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An Evaluation of Vehicle Component Procurement on the Performance of Road Transportation, A Study of Public Bus Transit, Ghana

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Abstract

Road transportation is an essential transit medium for development and economic growth in developing countries. Procurement of vehicle component parts has serious impact on the performance of the road transport industry. Shortage and unavailability of technically specified and quality vehicle component parts resulting in broken down transit buses tend to affect the overall management of public bus transit system. We use the public transit system in Ghana as a typical case study in the West African sub-region. Data gathered through questionnaires, interviews and observations and the adoption of a hybrid form of Just-In-Time (JIT) and Total Quality Management (TQM) supply chain management systems for procurement procedures revealed some results. The study findings outlined ineffective procurement practices as contributing to the difficulties in shortage of vehicle component parts. Difficulties relating to poor provision of technically detailed parts specification, inaccurate purchased quantities, delivery delays and dysfunctional supplier relationships, amongst others. Proposed recommendations are measures of enforcing on the procurement function and strengthening of communication within procurement stages, information flow and improvement in the use of fully electronic computerized data management in the procurement and inventory systems.

Keywords: Road Transportation; Public Transit System; Vehicle Component Procurement; Procurement Practices; Just-In-Time System; Total Quality Management System.

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1. Introduction

Road transport is one key area in the infrastructure development and economic growth in a developing country. In Ghana, it is estimated that road transport accounts for 97% of passenger miles in the country (10). The operation of road transport service has been growing with high preference for good quality bus services as the sector continues to offer more options to passengers. The modern running of the transport services in developing countries like Ghana has encountered shortfalls in terms of vehicle suitability, availability of motorable road, vehicle maintenance, investment in technological systems and devices, as well as operational problems. There is resultant impact public bus transportation services where inefficient and ineffective procedures hinder the fulfilment of the objectives and goals for which they were established.

It is a real traumatic and frustrating experience commuting in and across cities in a developing country, such as in the West African sub-region, considering the appalling public transport system that exists in that country. This situation emphasizes the need of an established public transport system. It is even more vital in the municipalities and metropolitan areas where public transit service can cover extensive residential areas, wider population, as well as bustling commercial, industrial and social activities.

The authors in [7] reports that with the passing of years and increasing population and business operations in the cities, passenger buses have become insufficient to cope with the influx of commuters into the city centres. This lack thereof has resulted in intra-city bus service by private corporate bodies and individuals where private commercial buses and taxi cabs operate to hold the transportation gap. The operations of private transport cannot cope with the increasing number of commuters thereby affecting the productivity growth in the country's economy. The authors in [8] reports that most of the commercial vehicles in West Africa especially Ghana are manufactured in Europe, India, Japan and lately with an influx from South Korea. One feature of these vehicles is that most of them were manufactured for temperate environment and are not suitable for the rugged tropical environments. Hence, despite their low initial purchasing cost, they have high maintenance cost including expensive component parts acquisition and cost resulting arising from very low road worthy duration.

Hence, a public transport system must be in place which should adequate, efficient, and effective to facilitate the mass movement of people, especially the middle-income working class, and enhance business operations of the general population. Statistics from the public transit system operators in Ghana, Metro Mass Transit Limited (MMTL), indicates that procurement is apportioned 75% of the revenue generated with 50% budgeted for vehicle component parts [11].

Current procurement practice challenges in MMTL, thus, the chronic shortage or unavailability of spare parts for the maintenance and repair of buses, lack of integration and communication and inventory systems (using automated systems) have negatively affected the performance of MMTL in the public transit system. These situations have therefore necessitated a study to find appropriate strategies that will ensure that MMTL sustains its competitive advantage in the road transport industry.

In this paper we explore and an attempt to evaluate the effect of procurement practices on the performance on public transit system operated by MMTL. We therefore conducted data analyses to uncover some key areas of operational weaknesses and evaluate suggestions for strengthening the internal procurement operations. Our main contribution is to propose the implementation of a hybrid methodology of Just-In-Time and Total Quality Management supply chain management systems to enhance the efficiency of the procurement procedures at MMTL.

The rest of the paper is organized as follows. In Section 2, we discuss the background information regarding the organizational setup and general operations of MMTL. We further address the overview of the current procurement procedures in the public transit system in Section 3. In Section 4, we perform data analyses and evaluate the results that arise from the current procurement practices. In Section 5, we present our proposed methodology for effective and improved procurement management at the public transit system; we further discuss the merits of our propositions. In Section 6, we conclude and discuss the recommendations from the research study; and in Section 7, we address the limitations and areas of future work.

2. Background of Metro Mass Transit

The Metro Mass Transit Limited (MMTL) is a limited liability company incorporated in Ghana in October 2003. The company has shareholdings from the Government of Ghana owning 45% and the remaining 55% being held by private investors [4]. It is the only public transport transit service for commuters in the metropolitan and municipal areas. The MMTL can be labelled as a public-private initiative that aims to operate an effective and affordable transport system in an economical sustainable way. The sole establishment of MMTL is to operate public bus services to ensure safe, affordable, efficient, reliable and profitable transport of commuters. Moreover, the management of the public service should be comparable to the best of operations as evident in other developing or developed countries [9].

The company operates 3 main bus services; namely Bus Rapid Transit System, Urban services, and Rural services. The Bus Rapid Transit System is a fast and express transit system for the major cities of Accra and Kumasi in Ghana. The service is expected to be replicated in other major cities in the country. The urban service operates in the greater urban areas. This service connects the central bus terminals with the city outskirts, and provides medium-distance transportation to villages in the surrounding of a regional capital. The rural services are mainly a long distance service operating mainly in the rural areas. Services in these remote rural areas are limited with low frequency of operations. The service opens activities in villages and isolated districts for social and economical development.

The MMTL operates with several kinds of fleet of buses. Currently, there are 7 types of buses running the operations of the transit services; namely, Iveco, DAF, Yaxing, VDL Neoplan, VDL Commuter, VDL Jonckheere, Tata, and Oret Grant. These bus types make up a total fleet size of 838 buses. There are a number of international partnerships with the bus manufacturing plants and countries of origin of the fleet of buses. These partnerships are firmed up to offer smooth services of procuring new buses and vehicle component parts for existing buses.

3. Overview of Current Procurement Procedures at the Public Transit System

Thorough analysis of various documents and personal observation of the researcher revealed that the procurement function of MMTL is organized as a unit. Effective procurement practice involves practices and cost saving activities such as obtaining value for goods and services acquired or purchased, as outlined in the purchasing cycle. The authors in [2] proposes the purchasing cycle involving activities which are chronologically stated as follows; purchase planning and integration (communication), standards determination, specifications development, supplier research and selection, value analysis, financing, price negotiation, making the purchase, supply contract administration, inventory control and stores, and disposals and other related functions.

This study focuses on only 3 aspects of effective procurement, namely; the activities and processes involved in the acquisition/purchasing of spare parts, integration (communication), and the inventory control and stores management.

A. *Vehicle Component Procurement Procedures*

Purchasing is more concerned with the commercial relationship and this is exhibited in the preparation and processing of a requisition through to receipt and approval of the invoice for payment. An in depth analysis of various documents and personal observation of the researcher revealed that the purchasing function of MMTL is administered according to the guidelines contained in the procurement manual and in consonance to the regulations governing the Public Procurement Act of Ghana, Act 633.

There are 3 different ways of acquiring or purchasing vehicle component parts depending on the threshold (approval limit) based on the application of particular situations and list of requirements to be met. These are explained below:

Open Market Purchases. This involves purchases in an open and free market where there is the option and allowable level of bargaining with the intended supplier. This usually takes place at the suppliers' market place and the purchaser has the choice of buying from a host of suppliers. Additionally, the maximum permissible amount is very low within the range of \$35 USD.

Use of Purchase Order. This mode of procurement involves purchases through invitation by quotation. Here, a number of price quotations for an intended item are solicited from potential suppliers. Based on defined criteria and requirements one of the suppliers is chosen to deliver the intended item. This method of procurement may also apply for item purchases from overseas. The maximum allowable amount is \$10,000 USD for pro-forma invoice-based purchasing. Field Purchases Order (FPO) purchases have allowable amounts up to \$250,000 USD.

Single Source or Selective Supplier. In this type of procurement a carefully selected supplier or suppliers from a single source of production of an intended item are invited to participate in the bidding, tendering, and acquisition processes. The maximum allowable amount for the payment of an item is \$250,000 USD.

Figure 1 shows a diagram of the 14-step process for the purchasing and acquisition of vehicle component parts from a single source or selective supplier at the public bus transit service management, MMTL. We describe each of the steps as follows:

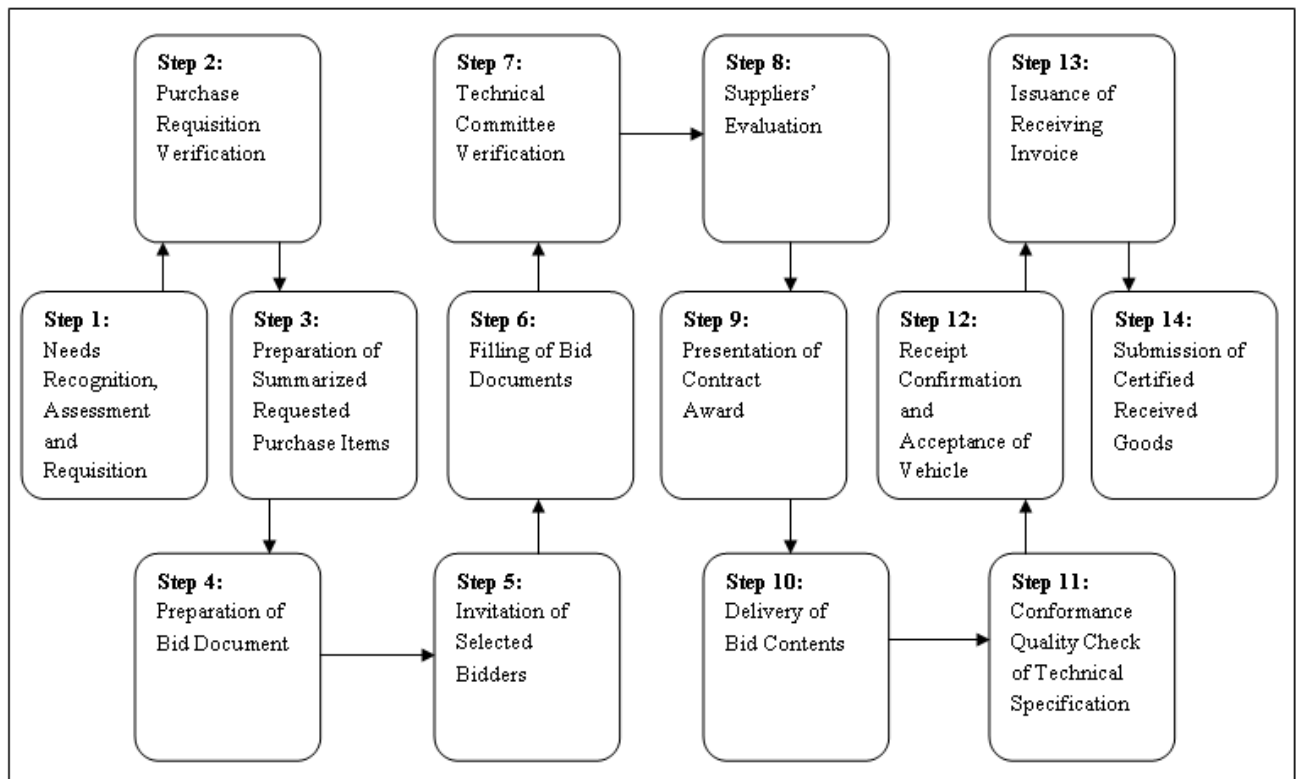


Figure 1. Overview of Work Flow for Vehicle Component Procurement at MMTL

Needs Recognition, Assessment, and Requisition. This step outlines the need for the members of the procurement unit in identifying the need to purchase a vehicle component part. There are 2 ways of the need recognition process, namely; when members of the technical department present request for purchase requisition for a faulty vehicle component part. Secondly, when the store demands for the replenishment of parts in the inventory or there is an immediate request for parts purchase.

Purchase Requisition Verification. This step involves the verification of the purchase requests by the head of the procurement unit to perform checks on whether the request is budgeted for. All vehicle component parts acquisitions are budgeted with the exception of heavy duty equipments. If the purchase request is budgeted for, then process control is transferred to the next stage for onward activities. But on confirmation that the requested item is not budgeted for, the need for approval from the Managing Director has to be ascertained for proceeding to the next step. Otherwise, the procurement process is halted.

Preparation of Summarized Requested Purchase Items. The head of the procurement unit prepares a summary of the list of all the requested items for purchasing.

Preparation of Bid Document.This step involves a formal preparation of documents needed for the bidding process of the procurement procedures. The step focuses on information relating to the technical specifications, financial capacity of the purchase requisition, and time constraints and delivery terms, amongst others.

Invitation of Selected Bidders.This step involves the selection of a number of bidders who have expressed interest in the requested purchase items outlined in the bid document. The step focuses on the public advertisement for expression of interest in supplying the requested vehicle component parts.

Filling of Bid Documents.At this stage each bidder who has purchased a copy of the bid document completes the filling of the information details required in the document. The completed forms, together with additional documents, are then returned to the designated address on an appointed date.

Technical Committee Verification. An opening of all the completed bid document submission is conducted. A committee made up of technical members examine the content of detailed information and documentation submitted by each bidder. This verification is to ensure that the submission of technical information meets the specifications outlined in the bid document.

Suppliers' Evaluation.The next step of the procurement procedure is to undertake an evaluation process for the suppliers. This stage involves the constituted membership of tender committee in assessing each of the verified bid documents to ascertain its suitability for an award. Further processes at this stage require the selection of the best responsive bid based on a list of set criteria in the document. The results of the selection process are presented to the Managing Director for approval and award of contract.

Presentation of Contract Award.The notification of contract awards succeeds the successful selection of the prospective supplier for the bid tendering process. This phase of the procedure involves the formal announcement and communication to the selected supplier for immediate measures of delivery of the bid contents. A presentation is then made on the award of the contract.

Delivery of Bid Contents.This step underlies the delivery of the vehicle component parts by the successful selected supplier according to the requirement and technical specification outlined in the bid document. The step also ensures compliance on the time delivery constraints.

Quality Check Conformance to Technical Specification.A series of checks are performed on the delivered set of vehicle component parts. This step certifies the overall procurement procedure where technical and quality standards specifications in the bid document are adhered to.

Receipt Confirmation and Acceptance of Vehicle Component. The next step after the conformance of quality check is the confirmation for receipt and acceptance of the component parts. The tendering committee acknowledges the delivery and issues a certification of acceptance.

Issuance of Receiving Invoice.This step of the procurement procedure involves the issuance of an invoice covering the delivery of the vehicle component parts as detailed in the bid document.

Submission of Certified Received Goods.The final step in the overall procedure is the submission of certified received goods. This stage will require the suppliers to issue a certificate which should correspond with the details in the receipt issued by the tendering committee. This step enables the members of the tendering committee to effect the processing of payment for the contract awarded.

B. Findings from the Assessment

Thorough analysis of the procurement and purchasing procedures at the public transit services revealed a number of inherent problems affecting the seamless and productive processes of each of the steps. A careful assessment of the procedures details the following findings. We describe each of these findings and discuss some of the difficulties encountered.

Detailed Specification.It is observed that the requesting unit most often does not clearly state detailed technical specification of the component parts required on the purchase requisition form. This is due to the lack of technical knowledge of the component parts, the variety of models for such component parts, and inadequate description of both the technical and requisition information for the intended vehicle component part.

Lengthy Procurement Process.A careful assessment of the overall procurement and purchasing procedures indicates a lengthy process of 14 procedural steps. Some of the steps are redundant while others have minimal effect on the overall process. These factors together cause corresponding delays in the procurement and purchasing process.

Varied Decision Makers.Besides a lengthy procurement and purchasing process, the involvement of a many decision makers adds to the cumulative delays in the process. For example, in a particular selective or single sourced purchasing process, 5 different parties are involved. Out of these parties, 2 are constituted committees each consisting of at least 2 to at most 4 members. The members constituting these committees act in a part-time capacity without additional benefit or compensation and with minimal direct supervision. Furthermore, a particular procurement and purchasing process shall pass through 7 levels of organizational hierarchy. The involvement of several decision makers, particularly in the form of committees is essential, but creates a big challenge for the timeliness of a procurement and purchasing cycle.

Communication Gaps.There exists communication gaps among the parties involved in the procurement process. These are described in the following:

- a) There is less integration or coordination among parties involved in the procurement process. These parties are Technical, Stores, Finance, Audit and Suppliers.
- b) In a non-bid or non-technical acquisition or purchases, suppliers tend to deliver different models or wrong branded vehicle component parts. This is as a result of the non-involvement of experts and technical committee membership.
- c) There are instances that staff members directly present purchase requisitions to the procurement unit without the consent of the store inventory. This sometimes leads to the purchase of items that already exist in the store inventory, and this therefore adds to the budgetary constraints of the procurement unit.

d) Quite often the staff member or the unit that makes the requisition is not involved in the work of the technical committee in their duties of conformance to quality checks of technical specifications of delivered vehicle component parts. This usually leads to lapses in the whole process where suppliers take advantage in outmaneuver the system.

e) The inadequacies in specifications of pertinent information in the technical documentation for the acquisition and purchase of a vehicle component part lead to a pushing around of control from one stage to another in the procurement process. This occurrence further stretch the already long process and cause undue delays.

Poor Record Keeping. There are no existing or any form of records management system at the procurement unit. For example, issues of non-availability of serial numbers and non-compliance to documentation of the purchase progress. As a result of these deficiencies, practitioners at the unit find it a difficult task searching for or managing procurement documents. This adds to the inefficiencies and intricacies in the overall procurement and purchasing process.

Absence of Effective Monitoring and Follow-up. There is no systematic way to expedite and monitor the procurement process. The users who request for the procurement of vehicle component parts have to do the expediting activity by themselves. Quite often information on the progress of the acquisition or purchase would not be known since there is no record to refer to. There is no documented evaluation report and review of process to account for.

Absence of Accountability. There is no practice that takes into consideration the consequences of intentional or negligent delays in the procurement process. Moreover, the need for accountability in the acquisition or purchasing process is non-existent. If a particular purchase is taking too long to complete no due significance are attached to and no remedy measures are administered. Consequently, the procurement unit lacks reinforcements and commitment to execute their tasks to meeting the demands of the overall corporate vision and public transit service.

Dysfunctional Committee Membership. The purchasing and acquisition process involves various committees, including tender review committee and technical committee, amongst others, of which majority of the membership work on part-time basis. Additionally, most of the membership have very little knowledge of procurement procedures. Besides these, part-time committee members do not prioritize the attendance of key procurement meetings which in turn leads to postponement of meetings and an overhead delay in the entire purchasing and acquisition process.

Least Price Selection Criteria. The handbook manual for administering procurement procedures and the Public Procurement Act of Ghana, Act 663 recommends and instructs the adherence to least price selection criteria. This recommendation often leads to the compromise of quality in the vehicle component parts.

Poor Store and Inventory Management. There is lack of efficient store and inventory management practices for vehicle component parts. This is evident in the inability to satisfy the demands for frequently requested

component parts. Hence, every part is purchased when the need for it arises. The store most often contains obsolete, wrongly specified vehicle component parts. For urgently placed requests for purchases and acquisitions, the open market is resorted to leading to non-conformance to standards on purchased items. Besides this, the use of manual system of store and inventory management does not offer a classification for component parts. Additionally, the support staff are not technically skilled to identify vehicle component part available in the stock system.

4. Quantitative Analysis and Evaluation

In this section, we describe and discuss the analyses of data that we conducted as part of evaluating the procurement procedures at the public transit management, MMTL. We describe the adopted methodology approach of the data analyses and further on evaluate the insights out of the analyses.

C. Methodology of Data Analysis

We implemented the analyses using 2 types of research methodologies, namely; qualitative and quantitative techniques. This approach enabled the perspective view of assessing the different ways of operation and measuring the theoretical constructs and practical concepts. The application of the qualitative technique helped to gather the right data considering the size of the research environment and the targeted respondents. It enabled more complex aspects of a respondent's experience to be studied, and provided a greater depth of information about the nature of communication processes. It also helped to investigate and study the individual experiences in more depth. On the other hand, the quantitative technique provided the view to ascertain the relative size of a particular communication phenomenon. It therefore ensured a higher level of reliability of the analysis of the gathered data.

Data Collection and Sampling Method. To effectively evaluate the existing procurement practices at MMTL, data regarding the operational and managerial activities of the transit service were collected. The various forms of data collection extracts were in-depth interviews, observations, questionnaire administration, and official newsletter articles, amongst others. These constituted the primary data for the analyses. Secondary data comprised of web information, industrial reports, and publications. Structured questionnaires were addressed to the Procurement Unit, Technical Department, Store Unit, Workshop Unit, Operations Department and Traffic Department. Moreover, interviews were conducted with the Assistant Technical Manager, Procurement Officer, Operations Manager, Head of Traffics, Workshop Manager & Supervisor, Stores Manager & Officer, Distribution Officer, and the Information Technology Manager. These personnel offered information regarding the daily operational activities at the service.

The researcher considered the study as exploratory since the research seeks to evaluate the effect of procurement practice and the propositions of methodologies to improve on difficulties that seem to hinder the operation of the management of public transit services. Purposive and convenient sampling data collection were used within the constraints of proximity of the data collection point, selected location, cost of data collection, and the convenience to the research, amongst others.

To access and evaluate the impact of procurement practices on MMTL's operations and performance, the researcher distributed questionnaires to a population sample size of 111, which were selected using quota sampling method. This form of data sampling method ensured that the samples points have good representation from various departments and will consist of both operational and administrative staff. Out of the sample data distribution, the researcher observed a response size of 93, of which this represented an 83.78% of the overall population size.

D. Analysis and Evaluation

We performed an analyses and evaluation of the sampled data collected from the population size of staff members at MMTL. This activity was conducted to affirm the assertion of the lapses in the overall procurement cycle. We discuss the analysis based on the criteria used in the data collection and sampling.

Frequency of Vehicle Component Parts Requisition.In terms of the rate of frequency of vehicle component parts requisition, the analysis depicted that 39.8% of the respondents make request up to 5 times a week. On the contrary, 60.2% of the respondents made purchase request up to 10 times a week. This indicated a trend in highly frequent requisition of vehicle component parts, with a ratio of more than half making requisition. This further highlighted an overhead burden on procurement staff with varied requests from all associated departments and increasing the time duration of the procurement cycle.

Accuracy of Technical Specification.The accuracy of technical specifications is another context that needs to be critically observed and analyzed. The data analysis generally indicates 38.8% of an accurate specification made. Moreover, 40.8% of the respondents give rise to a proportion of respondents affirming a partial, vaguely stated parts specification which is rarely made. For a proportion of 20.4% of the respondents, their response verifies an inaccurate technical specification of vehicle component parts. Deductions from these analyses indicate a relatively high level of poor technical specification of component parts. This is evident in 61.2% of the sample size making laying emphasizes on partially accurate or inaccurate specification.

Accuracy of Quantity Requisition.The quantity involved in the requisition for vehicle component parts is always difficult to determine by the user. This is because there is a tendency to acquire more than the expected for future purposes. This further affected budgetary constraints for other forms of procurement items. A statistical analysis revealed that 35.5% of the vehicle component parts quantity requisitions were accurate. Moreover, 54.8% were determined to be partially accurate in terms of quantity specification, whilst 15.7% was accessed to be inaccurate in terms of quantity specification. This analytical breakdown indicates a higher percentage of 70.5% of vehicle component parts were quantitatively specified inaccurately.

Procurement Process and Approval Cycle.The process and approval cycle represents another area of analysis that is critical to the operational efficiency of the procurement unit. It is always deduced that a relatively short cycle tend to deliver very good results of timely and accurately specified parts acquisition. The figures depicted that 30.3% of the procurement processes that were analyzed were very bureaucratic and long in the average time duration of 40 weeks. Furthermore, for the processes and approval cycle that ranged in an average of 30-35

weeks, a proportion of 55.4% was realized. Finally, a proportion of 14.3% represented procurement process and approval cycle going through a relatively short duration of time. This period of time was normally in the average of 25 weeks. The figures breakdown of the process and approval cycle indicates a measure of a total of 85.7% going through a relatively long bureaucratic process and time. This depicted a negative impact on efficiency of supply chain management service from the requisition time to approval time and a loss of assurance from stakeholders in the overall procedure.

Duration of Procurement Delivery Period. The duration of delivery of procurement items plays an important role in the overall procurement and acquisition process. The impact is this step tends to either affect the agreed pricing metrics of vehicle component parts or the quality of delivered items. An assessment of the analyzed data indicates that 65.6% of the procured items are delivered within the range of 5-10 days interval. On the other hand, items delivered with the range of 11-20 days interval represented a 34.4% in the overall vehicle component parts at the procurement unit within the time frame of the evaluation analyses. It can be deduced that quite a sizeable number of the procurement item deliveries still fall short of standard regulation time of supplying procured items. Some of the extensions to the delivery times are attributed to varied problems, such as customs clearance at the ports, specification changes, amongst others.

Procurement Management and Inventory Data Control. Data on procurement and inventory play a critical role in procurement procedures. The readily availability of such data facilitates the flow of information and communication within different departments and personnel, as well as effective coordination in between the procurement unit and the inventory unit. An assessment of the respondent's data revealed that 21.2% of the inventory data were recorded on manual tally cards. Moreover, 20.5% of the inventory data were electronically recorded into computer systems, whilst 58.3% were partially recorded on either manual tally cards or electronic data captures. This data representation indicates a relative moderate level of inconsistency in the management of procurement and inventory data. Consequently, a repercussive impact on the timely and readily information for weak procurement procedures is inevitable.

5. Propositions for Effective Procurement Management in Public Transit System

In this section, we describe the propositions that will serve as a platform for an effective supply chain management for the entire procurement procedures at MMTL. We also discuss the merits of the proposed methodology of procurement procedures as a way of analyzing and properly evaluating measures for improved public transit system in Ghana.

E. Proposed Methodology

With the processes of procurement practices at MMTL having negative consequences on the performance of public road transportation in Ghana, it is imperative to advocate for a restructuring of procurement systems and procedures. This will facilitate the increase in patronage of an improved and efficient public transit network in the metropolitan and municipal areas, as well as the country side areas. We therefore outline some measures of improvement on the methodology currently practiced in the procurement unit at MMTL.

We propose the adoption and implementation of a hybrid form of procurement management system involving Just-In-Time and Total Quality Management procurement systems to streamline the operations at the procurement unit. The fusion of these forms of procurements offers a medium of drawing on the strengths from both systems whilst minimizing the effects of the lapses and weaknesses from the systems. Furthermore, the methodology implementation will offer cost-effective procedures, informed communications structures, well equipped and detailed technical specification, and timely execution of sub-procedures.

Figure 2 displays a diagrammatic overview of the streamlined and improved system for procurement and acquisition of vehicle component parts at MMTL. We adopted the implementation of a hybrid form of supply chain management system. We combined Just-In-Time (JIT) [1] and Total Quality Management (TQM) systems [1] as an approach of proposing an effective methodology for the procurement procedures and practices at MMTL. Our motivation for this proposition is to harness the timeliness factors of utilizing and replenishing stock materials in an inventory system. This usually comes from the application of the theory of Just-In-Time supply chain management. Moreover, the JIT system offers a scheduled coordination between the production or inventory units and the procurement unit [4,3]. This, therefore, minimizes total variable cost and in turn determines the batch and order sizes for vehicle component parts. The application of the TQM system also brings to fore an approach of managing and maintaining quality standards in the operational methodology of an organizational system. In implementing this system, the manipulations of different operations which lead to process variations are minimized so as to achieve a predictable quality level for the procurement of vehicle component parts [4,5]. As it is generally portrayed in TQM systems, this supply chain system will offer a platform for personnel in top management to serve as the driving force in ensuring that technical specifications meet assessed and verified needs requisitions; to ensure that staff are equipped with the right training level of technical specifications; there is adherence of continuous quality improvements; and the adoption of techniques and tools suitable for growth in the transit service, amongst others [6].

In Step 1 of the workflow diagram, there is the process of needs assessment, requisition, and verification. At this stage, thorough verification process is automatically attended to the assessment for the attainment of a determination whether a procurement of the vehicle component part is actually required. A JIT implementation of a sub-process here will ensure that there is utmost information on the inventory stock levels and a request for shortage, where necessary. This step is succeeded by the preparation of summarized requested items in Step 2. A successful summarization of requisition leads to the preparation of bid documents in Step 3. Here, all the technical and requisition information are formally formulated into a bid document for supplier expression of interest. In cases where there are inadequate technical specification details meeting the requirements for the requisition, the workflow procedure is routed to Step 1 for a new process of needs assessment, requisition, and verification.

In Step 4, the workflow proceeds with an invitation for a selected number of bidders. At this stage, various prospective supplier(s) who express the interest in undertaking the supply of requested vehicle component parts are invited to formally submit their bids. In Step 5, interested supplier(s) complete the filling of the bid documents covering the supply of vehicle component parts, paving the way for the technical committee to verify the specifications submitted by the supplier(s). This stage also applies the implementation of TQM in the sub-process for the adherence of quality technical standards in the intended supply set of vehicle component parts. Where

there is a compromise or contrary specification, the procedure is redirected to Step 4 for invitation of new bidders. The next step is the evaluation of selected suppliers and award of contract in Step 7. An unsuccessful selection leads to Step 4 for invitation of new bidders. On success, the workflow proceeds to Step 8 for the delivery of the quality-conformed and technically specified bid documents. Steps 9 and 10 follow successfully to end the procurement workflow procedures.

F. Merits of the Proposed Methodology for Procurement

The proposed methodology for procurement procedures at the public bus transit service offers a number of merits for efficient and effective management of the operations of the MMTL.

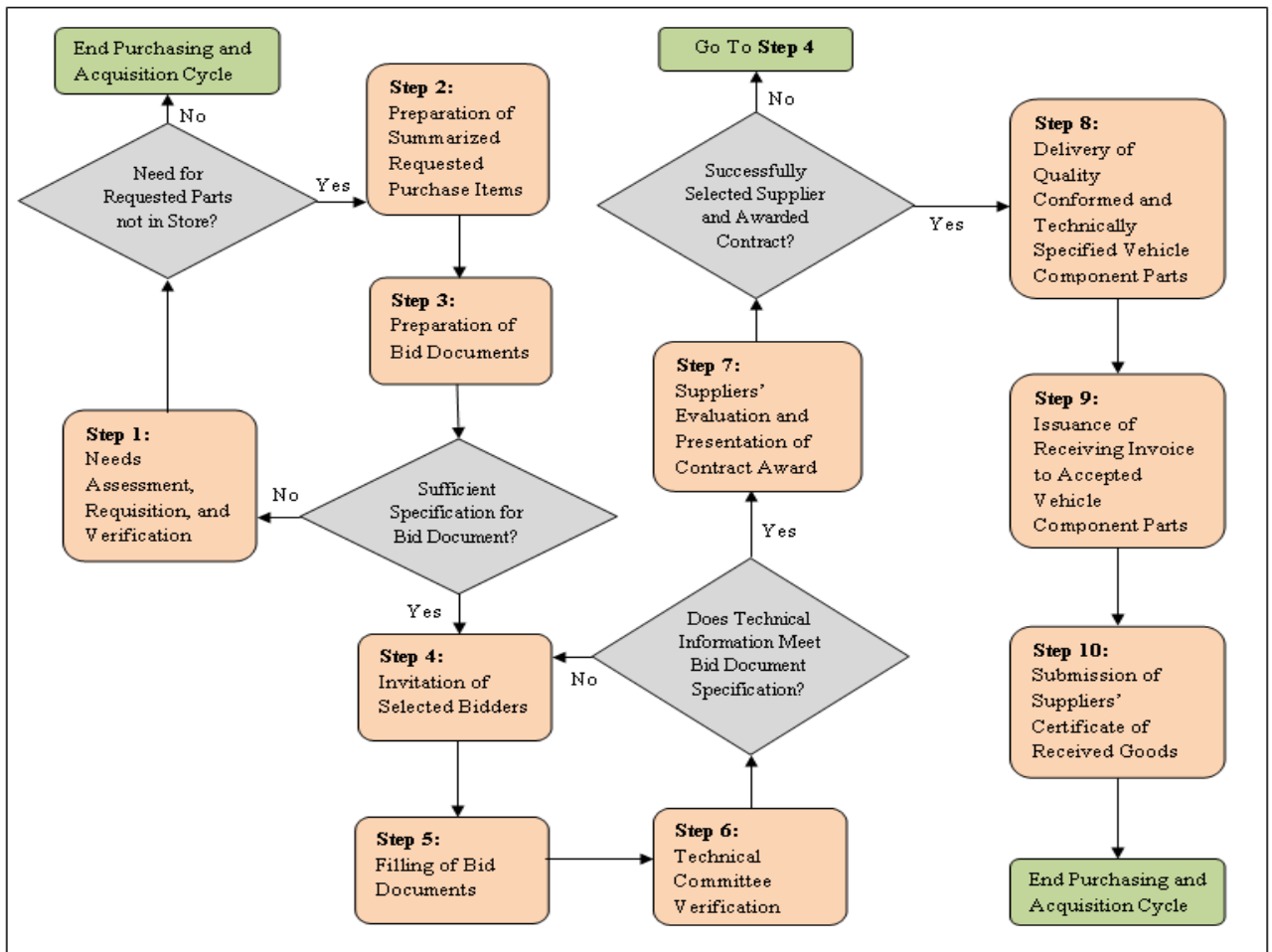


Figure 2. Overview of Proposed Procurement Workflow Procedures at MMTL

We discuss these advantages to address areas of improvements in procurement practices.

Adequate Technical Specification & Training. The proposed implementation of TQM in certain stages of the overall procurement procedures, such as in Steps 2 to 6, requires adequate and essential technical knowledge to ensure the adherence to, and maintenance of quality standards in practices and the procured vehicle component parts. The requisite training that different practitioners from the Technical, Inventory, Procurement, and Audit

departments, amongst others, will undergo will equip them with all forms of technical know-how in their job execution. The training and technical knowledge will become vital constituents for the conformance of high quality standards.

Implementation of Efficient Record Keeping and Data Management Systems.The implementation of JIT system in Steps 1 and 2 of the procurement workflow procedures require data control systems in record keeping for majority of the work in the inventory and procurement units. This ensures readily availability and accessibility of timely data on inventory management and other procurement tasks. The introduction of electronic computerized system of data management for inventory and procurement will offer all practitioners with relevant and updated information for efficient tasks execution.

Reduction in Supplier Lead Times. In Steps 4, 7 and 8, the procurement procedures require interaction with prospective and selected suppliers for the delivery of intended vehicle component parts. The implementation of JIT system will offer a streamlined inventory, procurement, and supplier coordination where there is a rapid supply of requested vehicle component parts, as well as keeping inventory cost to the barest minimum. Moreover, the JIT system will offer delivery reliability and quality conformance between the vendors (suppliers) and the buyers (procurement unit), and the establishment of trust and long term relationship between the suppliers and the procurement unit.

Quality Certification of Suppliers.The procedures of procurement management need a thorough assessment on the suppliers' credibility, credit worthiness, capital strength, and assurance of delivery times, amongst others. The compliance to these characteristic features of suppliers, as part of evaluation and technical committee verification, can be attained by the partly application of both JIT and TQM systems in Steps 7 and 8. It is expected that the implementation of the systems will present an efficient mechanism for monitoring prospective suppliers, and to evaluate suppliers on the basis of quality of design, training, capability of delivery on-time, and defect rates. Hence, the assurance of optimum quality level from prior audit of supplier performance on quality.

Sole Supplier Sourcing.Sole supplier sourcing involves entrusting the supply of vehicle component parts to a single or group of suppliers. The application of JIT in Steps 4 and 7 will offer efficiency in close coordination of schedules, supplier involvement in planning and designing of parts to be supplied, and availability of quantity discounts. It will also enable the selection of supplier(s) with high quality and expertise in handling of particular types or models of vehicle component parts. The implementation of JIT will further strengthen the relationship, reliance, and confidence between the procurement unit, as buyers, and the supplier(s) in a manner where supplier involvement goes beyond financial and economic relationships.

Preventive Maintenance Scheduling.Preventive maintenance scheduling involves the aspect of business operations where the responsibility of eliminating breakdown of the vehicle component parts is divided between the operators of the buses and the maintenance department [3]. The application of JIT in Steps 1, 2, and 6 will afford the platform for technical evaluators in the procurement procedures to access the general operations of the transit buses and their efficiency on the road. Moreover, it offers the technical and maintenance staff the skills to be proactive in technical diagnoses, overhauls, and audits so as to mitigate against the development of

faults in the component parts. One other advantage to the overall procurement procedure is the infusion of constant improvement, employee involvement, constant upgrading of technical skills of employees and better adaptation to newer technologies.

6. Conclusion and Recommendations

This paper presents a case study for the evaluation of procurement of vehicle component parts on the performance of public transit system. We considered the operational procurement practices of Metro Mass Transit Limited, which manages the public transit system in Ghana. We addressed the general overview of the current procurement procedures at the public transit management service. Moreover, we discussed some of the findings from the assessment of the procurement procedures. We conducted data analyses on some critical operational areas of the service and performed an evaluation of these analyses to ascertain their impact on the current operations of the company. In line with the revelations arising from the data and evaluation analyses, as well as the initial assessment, we propose some measures for improvement in some key areas of procurement procedures at the company.

We adopted the implementation of a hybrid form of supply chain management system. Our adoption of Just-In-Time and Total Quality Management systems of supply chain management enabled the propositions discussed. It is the desire of the researcher that these propositions and discussions will serve as vital operational metrics for procurement practitioners. Moreover, it is expected that propositions will facilitate efficient implementation and practice of procurement procedures at the public transit management service in Ghana, in the West African sub-region, and to the larger extent of the sub-Saharan region.

We outline some recommendation measures from the study as part of evaluating the operational procurement procedures at the public transit service. We recommend that the company can perform better by re-engineering its supply and purchasing practices by streamlining the sub-procedures and reducing some of the bureaucratic stages in the approval processes. Moreover, there is a dire need on improving the internal communication by the introduction of efficient record keeping and data management systems for the associated departments. This could be in the form of automated or electronic computerized systems for inventory and procurement procedural systems.

Some other forms of recommendations are the reduction of delays in the overall procurement procedures, conformance to detailed technical quality standards, and the effective evaluation practices for prospective suppliers and vehicle component parts.

7. limitations

The discussions in this paper have focused on an exploratory case study overview of the procurement procedures. Moreover, we proposed some standpoints for improved and efficient procurement procedures in the management of public transit system at the MMTL. In this section, we briefly discuss some limitations regarding the content of this paper and areas of likely future works.

We encountered the constraint of adequate resource persons for more extensive study. Despite the fact that we had enough an above average response rate on the questionnaires, the researcher felt additional information could have unveiled much deeper operational practices of procurement. This will have lead to the proposition of some other criteria for improved procurement practices.

Moreover, accessibility to information that was deemed private to the operations of MMTL was a hindrance to an in depth analysis of the procurement procedures. The researcher was constrained to relevant information due to the proprietary nature of the data and the unwillingness of the respondents to issue out some data and information.

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