supply chain management in shipping industry has been highly emphasized but little is known on its roles on promoting operational performance in supply chain management in shipping industry. This study conducted assessing the roles of ICT on operational performance of supply chain management in shipping industry at Dar es Salaam Port in Tanzania. The Tanzania Ports Authority (TPA) implemented ICT infrastructure since year 2000 at the Dar es Salaam Port with a view to improving operational performance in the supply chain management, thus improve efficiency and productivity. Yet up to year 2017 Dar es Salaam Port had not been able to provide dividend to the government (President Magufuli, 2018); a manifestation that there was no improvement in the operational performance accruing from adoption of ICT in its operations.

ICT has essentially found peculiar in changing the management of supply chains whereas competition has transformed from company to company but supply chain to supply chain (Christopher, 2011). Organizations increasingly find that they have to rely on effective supply chain management to compete in the global market and networked economy. Supply chain management helps organizations to integrate systemically the traditional business functions and the process across organizational boundaries to help companies improve the long-term performance (Mentzer et al., 2000). ICT, which is capable of processing large amounts of data and enables long-distance communication, is essential for supply chain management. That is why firms need to invest in ICT and they are often tempted to spend more money on ICT. However, the use of ICT has not wholesome appreciated by all firms that have invested in it. Sometimes the companies have made investments in ICT, but they are still searching how to apply ICT to achieve actual improvements in their Supply chain performance particularly in shipping industry (Mentzer et al., 2000). Although Africa has been facing challenge in operational performance in shipping industry due to application of manual system, the current adoption of information and communication technologies (ICT) considered as alternative path toward promoting operational performance in shipping industry. ICT goals in Africa are diverse but centered on seven pillars.

The Global Information Technology Report of 2015 provides the evidence of ICT benefits in shipping industry, citing countries like the Republic of Korea, Israel, and Estonia as exemplary in that they have achieved national competitiveness on shipping industry as the results of

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adoption of ICT technology. The report shows that the spread of ICT have also had wide societal impact, especially on less-privileged segments of society including; farmers in developing countries who have benefited from services such as real-time information about commodity prices and weather, and ease of money transfers and knowing market of their products across the world (Dutta, Geiger and Lanvin, 2015). The effectiveness of governments in knowing the amount of levy and taxes required to collect in shipping industry has increased with adoption of ICT. ICT have enablers of business and employment creation and productivity growth and promote shipping transportation efficiency and performance (Majumdar et al., 2010). The use of Information and Communication Technology (ICT) in the management of a supply chain has found to influence and change everything in today's business environment.

II. EXCHANGE THEORIES, ICT, AND SUPPLY CHAIN MANAGEMENT

There is a perceived Exchange relationship between Supply Chain Management (SCM) and the application of Information and Communication Technology (ICT). Wen-Liang, et al. (2017) provides that the supply chain organizations interact with each other via ICT, which a social exchange activity. Through this interactive behavior, knowledge or resources communicated; meanwhile new knowledge or resources needed to form dynamic capabilities (Nieves et al., 2016; Tseng and Lee, 2014). The social exchange among the supply chain members is similar to the goods exchange in economics, with the exception that the returns from social exchanges may not be in the form of money or tangible objects. In view of this, present research takes the social exchange theory as the basis, to which the intermediary variables of "relationship trust" and "relationship commitment" added for an in-depth exploration of the impact of supply chain ICT interaction intensity, on dynamic capabilities.

2.1 The Importance of Information Technology in Supply Chain Management

Supply chain management defined as all processes concerned with the enhancement of movement and handling of goods from point of production (supply) to point of consumption (demand). Supply-chain management is a process responsible for development and management of the total supply system of a firm, both the internal and the external components. During the past two decades, the maritime industry has witnessed the evolution of one of the most important trends in the history of port community the increasingly sophisticated use of computers. Although these devices and electronic commerce have found applications in port/transport industry, the business sector is a major beneficiary (Burt, 1996). A study examined factors affecting supply chain management in manufacturing companies by focusing on Tanzania Distilleries Limited (TDL)

2.2 The use of ICT on Port -Transformation, and Competitiveness

E-transformation in container port means port organization-wide innovative transformation encompassing internal and external value chains based on information and communication technology. There is a considerable theoretical literature on the impact of e-Transformation on business performance, but there is very little empirical study on its effectiveness in ports. A study was conducted to investigate the how e-transformation in container port management can influence customer satisfaction and port competitiveness (Tongzon and Kim, 2016). The findings reveal that e-transformation in container ports can affect customer satisfaction and port competitiveness through e-workplace, customer relationship management and security, implying that container ports should make every effort to focus on e-transformation in these critical areas. Due to limited empirical studies in this area, the findings have provided an empirical support for the importance of e-transformation in container terminal management and shed more light on how e-Transformation can affect customer satisfaction and port competitiveness (Tongzon andYonghee Kim, 2016). Dar es Salaam Port as well, can focus on improving its performance through customer satisfaction by using e-transformation, a part of ICT topology. Dar es Salaam Port is currently overwhelmed with delayed cargo clearance for example, because, in part of failure to use ICT at a significant extent. By relying on traditional means of communications, every action takes considerable time to implemented, including documentations for exports or imports. Delays in cargo clearance prompt some customers to shift to neighboring ports like Mombasa and Durban in South Africa.

2.3 Information Technology Integration

Supply chain relationships play an important role in achieving the firm's goals. The coordination and integration of activities with suppliers and understanding of customer's needs results in greater benefits for companies. According to Bradawl, (2000) supply chain management is directly related to relationship management, which includes suppliers and customers. Strategic supplier partnerships and customer relationships are main components in the supply chain management practices, leading to information sharing, which is one of the five pillars in achieving a solid supply chain relationship (Bradawl, 2000). Two sub-factors considered in the model relationship with suppliers and customers Companies are inclined to work with different suppliers in different ways. It is important that the relationship with suppliers satisfy their company needs. Bowers, (2009) mentioned that in commodity products, it is common to find an adversarial relationship mainly based on price between buyer and supplier.

2.4 Internet Disclosure

The connection between internet disclosure, profitability, and financial structure in the shipping sector are also crucial. According to Andrikopoulos et al. (2013), shipping firms are keen on making more and more financial information accessible via the web and have significant policy implications for executives, as it implies that greater internet disclosure is not a just an effect of reliable and sound financial performance, but also, a requirement for it.

ISSN No:-2456-2165

2.5 The Roles of ICT on operational performance

Presently, the extensive use of ICT is changing the way people or companies work. Researchers (e.g. Hipp and Grupp 2005; Tidd et al., 2005 and Castellacci, 2006) refer to ICT as a very important tool for innovation in this present era. The benefits of ICT for a firm includes saving of inputs, general cost reductions, higher flexibility and improvement in product quality (Mouelhi, 2009; Majumdar et al., 2010). Bloom et al. (2009) ascertain that ICTs play a major role in networking and communication as firms use these technologies to facilitate communication among employees and reduce co-ordination ICT enhances the production process in organizations as monitoring technologies could be used to reduce the number of supervisors required in the process. Arvanitis and Loukis (2009) also advocate that the use of ICT has direct implications for firms. ICT helps in areas such as information gathering and dissemination, inventory control and quality control.

The assumptions were that if e-commerce is used, there are IT capability and ICT infrastructure, and ICT supply chain communication system, there would be an effect on lowering costs of operation, increasing speed in service delivery and decreasing level of risks in supply chain managements. The study has assumption that the relationship between use of ICT and operational performance in supply chain management moderated by ICT policy and business environment. Figure1 shows the relationship of the independent and dependent variables in the conceptual framework.

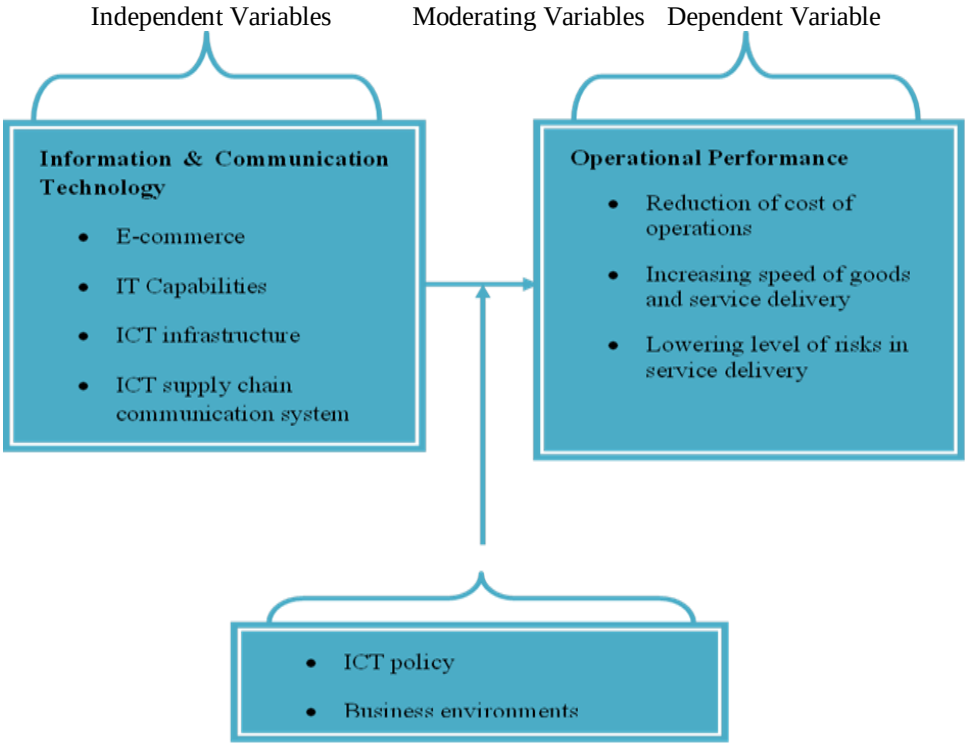

Figure 1 Conceptual Framework

The conceptual framework (fig. 1) used to test the relationship of the independent and dependent variables. The study tested the extent to which shipping stakeholders used e-commerce, the efficacy of IT capabilities used, the strength of IT infrastructure and the strength of ICT interaction existing among the stakeholders used for communication. These tested against the operational performance of the supply chain members in terms of reductions of costs of operations, increasing speed of goods and service delivery, and lowering level of risks in the service industry.

III. METHODOLOGY

In this study, both primary and secondary data collected. Primary data were data collected afresh and for the first time, and thus happen to be original in character. They have neither been collected before nor were they recollected in the future. Primary data collected once at a specified period and aimed at answering the research questions. Secondary data are data which had already collected by someone else and which had already passed through a statistical process, for instance published reports/dissertations and books (Kothari, 2004). Both primary and secondary data collected from the following data collection methods/ instruments. The study conducted at the Dar es Salaam Port and involved the Port Stakeholders as listed in section 3.4 below. The Dar es Salaam Port is strategically located to serve as a convenient freight linkage between sea and land transport. It serves as a gateway to local and transit cargoes to vast hinterland of East and Central African countries, the Middle and the Far East, Europe, Australia and America. The port serves a crucial role in the economic development of the nation through handling imported and exported cargoes, which are essential sources of revenue generation and GDP growth. Further Dar es Salaam port has a large number of populations, therefore, availability of research respondents.

ISSN No:-2456-2165

3.1 Targeted Study Population

The total population of the study was unknown because of the variability of exporters and importers at the Dar es Salaam Port. Other stakeholders include; the officials at the Dar es Salaam Port, clearing and forwarding agents and TRA employees whose numbers differ on daily basis.

3.2 Sample Size

The size of the sample size that was used in this study were 125 respondents; Dar es Salaam Port drawn from population of people distributed as shown in the table 1 and calculated from the following Cochran's formula. Cochran (1977) developed a formula to calculate a representative sample for proportions as.

Where by:
no = Sample Size
z = value of desired confidence level (1.96 of 95%CI)
p = the estimated proportion of an attribute that is present in the population (20%),
q = 1 – p
e = desired level of precision (5%)
Thus

(0.05)2

no = 125.44
no = 125

Thus the sample size in this study were 125 respondents and their distributions are shown in table 1

Table 1: Distribution of Sample size

S/N	Study Units	Selected	Selection Technique
1	Clearing and Forwarding Agents	35	Randomly
2	Dar es Salaam Port employees	50	Purposively
3	Importers / Exporters	35	Randomly
4	TRA employees	5	Purposively
	Total	125	

Selection of sample size representatives done either randomly or purposively, Random method is administered to populations which are known to have similar information in the topic so are given equal chances of being selected. Clearing and forwarding agents, importers and exporters treated as having similar information in the process of transacting imports and exports, thus, among them everybody is given equal chance. On the other hand, some of DP employees were directly involved in import/export transactions while others like cargo handlers were not. The same is for TRA employees. From these two groups representatives selected purposively basing on their daily functions.

3.3 Model Setting

The study assessed the relationship between ICT use and operational performance of supply chain management in shipping industry at Dar es Salaam port. Thus this study adopted multivariate linear model in assessing the relationship between ICT uses on operational performance. The study assumed that e-commerce, IT capability, ICT infrastructure and ICT supply chain communication system has an effects on lowering costs of operation, increasing speed in service delivery and decreasing level of risks in supply chain managements. Thus the study considered the following regression model that will be used:-

$$Y1 = \beta0 + \beta1X1+\beta2X2+\beta3X3+\beta4X4+\mu \quad \text{eq.33}$$

$$Y2 = \beta0 + \beta1X1+\beta2X2+\beta3X3+\beta4X4+\mu \quad \text{eq.34}$$

$$Y3 = \beta0 + \beta1X1+\beta2X2+\beta3X3+\beta4X4+\mu \quad \text{eq.35}$$

Whereby
Y1=Operation cots is lowered
Y2=Increase speed of service delivery
Y3=Risks is lowered
X1=There is use of e-commerce (1=Yes, 0=No)
X2=There is IT capability (1=Yes, 0=No)
X3= There is ICT Infrastructure (1=Yes, 0=No)
X4=There is ICT supply chain communication system (1=Yes, 0=No)
β0 = Intercept
β1…4= Coefficient of variables
μ= Error term

3.4 Management and data analysis

Data entry and checking done every day during the data collection before analyzing them, This included checking the data for internal consistency, completeness, miscoded responses, and coding some open-ended questions.

3.5 Validity of data

In order to achieve the validity the study ensured the measurement instrument was provided adequate coverage of the topic by containing adequate representative sample of universe. Moreover, criterion related validity considered predicting some outcome or estimate existence of some current condition. The researcher used clearly word questions as instruments of measuring answer of respondents with reference to study problem, research question, and the researcher avoid source of error by setting good sample, setting questions simple and straight.

IV. GENDER OF RESPONDENTS

The gender of respondents shows the sex status. Table 2 shows that 101 (80.8%) of respondents were male while 24 (19.2%) of respondents were female. The finding implies that despite both male and female participated in this study, but male dominated in shipping operation relative to female. The finding has implication that male are more involved in port operations and this finding related with earlier study

ISSN No:-2456-2165

conducted by Bichou and Gray (2004) male have been dominated in logistics and supply chain system relative male gender.

Table 2: Gender of Respondents

Sex	Frequency	Percent
Male	101	80.8
Female	24	19.2
Total	125	100.0

4.1 Age of Respondents

The age of respondents shows the number of years of respondents since they were born. Table 3 shows that 87 (69.6%) of respondents aged 31-40 years, 25 (20.0%) of respondent aged 41-50 years, 9 (7.2%) of respondents aged 20-30 years and 4 (3.2%) of respondents aged above 50 years. The finding implies that respondents with different age categories participated in assessing roles of ICT on the operational performance of Supply Chain Management at Dar es Salaam Port. The participation of respondents with different age categories benefit of inclusions views of people with different age in getting answers related with roles of ICT on the operational performance of Supply Chain Management at Dar es Salaam Port.

Table 3: Age of Respondents

Age	Frequency	Percent
20-30 years	9	7.2
31-40 years	87	69.6
41-50 years	25	20.0
+50 years	4	3.2
Total	125	100.0

4.2 Experiences in Port Operations of Respondents

The experience in port operations of respondents shows number of years to which respondents have been involved in port operations at Dar es Salaam Port. Table 4.4 shows that 63 (50.4%) of respondents have 6-10 years in experience with port operations, 54 (43.2%) of respondent have above 10 years in experiences with port operations and 8 (6.4%) of respondents have 1-5 years in experiences with port operations. The finding implies that respondents with different experiences with port operations at Dar es Salaam participated in assessing roles of ICT on the operational performance of Supply Chain Management at Dar es Salaam Port. The participation of respondents with different experiences in port operations benefit of inclusions views of people with different education in getting answers related with roles of ICT on the operational performance of Supply Chain Management at Dar es Salaam Port.

Table 5: Experience in Port Operations

Working Experience	Frequency	Percent
1-5 years	8	6.4
6-10 years	63	50.4
+10 years	54	43.2
Total	125	100.0

4.3 Distribution of respondents by institutional categories

The stakeholder participated in this study indicates institutions to which respondents are working with. Table 4.5 shows that 43 (34.4%) of respondents are working at Tanzania Ports Authority (TPA) in Dar es Salaam, 37 (29.6%) of respondent are working as clearance and forward agencies, 17 (13.6%) of respondent are working as carriers, 15 (12.0%) of respondents are working as shippers and 13 (10.4%) of respondents are working at Tanzania International Container Terminal Services Ltd (TICTS). The finding implies that respondents with different stakeholders of port operations at Dar es Salaam participated in assessing roles of ICT on the operational performance of Supply Chain Management at Dar es Salaam Port. The participation of respondents with different stakeholders in port operations added value in assessing the roles of ICT on the operational performance of Supply Chain Management at Dar es Salaam Port.

Table 6: Stakeholders Participated in the Study

Stakeholders	Frequency	Percent
TICTS	13	10.4
TPA	43	34.4
Carriers	17	13.6
Shippers	15	12.0
Clearance agents	37	29.6
Total	125	100.0

4.4 The Extent of Applications of E-commerce among Port Stakeholders in Dar es Salaam

The study investigated the extent to which port stakeholders in Dar es Salaam have been involved in applications of e-commerce in shipping operations. The respondents were asked to rate the levels of extents in which port stakeholders in Dar es Salaam have been involved in applications of e-commerce in shipping operations. The finding obtained presented at Table 7.

Table 7 Extent of Application of E-commerce in Shipping Operations among Dar es salaam Port Stakeholders

Extent	Frequency	Percent
High extent	4	3.2
Moderate extent	110	88.0
Low extent	11	8.8
Total	125	100.0

Table 7 indicates that 110 (88.0%) of respondents considered there is moderate extents to which port stakeholders in Dar es Salaam have been involved in applications of e-commerce in shipping operations. In addition to that, 11 (8.8%) of respondents considered that port stakeholders in Dar es Salaam have been involved in applications of e-commerce in shipping operations. Finally, 4 (3.2%) of respondents considered there is high extents to which port stakeholders in Dar es Salaam have been involved in applications of e-commerce in shipping operations.

4.5 The extent of Application of IT Capabilities in Shipping Operations among Dar es Salaam Port Stakeholders

The study investigated the extent to which port stakeholders in Dar es Salaam have been involved in applications of IT capabilities in shipping operations. The respondents were asked to rate the levels of extents in which port stakeholders in Dar es Salaam have been involved in applications of IT capabilities in shipping operations. The finding obtained is presented at Table 8.

Table 8 Extent of Application of IT Capabilities in Shipping Operations among Dar es Salaam Port Stakeholders

Extent	Frequency	Percent
High extent	3	2.4
Moderate extent	101	80.8
Low extent	21	16.8
Total	125	100.0

Table 8 indicates that 101 (80.8%) of respondents considered there is moderate extents to which port stakeholders in Dar es Salaam have been involved in applications of IT capabilities in shipping operations. In addition to that, 21 (16.8%) of respondents considered that port stakeholders in Dar es Salaam have been involved in applications of IT capabilities in shipping operations. Finally, 3 (2.4%) of respondents considered there is high extents to which port stakeholders in Dar es Salaam have been involved in applications of IT capabilities in shipping operations.

4.6 The Extent of Application of IT Infrastructure in Shipping Operations among Dar es salaam Port

The study investigated the extent to which port stakeholders in Dar es Salaam have been involved in applications of IT infrastructure in shipping operations. The respondents were asked to rate the levels of extents in which port stakeholders in Dar es Salaam have been involved in applications of IT infrastructure in shipping operations. The finding obtained is presented at Table 9

Table 9 Extent of Application of IT Infrastructure in Shipping Operations among Dar es salaam Port

Extent	Frequency	Percent
High extent	4	3.2
Moderate extent	95	76.0
Low extents	26	20.8
Total	125	100.0

Table 4.8 indicates that 95 (76.0%) of respondents considered there is moderate extents to which port stakeholders in Dar es Salaam have been involved in applications of IT infrastructure in shipping operations. In addition to that, 26 (20.8%) of respondents considered that port stakeholders in Dar es Salaam have been involved in applications of IT infrastructure in shipping operations. Finally,4 (3.2%) of respondents considered there is high extents to which port stakeholders in Dar es Salaam have been involved in applications of IT infrastructure in shipping operations.

4.7 The Extent of Application of ICT in Supply Chain Communication System in Shipping Operations among Dar es salaam Port

The study investigated the extent to which port stakeholders in Dar es Salaam have been involved in applications of ICT in supply chain communication system in shipping operations. The respondents asked to rate the levels of extents in which port stakeholders in Dar es Salaam have been involved in applications of ICT in supply chain communication system in shipping operations. The finding obtained presented at Table 10.

Table 10: Extent of Application of ICT in Supply Chain Communication System in Shipping Operations among Dar es salaam Port

Extent	Frequency	Percent
High extent	3	2.4
Moderate extents	101	80.8
Low extent	21	16.8
Total	125	100.0

Table 10 indicates that 101 (80.8%) of respondents considered there is moderate extents to which port stakeholders in Dar es Salaam have been involved in applications of IT infrastructure in shipping operations. In addition to that, 21 (16.8%) of respondents considered that port stakeholders in Dar es Salaam have been involved in applications of ICT in supply chain communication system in shipping operations. Finally, 3 (2.4%) of respondents considered there is high extents to which port stakeholders in Dar es Salaam have been involved in applications of ICT in supply chain communication system in shipping operations.

4.8 Increasing Speed of Goods and Service Delivery

The study investigated if increasing speed of goods and service delivery was the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The respondents were asked to rate their level of agreement whether increasing speed of goods and service delivery was the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The findings observed presented in Table 11:

Table 11: Increasing Speed of Goods and Service Delivery

Speed of Delivery Increased	Frequency	Percent
Strongly agree	5	4.0
Agree	111	88.8
Neutral	5	4.0
Disagree	4	3.2
Total	125	100.0

Table 11 shows that 111 (88.8%) of respondents agreed that increasing speed of goods and service delivery was the accruing benefit from use of ICT among stakeholders at the Dar es Salaam Port. In addition to that, 5 (4.0%) of respondents strongly agreed on increasing speed of goods and service delivery as the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port.

ISSN No:-2456-2165

Furthermore, 5 (4.0%) of respondents were neutral on increasing speed of goods and service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. Finally, 4 (3.2%) of respondents disagree on increasing speed of goods and service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The finding has implications that 92.8% of respondents agreed on increasing speed of goods and service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port while 3.2% of respondents disagreed. Based on this result we can conclude that increasing speed of goods and service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port.

4.8 Lowering Level of Risks in Service Delivery

The study investigated if lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The respondents were asked to rate their level of agreement if lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The finding observed presented at Table 12.

Table 12 Lowering Level of Risks in Service Delivery

Frequency	Responses	Percent
Strongly agree	13	10.4
Agree	92	73.6
Neutral	5	4.0
Disagree	15	12.0
Total	125	100.0

Table 12 revealed that 92 (73.6%) of respondents agreed that lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. In addition to that, 13 (10.4%) of respondents strongly agree on lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. Furthermore, 5 (4.0%) of respondents were neutral on lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. Finally, 15 (12.0%) of respondents disagree on lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The finding has implications that 84.0% of respondents agreed on lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port while 12.0% of respondents disagreed. Based on this result we can conclude that lowering level of risks in service delivery is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port.

4.10Increases Efficiency in Sharing Information in Supply Chain System of Shipping Activities

The study investigated if increases efficiency in sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The respondents were asked to rate their level of agreement if increases efficiency in sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The finding observed is presented at Table13

Table 13 Increases Efficiency in Sharing Information in Supply Chain System of Shipping Activities

Frequency	Responses	Percent
Strongly agree	38	30.4
Agree	78	62.4
Neutral	5	4.0
Disagree	4	3.2
Total	125	100.0

Table 13 revealed that 78 (62.4%) of respondents agreed that increases efficiency in sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. In addition to that, 38 (30.4%) of respondents strongly agree on increases efficiency in sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. Furthermore, 5 (4.0%) of respondents were neutral on increases efficiency in sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. Finally, 4 (3.2%) of respondents disagree on increases efficiency in sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The finding has implications that 92.8% of respondents agreed on increases efficiency in sharing information in supply chain system of shipping activities are the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port while 3.2% of respondents disagreed. Based on the result we can conclude that increases efficiency in sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port.

4.11Relationship between ICT Use and Reduction of Cost of Operations

The study investigated relationship between ICT use and reduction of cost of operations in shipping activities. The study employed correlation matrix analysis to investigate the relationship between ICT use and reduction of cost of operations in shipping activities. The finding obtained i presented at Table 14.

ISSN No:-2456-2165

Table 14, Relationship between ICT use and Reduction of Cost of Operations Correlations

		Application of e-commerce	Application of ICT capability supply chain communication system	Application of ICT infrastructure	Application of ICT in Reduction of cost of operations	
Application of e-commerce	Pearson Correlation	1	-.016	-.085	-.272**	.257**
	Sig. (2-tailed)		.863	.349	.002	.004
	N	125	125	125	125	125
Application of ICT capability	Pearson Correlation	-.016	1	.106	.272**	.367**
	Sig. (2-tailed)	.863		.241	.002	.002
	N	125	125	125	125	125
Application of ICT infrastructure	Pearson Correlation	-.085	.106	1	.119	.419**
	Sig. (2-tailed)	.349	.241		.187	.001
	N	125	125	125	125	125
Application of ICT in supply chain communication system	Pearson Correlation	-.272**	.272**	.119	1	.236**
	Sig. (2-tailed)	.002	.002	.187		.005
	N	125	125	125	125	125
Reduction of cost of operations	Pearson Correlation	.257**	.367**	.419**	.236**	1
	Sig. (2-tailed)	.004	.002	.001	.005	
	N	125	125	125	125	125
Correlation is significant at the 0.01 level (2-tailed)						

Table 14 *indicates that correlation coefficient between applications of e-commerce and reduction of cost of operations is 0.257 at p=0.004. The finding implies that there is positive relationship between applications of e-commerce and reduction of cost of operations. Furthermore, the finding indicates that p-value of correlation coefficients is less than 0.05 implying there is significant positive relationship between applications of e-commerce and reduction of cost of operations. The finding is similar with Capgemini (2008) who found that supply chain performance would be significantly increased if the members of the supply chain collaborated through Internet tools.*

Table 14 *indicates that correlation coefficient between application of ICT capability and reduction of cost of operations is 0.367 at p=0.002. The finding implies that there is positive relationship between application of ICT capability and reduction of cost of operations. Furthermore, the finding indicates that p-value of correlation coefficients is less than 0.05 implying there is significant positive relationship between application of ICT capability and reduction of cost of operations. The finding is similar with Cap Gemini (2008) who found that supply chain performance would be significantly increased if the members of the supply chain collaborated through Internet tools.*

Table 14 *indicates that correlation coefficient between application of ICT infrastructure and reduction of cost of operations is 0.419 at p=0.001. The finding implies that there is positive relationship between application of ICT infrastructure and reduction of cost of operations. Furthermore, the finding indicates that p-value of correlation coefficients is less than 0.05 implying there is significant positive relationship between application of ICT infrastructure and reduction of cost of operations.*

Table 14 *indicates that correlation coefficient between application of ICT in supply chain communication system and reduction of cost of operations is 0.136 at p=0.005. The finding implies that there is positive relationship between application of ICT in supply chain communication system and reduction of cost of operations. Furthermore, the finding indicates that p-value of correlation coefficients is less than 0.05 implying there is significant positive relationship between application of ICT in supply chain communication system and reduction of cost of operations. The finding is similar with Cap Gemini (2008) who found that supply chain performance would significantly increased if the members of the supply chain collaborated through Internet tools.*

The Extent of Applications of E-commerce among Stakeholders at Dar es Salaam Port

The findings were that, 110 (equivalent to 88.0%) of respondents revealed that Dar es salaam port stakeholders were potentially involved in applications of e-commerce in shipping operations. In addition, 11 (8.8%) of respondents considered that Dar es Salaam port stakeholders were involved in applications of e-commerce in shipping operations, and finally, 4 (3.2%) of respondents considered that there was high extent to which port stakeholders were involved in applications of e-commerce in shipping operations.

V. THE EXTENT OF APPLICATION OF IT INFRASTRUCTURE IN SHIPPING OPERATIONS AMONG DAR ES SALAAM PORT

The study investigated the extent to which port stakeholders in Dar es Salaam were involved in applications of IT infrastructure in shipping operations. The findings were that 95 (76.0%) of respondents considered there was moderate extent to which port stakeholders were involved in applications of IT infrastructure in shipping operations. In

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addition, 26 (20.8%) of respondents considered that Dar esb Salaam port stakeholders were involved in applications of IT infrastructure in shipping operations, and finally, 4 (3.2%) of respondents considered that there was high extent to which port stakeholders were involved in applications of IT infrastructure in shipping operations.

The study investigated if there was an increase in efficiency resulting from sharing information in supply chain system of shipping activities as accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. The findings revealed that 78 (62.4%) of respondents agreed that there was increase of efficiency resulting from sharing information in supply chain system of shipping activities as accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. In addition, 38 (30.4%) of respondents strongly agreed on increase of efficiency from sharing information in supply chain system of shipping activities as accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. Furthermore, 5 (4.0%) of respondents were neutral on increase of efficiency from sharing information in supply chain system of shipping activities is the accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port. Finally, 4 (3.2%) of respondents disagreed on the increase in efficiency from sharing information in supply chain system of shipping activities as accruing benefits from use of ICT among stakeholders at the Dar es Salaam Port.

5.1 Relationship between ICT Use and Lowering Level of Risks in Service Delivery

The study investigated the relationship between ICT use and lowering level of risks in service delivery. The study employed correlation matrix analysis to investigate the relationship between ICT use and lowering level of risks in service delivery. The findings indicate that the correlation coefficient between applications of e-commerce and lowering level of risks in service delivery was 0.885 at p=0.000. The finding implies that there was positive relationship between applications of e-commerce and lowering level of risks in service delivery. Further the correlation coefficient between application of ICT capability and lowering level of risks in service delivery was 0.761 at p=0.000. The finding implies that there was positive relationship between application of ICT capability and lowering level of risks in service delivery.

Relationship between ICT Use and Lowering Level of Risks in Service Delivery

The study investigated the relationship between ICT use and lowering level of risks in service delivery. The study employed correlation matrix analysis to investigate the relationship between ICT use and lowering level of risks in service delivery. The correlation coefficient between applications of e-commerce and increase in efficiency from sharing information in supply chain system of shipping activities was 0.551 at p=0.000. The finding implies that there is positive relationship between applications of e-commerce and increases efficiency in sharing information in supply chain system of shipping activities.

In yet another test the correlation coefficient between application of ICT in supply chain and increase in efficiency from sharing information in supply chain system of shipping activities was 0.236 at p=0.003. The finding implies that there was positive relationship between application of ICT in supply chain and increase in efficiency from sharing information in supply chain system of shipping activities. The findings indicate that p-value of correlation coefficients was less than 0.05 implying there was significant positive relationship between application of ICT in supply chain and increase in efficiency from sharing information in supply chain system of shipping activities. The findings are similar with Capgemini (2008) who found that supply chain performance would significantly increase if the members of the supply chain collaborated through Internet tools.

VI. RECOMMENDATION OF THE STUDY

i. The study recommends that strategies to recognize the roles played by application of ICT in shipping operations and action plans towards implementing appropriate measures to increase applications of ICT services at the Dar es salaam Port insisted
ii. The study recommends that since application of ICT has roles of facilitating reduction of cost of operations, increase of speed of goods and service delivery, efficiency in information sharing and develops trust in shipping activities, all stakeholders at Dar es Salaam Port should give priority in ICT uses.
iii. The study recommends that stakeholders have to work together in adoption application of ICT so as to increase operational performance in Supply Chain Management at Dar es Salaam Port
iv. Policymakers in the country have to ensure that policies in managing shipping activities insist the application of ICT services in order to promote better operational performance of Supply Chain Management in the Country.

VII. CONCLUSION OF THE STUDY

This study analyzed the impact of ICT adoption on operational performance of Supply Chain Management in Shipping Industry, with the case of Dar es Salaam Port. It revealed that there was moderate extent of ICT adoption among stakeholders whereby some had full installation of ICT infrastructure, others had partial installation, and some had none. Professional competency found to be low. Most stakeholders used ICT infrastructure for office automation but not linked on internet for communication with other organizations. The study also revealed that there were moderate reductions of cost of operations compared to the state of affairs before ICT installation for those with; there was general increase of speed of goods and service delivery, efficiency in information sharing and development of trust in shipping activities as benefits accruing from adoption of ICT among stakeholders. The study concludes that, there is significant positive relationship between adoption of ICT and reduction of cost of operations. Increase of speed of goods and service delivery, lowering level of risks in service delivery and increased efficiency accruing, from sharing

information in supply chain system if ICT adoption is done fully not as the case was at the Dar es salaam Port. The study recommends that future study should be conducted on assessing challenges facing Dar es Salaam Port stakeholders in adopting ICT in shipping operation activities. This study will help to develop appropriate solutions to address high usage of f ICT in shipping activities.

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