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CARGO SYSTEM UTILIZATION AND SERVICE DELIVERY IN DAR ES SALAAM PORT, TANZANIA

Edward Onyango Orinda
Lecturer School of Applied Science and Technology,
Kampala International University-Dar-es-alaam College,
Tanzania.

Julius Mbashango Malunde
Head of Department – ICT Port,
Dar Es Salaam,
Tanzania

ABSTRACT
The study explores how Cargo System as a Terminal Operating System used to handle cargo in Dar es Salaam port. The purpose of this study was to ensure that the services delivery meets the current Cargo System complaints. The objective of the research was to identify user requirements in order to improve the current system on service delivery, to design, develop web-based cargo System utilization updates. Testing the software as the application prototype related customer's claims. Action research design was used in this study and it based on the system specification stated by the system users. The study population was 1800 members who were TPA employees, Shipping Agents and Cargo Agents with a sample size of 328 members randomly chosen. The study used closed end Questionnaires as an instrument for this research. Descriptive statistics was used to analyse data whereas prototyping approach was used to come up with a working model of the system. On objective one, the researcher concluded that the current Cargo System does not interact with users, and found only 38% users gets updates online. On objective two, the researcher found that 81% of users support the design of the proposed software and agree that it is easy to interact with cargo Updates, search and view handling updates. This ensures that the system is user friendly. According to objective three, the research found that the proposed updates software is reliable and it is available through web. The researcher recommended that TPA management should consider implementing the prototype to extend utilization of Cargo System in order to meet problems that has led into delaying cargo clearance process.

Keyword: Terminal Operating System, develop web-based cargo System utilization updates.

1. INTRODUCTION
The introduction of Cargo System led into changes in handling cargo in port globally, where operations are in a manner that can serve time and money. An increased need of changing cargo handling techniques from manual to computerized systems has influenced customers the way they perceive service offered for handling cargo. Time taken to handle the cargo, accuracy on cargo information and security of the cargo has been foremost issues to customer requirements. Cargo sophisticated behaviour like huge, odd, delicate etc. has compelled majority of countries in the world to augment need for new technology to include details of the cargo and share cargo information timely during any handling process. Technical developments have brought information systems to the centre of many organizations. Computer-based systems

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have now been extended to serve business functions and are used to track information in cargo handling processes. According to Boddy (2005), the rise of internet from mid – 1990s has stimulated use of information technology world-wide. It challenges traditional organizations and shippers of cargo in the world to redesign their processes and to integrate with those of suppliers and customers, and minimize traditional way of paper work in communication. Use of various communication media in data sharing has played a great role in improving service delivery in ports.

Utilization of Cargo system as terminal operating software has reduced challenges of manual cargo handling and paper flow in most ports. Facilitate timely information flow among parties and enhance control and quality of service and decision making. Use of Cargo systems leads to faster discharging and loading of cargo, better monitoring and utilization of terminal resources. Accuracy and consistency of the information flow by various departments and other organizations involved in cargo clearance speed up documentation. Reliable, accurate and easy to access information upon desired operations results into customer satisfaction. Defined routines that exist in the port processes translate operational events recorded in the system into port charges and thus port gains. Customer enjoy the reduced cost of doing business, reduced number of copies to handle during cargo clearance

Dar es Salaam Port, Tanzania, in 2008 acquired Cargo System software to support its operations. Cargo System is a Terminal Operating System designed to handle various types of import and export cargo in a convenient way in a harbour, terminal and warehouse environment. Cargo System is a multi-purpose terminal management information system, as it is designed for various commodities to be handled simultaneously: containers, general cargo, bulk, cars, liquids, etc. (TPA, 2008). The Cargo System software (CS) has been designed to handle various types of import and export cargo in a convenient way in a harbour, terminal and warehouse environment. It is a multi-purpose terminal management system, as it is designed for various commodities to be handled simultaneously containers, general cargo, liquids and break bulk, cars, etc. There are four (4) major concepts of the system used to handle and track cargo information in port. These are known as orders as they initiate a certain process in cargo handling operations. Discharge Order, this is created by extracting approved manifest information from TRA. It is a list of Bill of Lading which refers the detailed information of the cargo to be discharged from the vessel. Delivery Order, this is an order from Ship agent to allow C&F agent to process delivery of the cargo out of port. Receipt Order, this mainly created by referring Shipping Order from Ship agent for receipt of cargo in port. This is detailed cargo information released by Customs for export. Loading Order, this is an order to load the cargo on board the vessel.

There are various types of services performed by use of Cargo System. They are listed as system modules. Vessel operations, these are activities that are closely related to vessel operations, Cargo Discharge and Loading. Yard operations, activities involving cargo transfers and various types of internal movements of cargo and delivery activities, all are carried under yard operations menu. Gate Operations, activities related to receipt and delivery of cargo by use of trucks and train through TPA gates.

Cargo System utilization replaces a traditional system where communication was through papers. Ship agents used to submit manifest in hard copy, TPA carry discharge operations, process revenue collections and delivery of the cargo through papers. Cargo System software intended to answer problems that multi – purpose terminals that handle containerized and non-containerized cargo often face, like how to increase rate of cargo processing time and to reduce cargo dwell time i.e. time of cargo to stay in port. The system proposed to enable terminal and port users exchange cargo information in a safe, quick and accurate way, through both thick-client and web based applications (TPA, 2008). Utilization of this system intended to reduce cost of handling cargo, time to process and improve on services quality

However, since the introduction of computerized Cargo System in port, there are still complaints from customers on how cargo information is shared during cargo handling and delivery processing. Cargo data updates is not timely shared so to improve delivery processing time that lead to cargo dwell time decrease. Customer complains on the time they use to process and clear cargo from Port of Dar es Salaam, this sometimes extends up to those coming from neighbour countries

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which are using the port e.g. DRC, Burundi and Rwanda to mention few. By doing this, port is losing credibility and revenue. The port is pressurized with customers asking various information and status of their cargo. Therefore the study trying to extend the Cargo system utilization and services delivery so that communicate cargo information updates through Web based system

Operational Definitions of Key Terms

Utilization

The extent to which port users uses Cargo System in the operations. Measured as percentage determined by the number of covered individuals who are Cargo System users by the total users

Cargo System

A Terminal Management System for multi-purpose terminals. It enables handling a variety of different commodities to keep track of operations and cargo

Cargo System Update Software

System software developed to extend utilization of Cargo System to port users. It enables users through web to query vessel, cargo and invoice status for a cargo cleared at Port of Dar es Salaam.

Service Delivery

The capability of the port to deliver services to its customers in the most cost-effective manner possible while still ensuring the high quality of its service and support by use of cargo System

Customer

In this research the customer refers Cargo system user that perform duty or involved in cargo clearance process by use of Cargo System

2. LITERATURE REVIEW

In this point ideas and concepts about utilization of Cargo systems, according to ideas from different authors, theoretical perspectives and related studies conducted by different researchers on systems utilization will be discussed. Literature on cargo handling and information sharing during the process of clearance in port operations was discussed. Gaps that have not been fully addressed will be identified and the review to create the context for discussion on the concepts of utilization of Cargo System in delivering service in the Port.

Requirements on Cargo Information Updates for Services Delivered Through Cargo System

According to Sommerville (2007), Software requirements specification is a process of understanding and defining what services are required by user that has to be provided by the system. It is identifying the constraints on the system's operation and development. Functional and non-functional requirements are identified to guide development of a system that will map the business requirements.

Whitten et al (2005), discussing on functional requirements, these are functions that must be included in an information system in order to satisfy the business needs that will be acceptable to users. Utilization of Cargo System on service delivery at Dar es Salaam Port must have an interface that allows users to interact with the system, search and view updates of cargo handling. The system to allow users has access on their cargo anywhere, access information from any

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internet web browser around the global. This facilitates port users to communicate status of cargo during the process of cargo clearance. Cargo System must have the ability to update information on cargo and invoice status through internet.

Sommervile (2007), discussing on non – functional requirements of a system, describes as constraints on services and functions offered by the system and they include performance, security, availability, usability and systems characteristics as a whole. Pfaffenberger (2003), defined non-functional requirements as descriptions of the features or attributes of a given system as well as any constraints that may limit the boundaries of the proposed solution. The current Cargo System features limited to only clients access to cargo information within the port. Whitten et al (2005), concurred with Pfaffenberger by defining non-functional requirements as constraints placed on any software project.

Utilization of advanced technology is common in almost every application of a port. Dar es Salaam port consists of various activities performed through use of Cargo System. According to Kim (2003) a well-designed terminal Operating System should supply information, reflecting all user requirements gathered, timely and frequently to enable decision making for efficient port service delivery. Cargo System as a terminal operating system manages flow of cargo information through port by relocating cargo in the right places. Vessel calls are registered so to associate with cargo on board the vessel, details of cargo registered for easy tracking in port area.

Input-transformation-output process, according to Ansari (2004), a system is a constant process of taking inputs and transforming them into outputs. The inputs are acquired from the environment and the output goes back into the environment in a constant exchange. The Cargo System application (CS) has been designed to handle various types of import and export cargo in a convenient way in a harbour, terminal and warehouse environment. Vessel calls and cargo manifest declared before vessel arrival, TPA and TRA approve declaration respectively.

TPA use TRA approved manifest for all fiscal control purposes and cargo tracking in port. At this stage the manifest is made available to all sections that also use Cargo system to perform discharge, transfer, receiving and delivery tally. No paper manifests are required to initiate operation processes. The manifest data is stored in Cargo System database and is shared to all users as a discharge order. During cargo discharge from the vessel, the port operator's through Cargo System perform tally as each container (or Bill of Lading for general cargo) is landed and its current position in port is located. All cargo information updates shared through system client application which is not installed to external port users (Zhang and Xue 2010).

Services in port through use of Cargo System include updates of receiving and delivery of cargo from warehouse or yard by trucks, vessel or rail. Cargo marks and number identification facilitate cargo tracking in port. Missing, damaged and hazardous cargo easily tracked by use of the system. Cargo manifest, manifest discrepancies and all cargo information details are shared to all Cargo system users through use of this system. Port activities and port tasks are integrated in the system for easy reference. Modern professionals employ a wide range of software applications to perform these tasks. Cargo information registered in cargo system, handlings and transactions analysed for easy decision-making. Computerized systems have now replaced manual systems in most organizations (McDowall &Jackling, 2006). Different menu in the system can be used to perform tasks that is an input to another user e.g. Shipping agents and C & F agent can identify cargo and initiate delivery processes while delivery staff in port may effect delivery.

Designing Cargo System Updates System

Systems Development Process

System development activities are performed in an order, almost chronological flowing order as explained by Pressman (2010). System Conceptualization refers to the consideration of all aspects of the targeted business function or process, with the goals of determining how each of those aspects relates with one another, and which aspects will be incorporated

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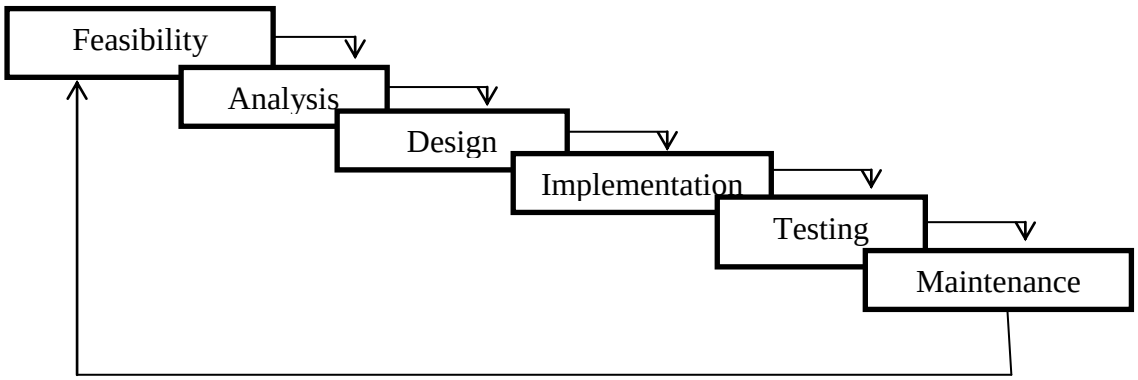
into the system. Systems Analysis is a step refers to the gathering of system requirements, with the goal of determining how these requirements will be accommodated in the system. Extensive communication between the customer and the developer is essential. System Design follows once the requirements have been collected and analysed, what information will be processed in the system? And how will the application be constructed? And what will the system look like? What standards will be followed? Coding stage involves the creation of the system software. Requirements and systems specifications from the System Design step are translated into machine readable computer code. Implementation and Testing, the software is created and added to the developing system, testing is performed to ensure that it is working correctly and efficiently. Testing is generally focused on two areas: internal efficiency and external effectiveness. The goal of external effectiveness testing is to verify that the software is functioning according to system design, and that it is performing all necessary functions or sub-functions. The goal of internal testing is to make sure that the computer code is efficient, standardized, and well documented.

System Development Methodology

A systems development life cycle composed of clearly defined and distinct work phases which are used by systems engineers and systems developers to plan for, design, build, test, and deliver information systems. The SDLC aims to produce high quality systems that meet or exceed customer expectations, based on customer requirements, by delivering systems which move through each clearly defined phase, within scheduled time-frames and cost estimates. According to Pressman (2010), Extreme Programming is a very effective approach used in the design process of the system and several activities are involved, analysis, planning, designing, coding, testing and implementation. A conceptual model by Sommerville (2007), describes the stages involved in an information system development project from an initial feasibility study through maintenance of the completed application. The figure below is the first SDLC method and it describes the various phases involved in development.

Figure 2: System development stages



Source: Sommerville (2007).

System coding is done in the modular and subsystem programming stage. Developers perform unit and module testing in this stage. Suzanne *et al*, (2006), this stage intermingled with the testing stage but it is for individual testing before integration of the whole project. Each unit has to be tested before integrated in the main project. Code Testing, is another important stage where system codes tested at various levels. Unit, module and system user acceptance test is performed to see if the developed software operates as per requirements.

Test and Implement the Prototype of the Cargo Information Updates System

Mark (2012, argues that system implementation is functionally tested as a whole and is done in line with system's level implementation of software projects. Testing is run parallel with multiple front-end users which enable a true system

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implementation. Full working prototype implementation on the system is completed due to non- availability of required resources. The System Implementation can be summarized as making the new system available to users (the deployment), and positioning on-going support and maintenance of the system within port users. At a finer level of detail, deploying the system consists of executing all steps necessary to educate the Customers on the use of the new system, placing the newly developed system into production, confirming that all data required at the start of operations is available and accurate, and validating that business functions that interact with the system are functioning properly. Transitioning the system support responsibilities involves changing from a system development to a system support and maintenance mode of operation, with ownership of the new system moving from the Project Team to the Performing Organization. System Implementation differs with all other phases of the system lifecycle because all project activities up to this point have been performed in safe, protected, and secure environments, where project issues that arise have little or no impact on day-to-day business operations.

Information to have value, according to Terry (2005), must be complete and available in time. There must be close liaison between information providers and users to ensure that the key factors are identified. Information to have value must be used, for it to be used, users must have confidence in the source and confidence is enhanced if there is good communication between the information producers. Good information is that communicated in time. Service delivered through cargo systems must be timely and accurate and updates to reach users online.

Cargo System Information Sharing in Cargo Handling in Port

Cargo Systems as Terminal Operating System (TOS) are designed to serve many different user needs, and the way in which it serves each need must be sensitive to the tensions between cooperation, competition, transparency, and privacy in the process of handling cargo in Port. Each interface must be customised to reflect the strengths and weaknesses of each user. Labourers need simplicity. Planners need comprehensive visibility. Liners need freight control. Truckers and railroads need transport flexibility. Regulators need the ability to intervene. Analysts need unfettered access to history. Developers user requirement gathering use various technique so to come up with robust cargo handling systems According to Yong Tan (2009), interviews, questionnaires, observations, Joint Application Design (JAD) and prototyping are techniques used in collecting user requirements. The terminal operator needs systems that balance conflicts and complains in offering service to customers.

Any Terminal Operating System (TOS) rests on three foundations: infrastructure, database, and development platform. The essential qualities of any foundations are durability and stability, as replacing them is not feasible. We must recognise that the TOS is mission-critical, and that its missions will evolve over time. As such, all three foundations must be judged on: stability, high availability, performance, scalability, security, redundancy, effective vendor support, ease of service, precision, accuracy, extensibility, ease of integration, ease of customisation, and the ready availability of professionals who can maintain and improve them. The foundations must be highly resistant to failure. Failures must be open to rapid repair. The foundations must be designed to accommodate change, growth and evolution without pain or disruption. The foundations must both reflect and foster mature and sophisticated quality control in delivery of service(Lovelock andWirtz, 2004).

Since a service process leads to an outcome resulting in the customer being either satisfied or dissatisfied with the service experience, it is of paramount importance that service organisations pay attention to designing the system by which service concepts are produced and delivered to customers. It is the role of ‘delivery’ to ensure that the expected service outcome is received by the customer fast and in a manner expected. Cargo System, a cargo handling service delivery system is made up of multiple, interdependent service processes (Johnston & Clark, 2001). The entire set of interrelated service processes constitutes hierarchically-organised process architecture. A service process can, in turn, be described as the sequence of activities and steps, the flows and interactions between these activities required in business decisions, and the resources required for producing and delivering the service outcome (Slack *et al.*, 2004a). It is important to

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define properly the roles of people, technology, facilities, equipment, layout, and processes that generate the service outcome. The Cargo Systems focuses on the value-creation input/output model which is the backbone of service delivery management.

In today's progressively complex and interconnected world, it is becoming increasingly clear that all members or users in a certain system rely on easy and fast exchange of information, applied skills and competences for their mutual well-being (Vargo&Lusch, 2004). All systems have inputs, processes, and output and by identifying and mapping the cycles of inputs, processes and outputs, we can define a system better and learn a lot about how it behaves.
Cargo System handle sets of operations in port, the technical information about it refer to the design of the system, processing information includes the vessel calls and cargo manifest as an input. These inputs of information be processed and become output that is shared to all port users. Output can be measured referring the identified services obtained by use of the system that is shared to all users to support their decisions (Johnson *et al*, 2004). Cargo system requires the capability of disseminating cargo information from one point to another, store effectively and efficiently cargo information and provide a quick access and cargo tracking for easy loading and unloading of cargo in port. Cargo information currently can be accessed through client application; there is no public information to customers that can be accessed online for cargo updates and ease of doing business.

The purpose of System design is to create a technical solution that satisfies the functional requirements. At this point the project life cycle has a functional specification which is written in the business terminology, with a clear description of operational needs. All customer needs to be translated into technical specification that now describes the design of the system. The functional specification produced is transformed into physical architecture. Data flow modelling and use case diagrams used to depict the system framework (Hevner, 2004). Cargo system design intended to serve activities that were manually performed in cargo handling operations, now are delivered through utilization of this system. Main goal of utilizing cargo system in port operations being faster discharging and loading of containers; improved speed in cargo access, tracking and easy identify the bill of lading relating to cargo invoices. Use of the system intended to better cargo receiving and monitoring of the storage areas in port (leading to increases in stacking area's capacity); high level of accuracy of information; and high level of consistency of the information given to various port users in the chain of transport. Systems users expect to have access on cargo status, information about current position of the cargo in port, status of processed invoices, paid or unpaid status.

The Terminal Operating Systems (TOS) like any system using computer, according to Boddy (2005), tries to understand utilization of the Cargo System by making the interaction between the two, human users and the software, more satisfying and productive. Use of the system has to be reflected in easy of doing business. Customers expect easy and quick interaction with Cargo System so to locate and identify their cargo status. Therefore communication according to Johnson at el (2001) plays a vital role in the implementation of the systems concept. System design has to consider connectivity in terms of network and all related infrastructure to enable cargo system users communicate cargo information. It is the connecting and integrating link among the systems network that enable cargo system users to access and get systems updates from their premises.

Interface usability as the extent to which Cargo System can be used by specified users to achieve specified goals with effectiveness, efficiency in cargo handling and service delivery in a specified context of use. The research on Cargo System utilization environments broadly focuses on system ability to communicate with port users from their premises. The processes must be well understood by users in order to be useful, therefore skills and knowledge of users on how to work through use of the system accessed through web application is vital. According to Lu *at el* (2010) have examined knowledge users' perceptions of information system in use, and introduced the concept of technology overload to represent the difficulties users have when additional technology tools begin to crowd out one's work instead of enhancing it. They reveal on how technology usability depends on the amount of tools available to the users, reaching an

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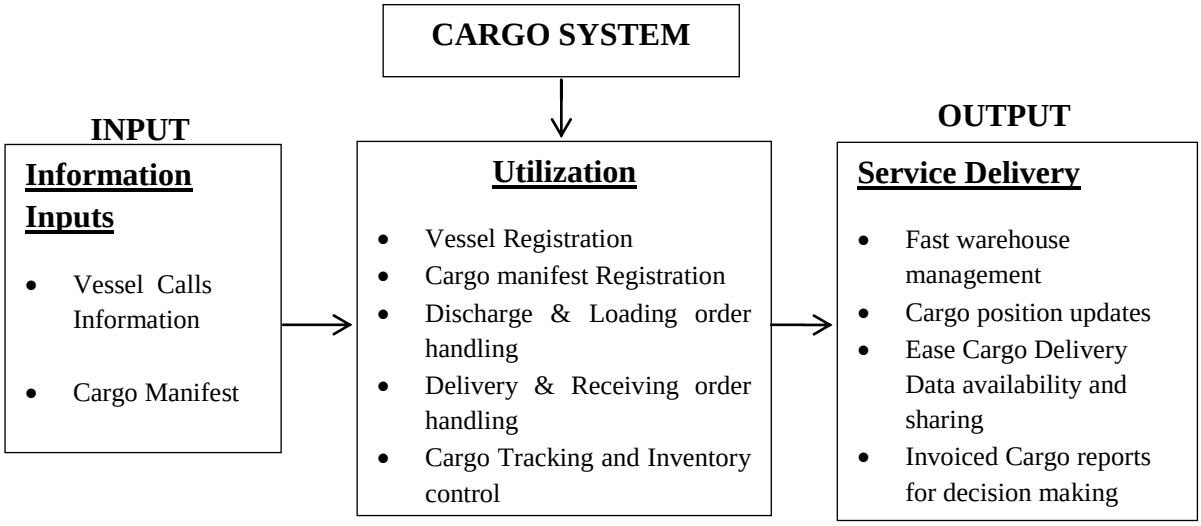
optimal level before becoming counterproductive. To overcome the difficulties inherent to the lack of system usability, many users still prefer to use paper documents to perform some information practices although takes time and money (Sellen& Harper, 2002; Boardman &Sasse, 2004; Bondarenko*et al*., 2010). Therefore, customers and port users in general require Cargo System to update on cargo status. Bill of Lading information to be accessed in an easy way, cargo invoice status paid or unpaid and delivery status to be accessed easily. Customers want to be furnished with information on current cargo position in port.

In any system development process, testing is important although does not just ensure that a quality product is delivered to the end user, but it is a measure of how well requirements were adhered to and is a continuous learning tool for process improvements (e.g., how to avoid bugs in the future, how to find them quicker. With device fragmentation and rapid changes in device software, it's even more important in the mobile world that the testing function does not just ensure quality, but that it continues to improve on the process of ensuring quality. The study designed, tested and implements the prototype system related to utilization of Cargo System so that updates of cargo information shared and accessed through web portal to all port users in a way manageable by every user. The design analysed entities involved in web portal database that will handle and disseminate updates of Cargo System effected in the process of service delivery. Cargo data with their related vessel calls to be mapped so to produce output that will enable customers to make decisions on their cargo. Service delivered through Cargo system depends on how reliable the processed data. Towards, cargo processing efficiency in terms of speed and accuracy, ease of use and data availability, System theory provides a set of powerful ideas developer used to design and implement, integrate and structure understanding in the disciplines of computer science engineering so to have cargo information shared in an easy way (Sommerville, 2004, p. 24).

Conceptual Framework

Figure 1: Conceptual Model of the research



Source: Adopted and modified from Sampson, 2001

The Cargo System application (CS) has been designed to handle various types of import and export cargo in a convenient way in a harbour, terminal and warehouse environment. Vessel calls at port are registered in the system, and the approved manifests downloaded from TRA system and registered in Cargo System. TRA system and Cargo system are not integrated; hence staffs from port of Dar es salaam enter the downloaded manifest in cargo system manually. TPA uses the manifest for all fiscal control purposes and cargo tracking. An extract of the manifest, a discharging list which is cargo details is sent to the port operator's for operational purposes. At this stage the manifest is made available to all

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sections that also use the system to perform discharge, transfer, receiving and delivery tally. No paper manifests are required to initiate operation processes. The manifest data is stored on the Cargo System database and is shared to all users as a discharge order. According to Johnson *at el* (2001), Communication plays a vital role in the implementation of the systems concept. System connectivity in terms of network and all related infrastructure to enable cargo system users communicate cargo information. It is the connecting and integrating link among the systems network that enable cargo system users to access and get systems updates from their premises. During discharge of the vessels, the port operator's through Cargo System perform tally as each container (or Bill of Lading for general cargo) is landed. On completion of discharge, the Cargo System process the data and issues 'discrepancy lists' to Customs and the carriers detailing short- and over-landed containers or general cargo items which may need further investigation or action. Shipping lines through Tanzania ports authority website under TPA systems connect to cargo system in order to assign delivery orders to C & F agents, enter pre-advice of container notification and released containers for transfer. C & F agents through Cargo System announce trucks and check real-time container status on the system before coming to the port. Truck stay in port, dwell time and demurrage is down and the port is enjoying better utilization of land, assets and staff.

Knowledge that builds on information extracted from use of Cargo System software is a property of people that predisposes them to act in a particular way. Knowledge represents prior understanding, experience and learning, and is either confirmed or modified as people receive new information. People use knowledge to economise on the use of resources (Nonaka et al., 2000). Cargo system users by having knowledge on data processed, they will react differently to information and data. C & F agent who has good knowledge on Bill of lading processed in Cargo system will use it to announce a truck to collect cargo in port. Using relevant knowledge enables people to act in ways that add more value and so supports effectively organization service delivery.

The Cargo System design to ensure that cargo tracking information and identification of the cargo in port can be easily tracked. Tasks performed regarding the cargo can be traced in the system so that users from different working groups can proceed. Modern professionals employ a wide range of software applications to perform their tasks. They use email to communicate cargo information, and record and analyse handlings and transactions for decision-making. Computerized systems have now replaced manual systems in most organizations (McDowall &Jackling, 2006). Different menu in the system can be used to perform tasks that is an input to another user e.g. Shipping agents and C & F agent can identify cargo and initiate delivery processes while delivery staff in port may effect delivery.

Operations activities through Cargo System has a flow which is inter-related to all parts involved. Shipping Agents send the manifest through emails and it is entered in Cargo system as a list of cargo details. The list is transformed into discharge orders. The port quay side operators use the information to discharge the cargo. The internal transfer operators track the cargo and monitor warehouses handling and delivery. The C & F agents initiate delivery after the cargo being released by TRA. Port delivery operators issue the cargo to C & F agents to complete delivery. Management at all points have reports to manage operations and other managerial decisions. Time and accuracy of information relayed in all the above procedures matters. The flow of tasks and operations above depends highly on network. Poor connectivity may lead to communication dwindles and poor service quality. Delivery of service the right way, gives service businesses control to gain, or at least maintain, a competitive edge in the marketplace (Verma et al., 2002).

According to Allwood (2000), Usability is something that is created in a use situation where the user, Cargo System and task are brought together. By use of Cargo System, service delivery aim to achieve several competitive advantages. First, Time to process and track cargo is reduced since all involved parties can have required information online. System automation takes over some of the burden of the more mundane and routine tasks, Cargo system users expect the system to reduce their work load. Second, knowledge on the nature of cargo helps port management to plan and deal with complexity and delicate cargo in an accurate way. With the right information, dangerous and cargo with abnormal characteristics will be secured during stay in port. Third, the disseminated information helps in making decision on cargo

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clearance, to issue or retain the cargo and improves service delivery. All in all, use of Cargo System software reduces cost of handling the cargo; this has great impact to port users.

According to Terry (2005), the information must be complete and available in time. There must be close liaison between information providers and users to ensure that the key factors are identified. Information to have value must be used, for it to be used, users must have confidence in the source and confidence is enhanced if there is good communication between the information producers. Good information is that communicated in time. Service delivered through cargo systems must be timely and accurate.

The effects of Cargo System towards service delivery aim at improved services, where time to process cargo handling in port is reduced. The shared information from a reliable system led to accuracy in cargo handling operations. Reliability varies by level, as a system can be hardware reliable but software unreliable, or both hardware and software reliable but unreliable for operator data entry. Service delivered through Cargo system depends on how reliable the processed data. Towards, cargo processing efficiency in terms of speed and accuracy, ease of use and data availability, General system theory provides a set of powerful ideas developers can use to integrate and structure their understanding in the disciplines of computer science engineering so to have reliable cargo information (Sommerville, 2004).

3. METHODOLOGY

In this point, detailed description of the research methodology that refers procedure followed in the establishment of study objectives. Descriptions include the research design, sampling techniques, research population, and research instrument used and their validity and reliability. The analysis techniques and methods involved for this research are discussed in this chapter.

Research Design

The action research design was used in this study. The design aims to contribute practical concerns of people in an immediate problematic situation. There is a dual commitment in action research to study a system and concurrently to collaborate with users of the system in changing it to a desirable direction. The Action research design focus on turning the people involved into researchers, where people learn best, and more willingly apply what they have learned, when they do it themselves. It also has a social dimension - the research takes place in real-world situations, and aims to solve real problems. It is unlike in other disciplines; the researcher makes no attempt to remain objective, but openly acknowledges their bias to the other participants.The study used closed end Questionnaires as an instrument for this research and covered the entire respondent within the study population.

Research Population

The study population for this research consisted of users from Port of DSM such as quay side operators, internal transfer operator, cargo delivery operators, port management; shipping agents and cargo agents (TPA, 2013). Therefore the total research population was 1800.

Sampling Procedure

The researcher conducted a simple random sampling. The individuals were selected from groups of cargo System users. The sample is randomly drawn so that each person or member has an equal chance of being drawn during each selection.

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Research Instrument

The study used closed end questionnaires for collecting data. The instrument fits the study because it enables researcher to collect a lot of information in a short time. The instrument divided into two parts; Demographic characteristics of the respondents and assessing requirements needed to develop Cargo System service updates software. Likert 5 scale closed questions provided for the respondents to offer the required data and the scale is from 1 to 5 with description .

Data Analysis

Data analysis is descriptive statistics where frequencies and percentages used to analyse data. Demographic characteristics of respondents analysed.A thematic analysis where descriptions and outlines of requirements used to derive software requirements, specifications and design techniques

4. SYSTEM ANALYSIS, DESIGN, TESTING AND IMPLEMENTATION

This point presents the analysis for Cargo System Update software, design and implementation of the prototype of the new system. It shows the way how data flows, processed and cargo updates sharing through web application.The chapter shows on how the system was designed and developed. Use case, data flow diagrams and entity relations model were used in design of Cargo System Update software

System Analysis

Feasibility Study

The researcher started with feasibility study and looked at the existing Cargo System. All the processes that are involved in handling cargo by use of the system were examined. It was established that Cargo System can improve the current situation that has led into delaying cargo clearance process, increase time for delivery, increased cost of doing business and encourages theft and loses for cargo lying in port for long time. Cargo system requires the capability of disseminating cargo information from one point to another, store effectively and efficiently cargo information and provide a quick access and cargo tracking for easy loading and unloading of cargo in port. This was in agreement with the views of Johnson *et al* (2004) who pointed out that output can be measured referring the identified services obtained by use of the system that is shared to all users to support their decisions.

Technical feasibility

During this study, the researcher found out that Dar es Salaam Port has computers and all it necessitates for the System to work. Cargo system users have computers of 26 Pentium four and above with high processor speed and RAM, compatible internet browser that the system needs to work. It was established that TPA HQ and DSM Port are connected with Local Area Network (LAN) using fiber optic backhaul and wireless backhaul as a backup. There is a data centre where the cargo System update software database to be managed. The study considered the technical requirements of the proposed system feasible.

User requirements Analysis

A feasibility study was conducted to examine Cargo System users. The researcher considered technically the system development part, to see if the requirements can be visualized to bring about expected implementation. The ability to design, coding and implement the updates of Cargo System so that can be accessed to port users. The researcher feasibility study on operational wise, considered factors like; will the system work and be helpful to port users? Can it deliver to port users the required updates? Will the system pass the user acceptance test? The researcher finally identified software requirements specification and assessed the port user's perception on the effects of Cargo System Update software on service delivery at Dar es Salaam Port. The researcher supported by customer requirements data analysis to proceed on development of software to extend utilization of cargo system, so that can give updates to users online. Requirements are categorized into two areas, functional and non-functional specification.

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System Implementation

The system database was developed using PHP and MySQL programming languages. The researcher selected MySQL DBMS because it can handle big data files, in this case considering transferred information from Cargo System to the Updates Software. MySQL DBMS allow heavy queries to be executed, is easy to install on all computers and it has high security level on assigning privileges to different system users.

Implementation of the Prototype

The prototype implementation of a system developed by researchers on Cargo status updates during cargo clearance in the port. The purpose of the implementation is to demonstrate the feasibility of automatically extending utilization of cargo System existing in the port to give updates to port users. Cargo handling information in the Cargo System is updated as people do their daily port operations duties. A customer through Cargo Update Software will access updated information through web. The successful integration and implementation of the on-site field data collection system with the Update Software enables port user to identify and track a cargo status to fasten cargo clearance process. Users using internet connection had an opportunity to interact with the prototype.

Update Software Access through web

Figure 14: The home page

Source: Researcher data (2013)

This is the area where port users interact with the update software and get connected to cargo updates. The purpose of the homepage of a website is to get a place where visitors are linked to their enquiries. Customers once connected to the organization website are linked down to cargo system updates. This can lead to frustration and despair if the link is not

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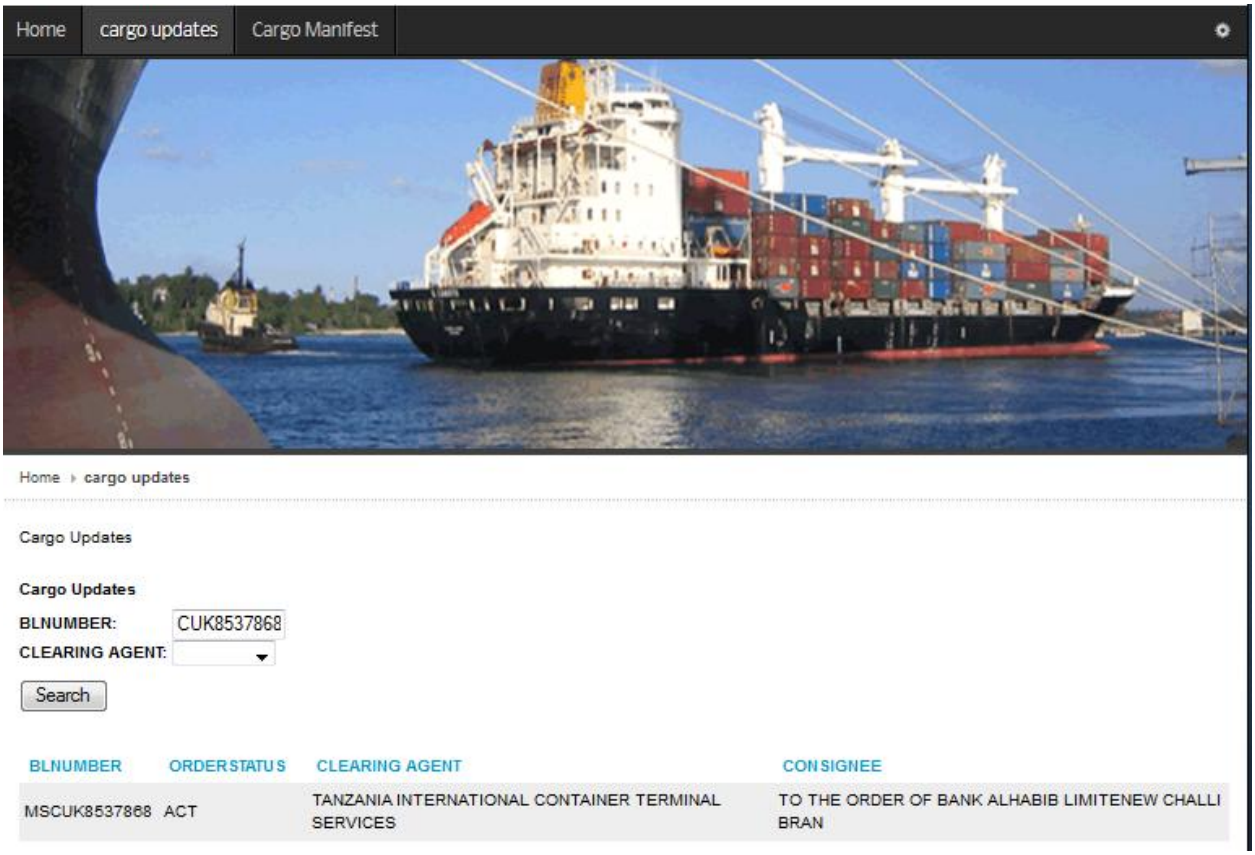
taking them to where they expect. In business using internet, this should be a greatest fear when considering proper site design, especially the home page. Port users by click on Cargo System updates will be connected to page 2 where cargo information and clearance processes can be viewed.

Figure 15: View Cargo Status Update



Source: Researcher data (2013)

In this screen the user is able to search the cargo and see the Bill of Lading status. There are three status, the Registered status RGS, Active Status ACT and Executed status EXE. The three statuses give light to which stage of clearance process the cargo is. Registered Bill of lading means the delivery order issued by the Ship Agent and Port charges can be raised. The Active status means Cargo port charges are paid and clearance process is going on within port area. The Executed status means that the cargo is cleared out of the port area. This enables port users from different parts of the world to track clearance process to save time and money

Customers based on the viewed status know exactly in which stage the documentation process is. Any system user can act accordingly online; make decision on the next stage in the process of clearing the cargo. TPA staff, shipping line agents and C & F agents as Cargo System customers through use of Update Software will be able to retrieve online the required information during Cargo Clearance process. This will save time and money.

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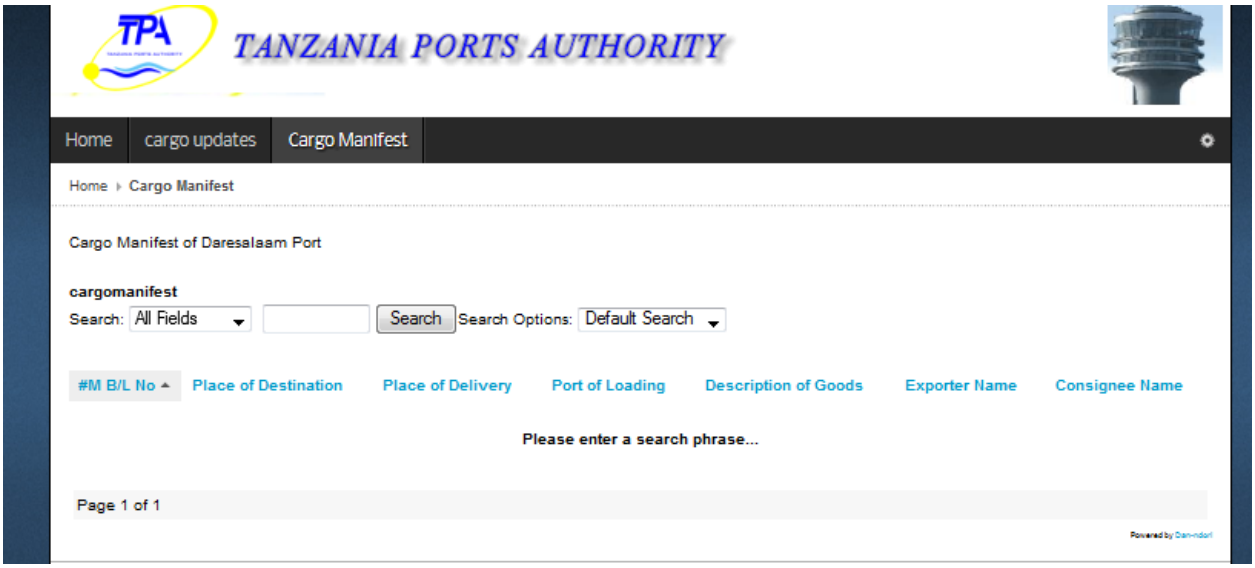
Figure 16: View Cargo Manifests



Source: Researcher data (2013)

In this screen the user is able to search the cargo and see details of cargo on board the vessel. The user is able to search the cargo by entering a search phrase according fields of the manifest.The screen enables users to confirm on their cargo as they can easily know who is addressed as a consignee of the respective cargo. This eliminates the confusion that may arise between the cargo owner and the selected cargo agent.

System Testing

System testing is the testing of the whole system based on its specification. It is a comprehensive testing and verification of the system against the requirement specification. Testing strategy in this studyfollows system testing basic principles adopted for all software testing and it applied a strategy and tactics that have been recommended for object oriented systems according to the literature reviewed. Each unit or component of the system was separately tested to ascertain whether it worked properly. Cargo Updates were view through web by search of Bill of ladings and see their status in the process of clearance. Defects were found, rectified and tested again. Update System users were involved in testing units of software developed throughout the testing methodology. Cargo update status was tested once the cargo in port is handled through Cargo System. Various status of Registered, Active and Executed Bill of Lading were tested. Manifest Module was tested in order to ascertain and access cargo information through web, cargo on board and consignee were identified immediately after Manifest upload in Cargo System

System Documentations

Cargo System Updates Software is a package enables customersget updates on cargo handling operations through utilization of Cargo system at Dar es Salaam Port. Customers are not compelled to be in the port physically to proceed and support cargo clearance. The software extends the usage of cargo System, simplifies cargo clearance processes by disseminating vital information about Cargo and clearance process status online.

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5. FINDINGS, CONCLUSIONS, RECOMMENDATIONS

This point summarizes the system development process, highlights the challenges and shortcomings, and conclusion to the major findings of the study, in light of the objectives and research questions. It also presents recommendation for Cargo system to be utilized fully to support port operations at Dar es Salaam port.

Characteristics of Respondents

Findings on feasibility study conducted by the researcher on the existing Cargo System reflects that, system users originate from three main categories, TPA staff, shipping line agents and C & F agents. User requirement for the proposed system was gathered. Respondents belongs to three employers, TPA, Shipping line Agents and C & F agents. Respondent analysis refers their role in port operations and on how they communicate with customers during cargo clearance process. The descriptive statistics (see table 4)on user requirements shows that 38% of respondents disagree on Cargo System Customers getting cargo updates online. The study identified that the system does not interact with users. The existing Cargo System is accessible only within port premises; this supports the suggestion to developUpdate softwareto extend utilization of cargo system and to be accessed through web. Study descriptive statistics on system design found that 81% of respondents support the design of the proposed software and agree that it is easy to interact with cargo Updates, search and view handling updates.

Findings of the Study

Customer requirement for services delivered through Cargo System in Dar es Salaam Port

According to the first objective of this study, the first thing for the researcher was to ask users on the current Cargo system. Users were asked on how they interact with cargo system during cargo handling process. There are several issues considered in this section with the intention to have an overview analysis on the design of the current Cargo System as well the proposed update software. Port users can access cargo manifest details in the system. Users are able to track and identify bill of lading registered in the Cargo system, this has great impact on the speed of service delivery. The entire set of interrelated service processes constitutes hierarchically-organised process architecture. A service process involves number of user, in turn, be described as the sequence of activities and steps, the flows and interactions between these activities must be clear to users, flow to all cargo stakeholder and shared information for quality service outcome. The faster the service is delivered the lower the cost to handle the cargo incurred.

The descriptive statistics analysed for user requirements (see table 4) reveals that, the system does not interact with users. The existing Cargo System does not reach customers outside the port, this supports the suggestion to develop software and extend utilization of cargo system to be accessible through web. The current Cargo System report layout scored a low mean of 2.3; this translates for users not agree on the design. This means the Cargo system requirement specification does not meet some of users' needs. The researcher concurred with Sommerville (2007), understanding user requirements is an integral part of information systems design and is critical to the success of interactive systems. Specifying these requirements is not so simple to achieve, methods to support user requirements analysis must be fully adapted in order to come up with a system that meets user requirements.

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Table 4: Descriptive Statistics for user requirements

	N	Mean	Std. Deviation	%
I would like to know status of the vessel arrives with my cargo	235	3.2043	1.09816	64.09
I can access the cargo details through the system	235	3.7191	.90927	74.38
I would like to know once the cargo is discharged	235	3.2383	1.23457	64.77
I can Track Cargo movement from the current system	235	3.2043	1.19149	64.09
Cargo Information updates online is not safe	235	2.3787	.82507	47.57
I would like to know once Export cargo received in the Port	235	3.0851	1.13284	61.70
I can access the cargo charges by using cargo system	235	2.5149	1.03093	50.30
I have enough knowledge and skills on how to use cargo system	235	3.4851	.93985	69.70
The current Cargo System report layout easy to follow and readable	235	2.2681	.71644	45.36
System accuracy in inserting data is high	235	3.3532	.83637	67.06
Information Sharing through Cargo system is easy	235	3.3574	.86225	67.15
Information entered or processed through the system always available at your request	235	3.0426	.98183	60.85
Cargo System Customers get cargo updates online	235	1.8851	.75078	37.70

Source: Researcher data (2013)

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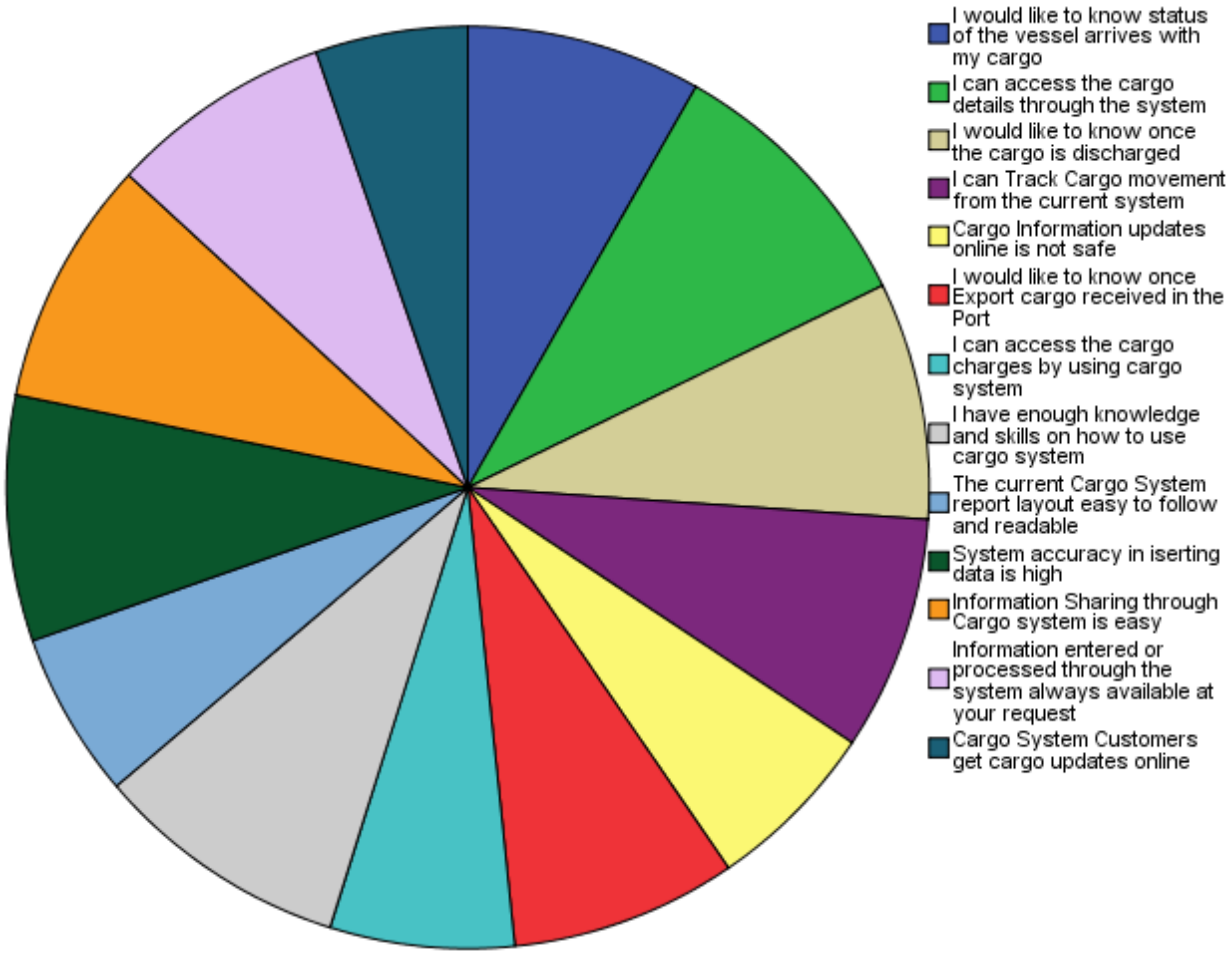
The researcher revealed also that Cargo System is limited only within port premises. Cargo System Customers getting cargo updates online scored a lowest mean of 1.9 that translates to the system not accessible through web. The System does not benefit on emerge of internet. Many services are now provided on the internet such as online banking, job seeking, purchasing tickets, guidance services on array of topics engulfing the every aspect of life, and port operations being not exceptional. Often these services are not available off-line and can cost you more. Ecommerce is the concept doing business online can be applied for any type of business deals that involves the transfer of information across the globe via Internet. It has become a phenomenon associated with any kind of operation in the transport industry, where every single product and service is available at your door steps. It has got a real amazing and wide range of products from household needs, technology to entertainment.

Graph 1: Mean Findings for Objective One



Source: Field Data (2013)

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Design web based application related to utilization of cargo System in Dar es Salaam Port

Study descriptive statistics on system design found that 81% of respondents support the design of the proposed software and agree that it is easy to interact with cargo Updates, search and view handling updates. A design of the prototype meets the requirement specifications. The study intended to come up with software extending cargo system service delivery. Cargo System updates software provides flexibility and scale in back-office systems to keep pace with the rate of change, and connects them to all of the new endpoints of front-office engagements. Leading businesses, communities and all port users to access and monitor critical real-time information, by adopting technologies like cloud, web, social and big data. This creates an opportunity to put cargo clearance in motion. A Business in Motion is ready to meet customers on their terms, with a complete understanding of each customer, used to create deeper, more meaningful engagements.

Table 5: Descriptive Statistics for Functional requirements

	N	Mean	Std. Deviation	%
It is simple to connect and get cargo updates	235	3.4851	0.93985	69.70
It is easy to interact with cargo Updates, search and view handling updates	235	4.0511	0.8608	81.02
The displayed report layout easy to follow and readable	235	3.1191	1.15593	62.38
Cargo system updates to be displayed in only one colour	235	3.3574	0.86225	67.15
It is not necessary to visit port in order to know cargo updates status	235	3.2085	0.92168	64.17
Cargo System updates accessible through internet	235	3.0426	0.98183	60.85

Source: Field Data (2013)

The developed software enables customers to interact with cargo updates by search of their respective bill of lading and view their handling updates. Cargo System updates software must have the ability to allow users search and access updates in a simple way. Descriptive statistics for functional requirements reveals that a mean score of 4.1 (see table 5) shows that software requirements archived. This is in line with the study on software requirements by Whitten, Bentley and Dittman (2005), where was established that functional requirements of the system are; enabling entry of information into the system through navigable user interfaces basing on customer needs.However, as per research question one in this study; the following were identified as functional requirement of the software; The system should allow users to input data via a graphical user interface, the system should allow the user to navigate through the records, the system should allow the user to store data in a database, the system should allow searching for a particular record. It was also found out

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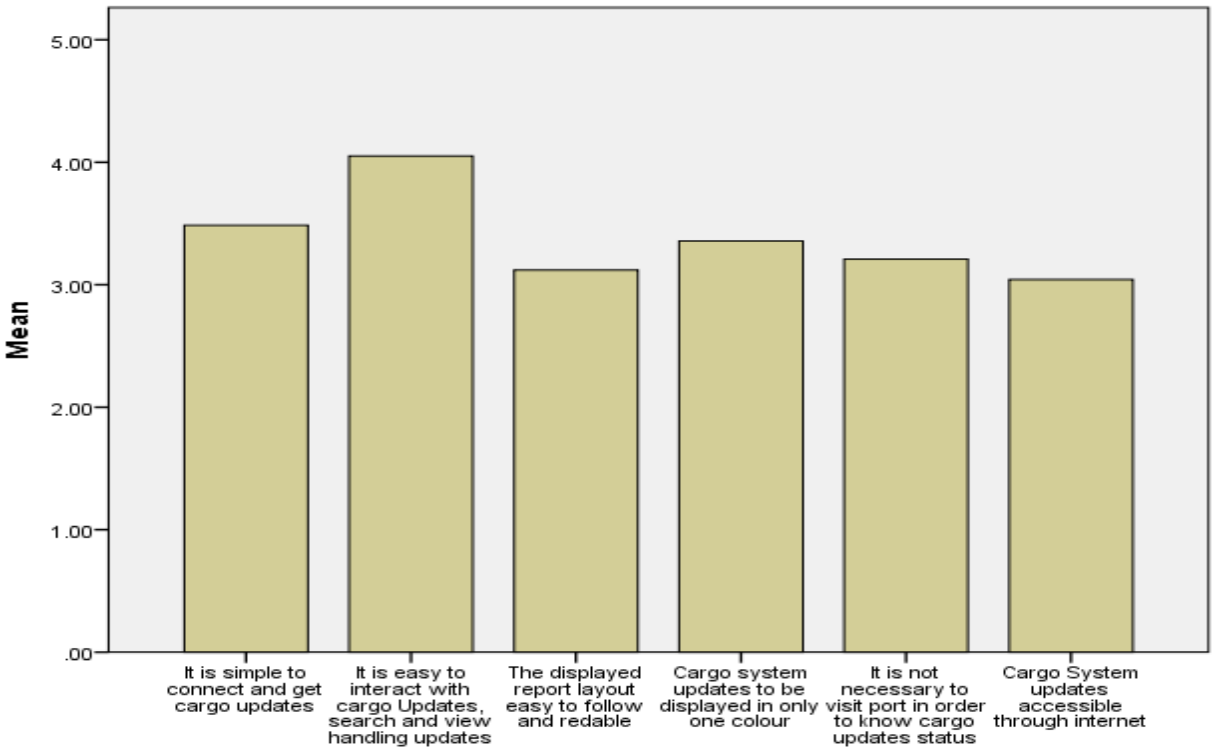
that the system should have a login interface where users should provide username and password in order to use the system. The findings from the study showed that the system should print out reports as required.

In conjunction with research objective one, Pfaffenberger (2003), defined non-functional requirements as descriptions of the features or attributes of a given system as well as any constraints that may limit the boundaries of the proposed solution. Whitten et al (2005), concurred with Pfaffenberger by defining non-functional requirements as constraints placed on any software project. The findings of this study concurred with Pfaffenberger (2003) on constraints that may limit the boundaries of the proposed solution, the current Cargo System features limited to only clients' access to cargo information within the port.According to the first objective of this study, the system requirements from respondent guided the whole process of developing the system. Port users requested updates of cargo handling operations performed by use of Cargo System. Some of the requirements were updates on invoice processing, cargo delivery points and handling status. In this part the researcher found out that all update requirements were possible to be accessed online, through use of Cargo System Updates Software. Therefore Port users preferred use of the system to fast and support cargo clearance processes at Dar es Salaam port.

According to Kim (2003) a well-designed terminal Operating System should supply information, reflecting all user requirements gathered, timely and frequently to enable decision making for efficient port service delivery. Cargo System as a terminal operating system manages flow of cargo information through port by relocating cargo in the right places. Vessel calls are registered so to associate with cargo on board the vessel, details of cargo registered for easy tracking in port area. Cargo position updates available in the system through client application. However, in this study according to research question two, prototyping was found to be the most appropriate software development methodology. The techniques and methods of designing Cargo System Updates Software was prototyping which involved working with the model sample at each stage of development.

Graph 2: Mean Findings for Objective two



Source: Field Data (2013)

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Implementation of the prototype

As per research objective three, the following were found to be the test and implementation procedures; content model for the system should be reviewed to uncover errors, system interface used to uncover errors in presentation and in navigation mechanics. Functional components should be tested one by one to meet the user requirements. Navigation throughout the entire system architecture should be done to make sure the system conform to requirements specified. The system should be implemented in different environment configurations to check compatibility. Security tests should be conducted to exploit vulnerabilities in the system environment. Performance tests should be conducted, and controlled under the guidance of end users; the results of their interaction with the system should be evaluated for the content and navigation errors, usability concerns, compatibility and performance. This is in line with Mark (2012, who argued that system implementation is functionally tested as a whole and is done inline with system's level implementation of software projects.

Cargo System updates softwaremust produce corrects outputs during its up time. Reliability is enhanced by features that help to avoid, detect and repair hardware faults. A reliable system does not silently continue and deliver results that include uncorrected corrupted data. Instead, it detects and, if possible, corrects the corruption, Findings reveals that users agree the software is reliable, this evidenced by a mean score of 3.8 in the descriptive statistics for objective three. Cargo System updates availabilityscored a statistical mean of 3.9 means that users agree the system is operational. The above concurred with Spencer and Floyd (2011) who explained and note the distinction between reliability and availability: reliability measures the ability of a system to function correctly, including avoiding data corruption, whereas availability measures how often the system is available for use, even though it may not be functioning correctly. For example, a server may run forever and so have ideal availability, but may be unreliable, with frequent data corruption

Table 6: Descriptive Statistics for Non-Functional requirements

	N	Mean	Std. Deviation	%
Cargo System Update Software is reliable	235	3.7660	.71650	75.32
Cargo System update Software is available all the time	235	3.8213	.72352	76.43
It takes short time for Cargo System update software to load	235	3.4383	.68518	68.77
Time taken to access cargo updates is acceptable	235	3.6128	.90997	72.26
I can access cargo updates by use of any internet browser	235	3.8340	.86856	76.68

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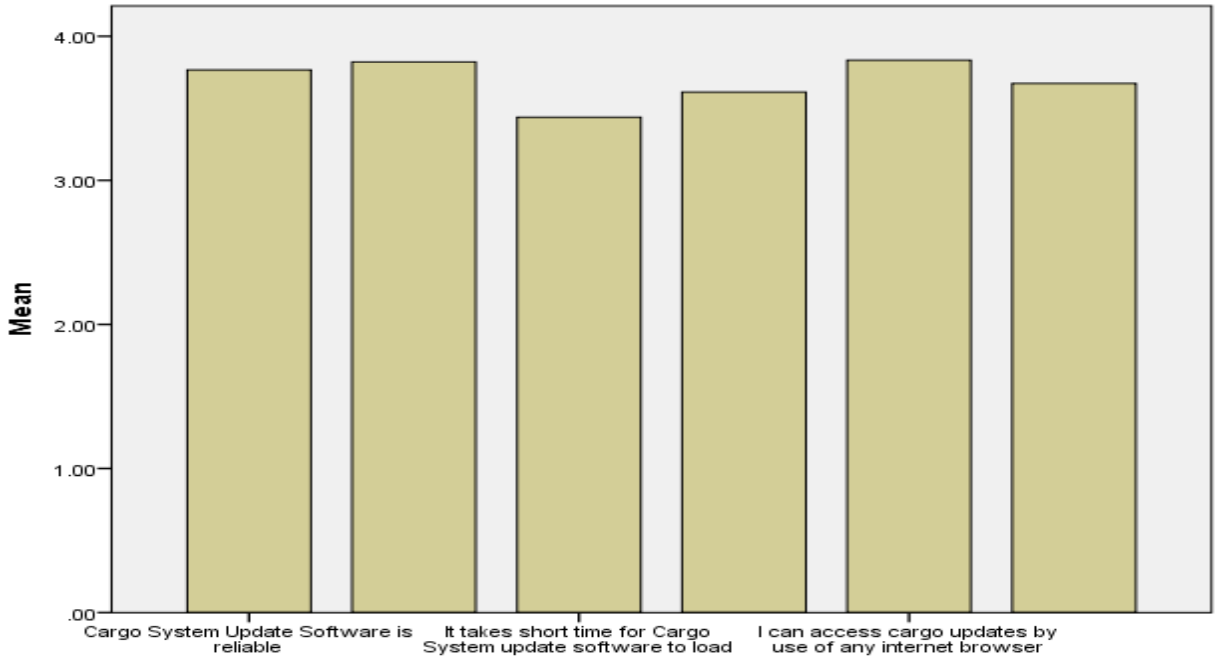
Cargo System updates software ease to use	235	3.6723	.89100	73.45

Source: Field Data (2013)

The Descriptive statistics found that 75% of respondents have a high score on reliability affirming that cargo system update software is reliable. Cargo System Update software has the ability to perform its required functions under stated conditions for a specific period of time. 77% on availability of a system that typically measured as a factor of the reliability - as the update software reliability increases, so does availability. Availability of a system may also be increased by the strategy on focusing on increasing testability & maintainability and not on reliability. Maintainability estimates (Repair rates) are also generally more accurate.

Graph 3: Mean Findings for Objective Three



Source: Field Data (2013)

A mean score of 3.8 in the graph agrees that the system allow users to access on their cargo anywhere, access information from any internet web browser around the global.

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Conclusions

The main purpose of the study was to investigate utilization of cargo system to be updated to various port users. Understand challenges encountered regarding development of update software of the system Cargo System operations in the port; give recommendation and advice to port users for operations service delivery efficiency.

According to objective one, the researcher concluded that the current Cargo System does not interact with users. It is accessible only within port premises, this supports the suggestion to develop software and extend utilization of cargo system to be accessible through web. The study identified that only 38% userscan get updates online. This means Cargo System does not interact with users. The Services delivered through cargo system is limited only to users paying visit to the port. Cargo updates not accessed through internet, hence slow the speed of cargo clearance process. Cargo System users cannot track updates of cargo information. Locate the delivery points that reduce costs of mobilizing resources. Invoice status can be disseminated to port users in order to facilitate ease and fast port charges that leads to fast cargo clearance.The majority needs Cargo System utilization extends services through web in order to improve service delivery at Port of Dar es Salaam.

On objective two in this study, the researcher concluded that the proposed Software design ensures that the system is user friendly. Study descriptive statistics on system design found that 81% of respondents support the design of the proposed software and agree that it is easy to interact with cargo Updates, search and view handling updates. It was discovered that coming up with a working prototype is the best strategy to design a system that can evolve as the designer gets more of the features that require by system users. The Cargo System users want it to have features that designed properly in order to do their work. It was in this study that the gap which existed in other studies on how to meet the current complaints through utilization of Cargo System in Dar es Salaam port, was identified and concluded that using a prototype helps to bridge that gap by keeping interacting with the system users so as to include in the designer their needs. The researcher concluded that accessing cargo System updates through web can bridge the existing gap on how utilization of Cargo System can improve service delivery and increase revenue at Dar es Salaam port.

The software has been developed using PHP, and MySQL database programming connectivity language and database management system respectively so as to meet the requirements of cargo System users. This helped in ensuring quality performance in terms of accuracy, security, reliability, ease of use and maintenance. The data in the system can be accessed, manipulated and retrieved very easily and effectively according to the users' cargo data. This study also concludes that prototyping, when employed properly, leads to improved software quality. The primary improvements are ease of use, better match with user needs, and often better maintainability. The study do not find support for the common notion that prototyping cannot be used for developing large systems. It finds no particular bias towards either keep-it or throw-away prototyping, and provides little insight into which languages are better for prototyping. The researcher concluded that, the techniques and methods of using prototype in designing Cargo System Updates Software is an appropriate approach in system design since it involves user at each stage of development. The model sample was tested by end-user before integration of the complete system thus ensures user acceptance to the system

According to objective three, the research concluded that the proposed updates software is reliable and it is available through web. 75% of respondents have a high score on reliability affirming that cargo system update software is reliable. Cargo System Update software has the ability to perform its required functions under stated conditions for a specific period of time and it is available through web.The study was also meant to test and implement the system; unit and system testing have been concluded to be the stages of testing the system where test data helps validate the system functionality in its operational phase. This should be done by a group of system users so as they get used with it before its actual use for further maintenance. The system was tested, users and actual data was used which conformed to requirements specified. The system was in position to restrict unauthorized access, schedule the courses, and generate

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individual workload as per lecturer, and general timetable where all the courses taught were found timetabled to different class rooms at different time intervals.Implementation of Cargo System Updates Software which was developed using free open sources software (FOSS) like Php, Html5 ensures updates of cargo handling operations by use of Cargo System. The software accessible through internet and therefore bridges the geographical barriers for port users located far from Dar es Salaam port.

Recommendations

In line with objective one, the researcher recommends that Cargo System Update Software should be developed to extend utilization of Cargo System service delivery. This should be done after interacting with the system users to know what the system should do and possess features that meet the user needs. With the Cargo System offers services through web, both the business community and TPA now benefit from a quick, efficient and reliable declaration, and cargo clearance process, 24 hours a day. All parties can work more quickly and efficiently, resulting in cost savings and a better standard of service to clients. This will bridge the current limitation of the system, from compelling users visit the port to a situation where they can interact with Cargo information at their premises. This means a lot to Cargo System service delivery in terms of cargo clearance process. The system will reach customer complaints on the time they cannot access their invoice and cargo handling updates for fast delivery process that sometimes extends up to those coming from neighbour countries which are using Dar es Salaam port.

TPA management should consider implementing the system to help extend utilization of Cargo System in order to meet problems that has led into delaying cargo clearance process, increased time for delivery, increased cost of doing business and encourages theft and loses for cargo lying in port for long time. This will result intoa better standard of service delivery to clients, hence a raised Port credibility. The researcher recommends that, Cargo System Update Software bridges the gap of information sharing among port users. This simplifies and speeds up decision making regarding cargo clearance in port. Port users can easily access data updates where vessel, cargo and invoice status are shared for easy cargo clearance.

According to objective two, the researcher recommends that the developed prototype be implemented and extended into the functional Cargo System for the improved service delivery at Dar es Salaam Port. The researcher recommends that developers carefully define the purpose and scope of the prototype. Avoid the use of entry-level programmers for making design decisions. Utilize a design checklist. Use a flexible development environment (such as object-oriented methods). Consider performance issues early. Limit end-user interaction to a controlled setting.

Finally, system testing is recommended for the design and implementation of Cargo system updates to ensure system usability. The system modules should be tested independently and then put together to get a fully compatible functioning system.

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