The Effects of Inventory Management Practices on Educational Service Delivery: A Case Study of Sunyani Technical University, Ghana

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Authors' contributions

This work was carried out in collaboration among all authors. Authors BEA and AA designed the study, performed the statistical analysis, wrote the protocol as well as the first draft of the manuscript. Authors BEA, AA and GA managed the literature search. Authors AA and GA managed the analyses of the study. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The study sought to assess the effect of inventory management practices on educational service delivery at Sunyani Technical University (STU). The study was guided by three specific objectives; inventory management practices in Sunyani Technical University, the relationship between inventory management practices and service delivery and the challenges in practicing inventory management at Sunyani Technical University (STU). The study adopted convenient sampling technique to sample 230 respondents. The study revealed that cycle stock (74.8%), in-transit inventories (51.3%), inventory planning and scheduling (78.3%), inventory recording (56.5%) inventory control (72.6%), material requirement planning (MRPI) (78.7%) and safety or buffer stock (57.0%) respectively are the inventory management practices used within the institution. Also the Chi-Square (χ2) analysis on the impact of inventory management practices on service delivery revealed that inventory plays an essential role within the survival of the institution and are consequently held to make sure goods are always available. The study recommends that staff on recruitment and during induction should be trained on how to handle inventory items so that the process of educational service delivery is not affected. This is because most of the teaching staff feel and think that management of inventory is not their responsibility when actually it is the inventory that facilitates their process of delivering the services expected of them.

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1. INTRODUCTION

Firms worldwide have realised the need to adopt inventory management systems into their daily operations [1] because the challenge of inventory control has become one of the significant concepts in the management of any organisation [2]. This has generated a lot of interest by both academicians and researchers on the topic and trying to link such inventory management practices to firms" operational performance. On a global perspective, Vikram et al. [3] conducted "a study on inventory management systems and supply chain collaboration that assume supply side. The researcher finding concluded that inventory management departments were more willing to have vendor managed inventory system to maintain consistent supply and collaboration amongst stakeholders". A related study by Adeyemi et al. [4] focused "on inventory management optimization tool in Coca- Cola Bottling industry in Nigeria. The researcher concluded that right quantity, quality and timing of inventory is achieved by use of appropriate inventory management systems".

Also, in a case of Kenya, Ng"ang"a (2013) conducted "a study on inventory management systems concept. The study focused on effectiveness of inventory management in Ministry of State for Provincial Administration and Internal Security in Nairobi. The study concluded that delay in procurement and frequent stock outs affected the organization performance and customer dissatisfaction". This is in conformity of a study conducted by Nyabwnga and Ojera (2012) which concluded that consumers may try to find an alternate service provider when firms are unable to satisfy their needs as a result of stock outs; such consumer might be lost eternally and this might negatively impact the long-term market share value of the firm [5,6]. They added that, to the retailers that might result in loss of customers thereby decreasing their net sales and market shares and to the manufacturers, it might result in sales loss, brand switching and consequently loss of brand. This is because, consumers who suffer continuous service dissatisfaction as a result of stock-outs might stop the search for alternative service providers or commodities and this will negatively affect the operational performance of such firm. Akintonye [7] in his study established that inventory management led to an enhanced performance of German Service firms. Lapide (2010) also found

in their study that, the use of technology in inventory management has enriched the proficiency of manufacturing firms and service firms.

According to Gbadomosi [8], the major hindrance to the application of inventory model is frustrations by the ordering system. Non availability of computers to properly keep track of inventory levels and lack of the requisite skill set on how best to implement the models were also cited as constraining factors [9-11]. Kitheka [12] concluded that inventory management computerisation affected the performance of supermarkets and other related businesses and Kilonzo et al. [8] posit that firms incur high cost resulting from obsolete inventory which will negatively affect the operational performance of such firms when there are poor inventory control mechanisms. In order to optimise production and achieve higher customer satisfaction, most firms have recognized the need to maintain efficient inventory management [14-17].

Efficient inventory management helps firms to minimise inventory associated costs, lessen lead time and on-time delivery of goods and services. Wisner et al. [18] argue that any firm that keeps proper inventory of its raw materials is most likely to have its production completed within schedule because inventory management control is part of the inventory management itself and helps ensure steady production operations whilst maintaining a smooth flow of the needed raw materials with no shortfalls. According to Annor [19], inventory management in hospital is to achieve an optimal stock level of medicine in general and other essential medicine for the satisfactory delivery of service to impact on the lives of human unlike procurement in other sectors of the economy. He added that, in the health sector there exist emergencies that pose serious health threats with unexpected arrival in nature, some of these are far beyond the capability of an individual or a community to manage [20-22].

1.1 Statement of the Problem

Every institution whether public or private holds and makes use of inventory so as to make sure that operation and manufacturing functions is efficiently undertaken. For making sure clean waft of operations, companies installed place and put into effect inventory control policies that

guide all stock control activities [23]. Despite this growth in fee and significance of more rigorous inventory strategies, many organizations keep to rely upon simple, use fixed order factor device/ bin gadget; periodic review gadget; financial order amount model; ABC Inventory Control Model, object based methods [24].

Sunyani Technical University (STU) since the upgrade manages one-of-a-kind sorts of stock like stationery, books and different analyzing materials, cleansing substances and construction substances. Educational services are rendered through many departments like colleges, institutes and academic registrar's department. Therefore to be able to efficaciously deliver academic services to which the University is mandated under which a variety of inventories are worried, it determined to use unique inventory management practices like inventory planning, garage, inventory report preserving among others (Hackman & Gyamfi, 2016).

The essential task these days on the Sunyani Technical University is the need to beautify performance while at the same time attaining effectiveness. However, Sunyani Technical University have been accused of negative stock control techniques and this has substantially affected their capability to fulfill their customers. This happened when the institution was upgraded (Audit report, 2017).

In a study by Hackman and Gyamfi (2016) on the organizational analysis of technical universities focusing on Sunyani Technical University stated that, in spite of those stock management practices, little information is available associated with education service delivery. The University nevertheless studies stock outs, shortages, negative fine merchandise and not on time resources. This has caused emergency procurements, bad demand forecasting, negative exceptional merchandise, shortages, inventory outs and negative reaction to the workers and students wish.

They also recorded that, inventory malpractices such as surpluses and shortages was common at the school. Inappropriate coding system, improper records keeping, problem of storage, stock-taking among others was mentioned. It is worthy to attest that; whereas surplus materials can result in capital cost, storage cost, inventory service cost and inventory risk cost; shortages on the other hands result in increasing order cost, risk cost and most especially causing poor

satisfaction to the user, customers or the user department (Hackman & Gyamfi, 2016).

There is inadequate literature on the inventory management practices and its effects on educational institutions in Ghana and the study area. Based on the above background, this study in coming out with findings on inventory management practices available, the relationship between inventory management practices and service delivery and the challenges in practicing inventory management, seeks to assess the effect of inventory management practices on educational service delivery at Sunyani Technical University (STU).

1.2 Significance of the Study

The study is relevant as it will provide useful information to management of Sunyani Technical University and also stakeholders on how to better manage their inventory to create good value in the discharge of duties. It will also help management to avoid wastage and shortages which bedevils the achievement of organizational objective of making profit and satisfying clients and as well present beneficial understanding in reducing the institutions' inventory management problems and also will suggest the best techniques and practices of inventory management to be adopted by the Sunyani Technical University for efficient inventory management in order to enhance their operational performance. Inventory and operations managers in Sunyani Technical University and educational sector in general will find useful insights to further enhance their knowledge and understanding of inventory management practices and their effects on performance and to decide which practices to implement at their levels in order to optimize operations.

Moreover, this study will afford researchers and academicians the basis for further research work. It will also make useful contributions to existing literature on the topic and further help to improve on the academic and scientific know-how on inventory management practices and operational performance regarding Sunyani Technical University.

Apart from that, the study will allow stakeholders to appreciate the influence of inventory management practices and their effects on operational performance. Specifically, government and other policy makers in the

educational sector will find useful insights regarding policy formulations and in designing the appropriate strategies and measures in ensuring the effectiveness and efficiency of inventory management practices in relation to operational performance within the sector.

2. CONCEPT OF INVENTORY MANAGEMENT

"Effective inventory management is critical for most companies, whether they are in production or distribution, to achieve superior business performance. Inventory management as part of a supply chain includes aspects such as managing and monitoring orders from both firm vendors and customers, stock storage, controlling the number of goods for sale, and order completion" [25]. Inventory management according to Kotler and Gertner (2002), applies to all activities involved in producing and conducting inventory levels of raw materials, semi-finish materials (work-in-progress), and completed goods such that sufficient supplies are available and overstocking and understocking costs are minimized. "The cost of maintaining inventory is included in the final price paid by the purchaser", writes [26-27]. Inventory items represent an expense to the owner. Eckert [28], as cited in Amahalu [29], went on to say that better inventory management leads to higher levels of customer satisfaction.

"Inventory management has changed dramatically as a result of technological advancement and the availability of process-driven software applications. However, getting what you need, when you need it, and at the right place is a key indicator of inventory management performance". Ismail et al. [30], stressed that "inventory management in its broadest view is to keep the most reasonable amount of one kind of asset in order to endorse an improvement in the overall value of the organization's asset –human and material capital. As a result, the crucial aim of inventory management is to provide what is needed and to reduce the number of items that a product is out of stock". Drury and Tayles [31], as cited in Mhenyu (2016), defined inventory as a stock of goods held by a business in anticipation of potential demand. Muralidharan and Raval [32], agreed with this concept, stating that "inventory organization affects all business functions, especially operations, promotion, accounting, and finance".

Transaction, preventative, and hypothetical motives are the three types of reasons for keeping inventories, according to him. Whether in manufacturing, distribution, retail, or utilities, the basic aim of inventory analysis is to determine (1) when goods should be ordered and (2) how bulky the order should be.

Badorf et al. [33] "identified five factors for stock holding: Economies of scale; maintaining inventory allows a company to achieve economies of scale in production, buying, and transportation. When a company buys in bulk, it receives volume discounts. As a result, transportation can move greater volumes and achieve economies of scale by better-using machinery. If more material is inventoried, manufacturing will run longer production runs, lowering fixed costs per unit". Supply and demand must be balanced;

An Assessment of Inventory Management Practices at the Sunyani Technical University certain businesses must stockpile inventory to take benefit of seasonal orders. A toymaker sees some order all year, but the Christmas season accounts for 60 percent or more of sales. Output can be kept consistent throughout the year by manufacturing to stock. This lowers costs by reducing idle plant capacity and maintaining a reasonably healthy workforce. When demand is comparatively invariable but raw materials are seasonal, such as in the case of canned goods, completed inventory may help satisfy demand when the materials are no longer available. Inventory allows companies with branches to concentrate by allowing them to stock-specific items. Instead of producing a wide range of items, each plant will focus on one and then transport the finished goods directly to consumers or to a storage facility. Each plant can achieve economies of scale by long production runs by specializing. Protection against unpredictability; one of the most important reasons to keep inventory is to compensate for market fluctuations. If demand rises and raw material supplies run low, the production line will be shut down before more materials arrive.

Similarly, a lack of work in progress means the product cannot be completed. Ultimately, if customer orders exceed finished goods supply, stock-outs can result in customer loss.

The following objectives can also be achieved by inventory control: to preserve operational independence: A supply of materials at a work center allows the center to be more flexible in its activities in order to accommodate variations in

product demand: if the order for a product is known accurately, it might be possible (though not always cost-effective) to manufacture the product exactly to meet the demand; elasticity in production scheduling; The strain in the manufacture systems to get the products out is relieved when there is a stock f inventory. Due to the longer lead times, greater lot-size construction can be completed at a lower cost and with a smoother output flow. Elevated setup costs, for instance, promote manufacturing a bigger number of units after the setup has been established and protect against predicted shortages and price spikes in situations of high inflation or as a purposeful strategy of speculation. Flow-through warehousing, according to Badorf et al. [33], aims to reduce inventory keeping (carrying) costs increasing the pace at which finished products are distributed.

Inventory is delivered directly to consumers from the retailer to a consolidated point. This reduces the costs of putting away, picking up, topping up, and stocking up. She explains that flow–through warehousing is essentially an effort to reduce the amount of inventory held and the length f time it is held. "Product flowing fluidly through a network node," she describes the technique.

On the other side, flow-through procedures are highly information-intensive, requiring computers, stockroom management systems, barcoding, and RF recognition, and they can only be implemented due to the availability of technology. She comes to the conclusion that the retail industry benefits from the use of flow-through techniques. A fixed distribution center may be responsible for a variety of shops, demand is known, mass manufacturing and alternative goods are accessible, and there are fewer value-added services. She concludes by pointing out how the system's operation has been hampered by the lack of precise real-time data. The article's problem is that it doesn't take into account how much it will cost to set up the system initially. The direct expenses of coordinating with other shops in the distribution centre and enjoying the amenities are not mentioned; only the lower costs of product storage are discussed.

Inventory can be best tracked and calculated in the warehouse, Ballard [34], as cited in [35]. "He claims that inventory control is considered a management function, while stock tracking is considered a management function, and stock tracking is considered a supervisory role. However, he points out that the tracking and

assessment process is often ignored, resulting in data that is changeable for management decision-making. He goes on to say that in today's dynamic business world, inventory tracking and calculation must be done quickly and accurately. He states that inventory management and measurement entails understanding all that needs to be known at any given time" [35]. "The whole procedure should be known rather than just the stockpile. In order to explain the properties, status, condition, and position of inventory, he also categorized stock information into fixed information, variable information, and derived information. The literature is inadequate because it ignores the tracking and calculation of damaged, outdated, or stolen products. It also fails to clarify how much money was spent and how much money was made as a result of the successful tracking and measuring process" [35].

2.1 Inventory Management Techniques

"As companies try to maximise their operations whilst minimizing cost, other operational costs may increase inventory management costs. The way a company is able to keep its costs at low levels, the better it is for the year end profits" [36], (Wisner, Tan and Leong 2011). "Most companies engage in buying and selling of their inventory hence the need to balance at the end of the year which normally is always carried over to the next year. Once a firm realizes the importance of this, it can develop an inventory management tool to monitor its inventory information by breaking it down into groups by correlating the categories with its customers. Since companies operate differently in different fields, the inventory can be classified by either seasons or economic year end of the most significant customers hence, demand forecasting need to be employed to have an efficient supply chain" (Poiger, 2010). Inventory Management systems have been identified as having a direct relationship with performance and firms trying to maximise productivity must choose a system carefully [37]. Different companies manage their inventory differently depending on the size of the inventory being held and the size of the company. Inventory management entails the tracking and management of commodities which include the monitoring of the movement of commodities in and out of warehouse locations and the reconciliation of the inventory balances for a time period (Muddassir, 2016). Most inventory management techniques used by companies include.

2.1.1 ABC analysis

Under this technique, inventory classification is based on the value of their importance. Inventory is usually categorised as A, B and C as most valuable, valuable and less valuable respectively (Muddassir, 2016). This analysis is derived from Pareto principle which states that there are a "critical few and trivial many" [38]. This implies, companies must put in place effective inventory policies to help focus resources on the few critical inventory items and not the many insignificant ones [38]. Despite the fact that, all inventories are key, categorising them into groups, resources would be efficiently used by concentrating on items that would be cost effective (Annor, 2012). The importance of this theory to this study is that, it suggests that although all groups of inventory are essential, inventory must be categorized or classified in accordance to their relative impact or value and treated differently by the hospitals to maximise their operations. Inventory control under the ABC technique is grounded on an opinion that, a small percentage of items might necessarily represent a huge value sum of the overall inventory used in the production process whilst a large percentage of items may in turn form only a small monetary value sum of stores [39]. This means the technique suggests that high value items are more carefully controlled than lower ones.

2.1.2 Economic Order Quantity (EOQ)

This technique assists companies in reducing overall ordering and holding costs hence an effective inventory control technique [38, 1] and can be defined as the point at which overall inventory cost are minimised by a firm (Oballah, Waiganjo and Wachiuri, 2015). The EOQ influences the quantity of goods to order and the reorder level of such goods (Sukhia, Khan, & Bano, 2014). "With the EOQ technique, itincorporates so many assumptions of inventory including; that demand is constant and known, lead time is known and consistent, orders arrive sequentially, no quantity discounts, stock outs can be avoided and variable costs involved are setup or ordering costs and holding or carrying costs. This technique has been recognised to be an effective inventory management technique because it is assumed that demand and lead time are relatively stable as well as the detection of significant variability and uncertainties that might exist" [39]. "This can only be achieved through the Economic Order Quantity (EOQ)

computation. Economic order quantity allows companies/firms to plan their inventory replenishment on a timely basis such as weekly, monthly, quarterly, half yearly or yearly basis. By so doing, it enables firms to have minimal storage costs or zero within their warehouses because inventory comes in and goes out immediately. Thus, as organizations try to improve on the inventory management, the Economic Order Quantity (EOQ) and Re-Order Point (ROP) are important tools that organizations can use to ensure that inventory supply does not hit a stock out as explained" by Gonzalez and Gonzalez [40].

Blackburn (2010) however suggests that EOQ is applied constantly as an inventory review system whereby the level of inventory is monitored at all times and a fixed quantity is ordered each time the inventory level depletes to a reorder point hence considers one of the models widely used to manage inventory in most industries. The application of this theory will help the hospitals optimise their stock levels or inventory and subsequently reducing their operational cost hence its relevance in this study.

2.1.3 Material Requirement Planning (MRP) System

Under this system, dependent-demand inventory is automatically controlled [41]. The main objective is to get the right materials to the right place, at the right time using a computerized system during the production planning process as well as in the control of inventory itself and to ensure the availability of materials, components and products for planned production and for customer delivery, maintain the lowest possible inventory level and plan manufacturing activities delivery schedule, and purchasing activities accordingly [42] and also to ensure that the need purchases or a firm"s production inputs are readily available for the next stage of production or for delivery if required (Gbadamosi, 2013). "With this system, companies are able to deduce how much of the final goods clients demand and when they need it as well as the timing and quantity of each component required to satisfy such demand automatically" [41]. "It derives information from a master production schedule, bill of materials, production cycle times and material needs, as well as supplier lead times to determine the category of materials that need to be ordered and when it should be done" (Moustakis,2010).

2.1.4 Enterprise Resource Planning (ERP) system

"The Enterprise Resource Planning (ERP) system is a software system that helps companies incorporate operations/logistics such as planning, manufacturing, sales, marketing, inventory management, supplier management, human resource and financial across the enterprise" [43]. Enterprise Resource Planning modules can either work as stand-alone units or can be combined to best suit and integrate the company"s operations. By implementing ERP systems, companies tend to have an improved operation which advances and controls their business processes together with reductions in their costs [44].

2.1.5 Re-Order level

The prime of every organisation is to achieve efficiency by maximising operations and by so doing, they need to understand their Re-Order Level (ROL) in order to know when to order and when not to order to prevent overstocking, stock outs and wastages. This can be realized by a firm through the application of quantitative methods in its operation since it requires proper inventory management. This system tries to abolish wastages by keeping just enough inventories at the right place at the right time to make just the right amount of product (Apte, 2010).

2.1.6 Just-in-time

It is an inventory management system with the main aim of maintaining enough materials in just the right place at just the right time to produce first the right amount of products needed by customers. Its significance is to order for materials and make them available for consumption and such materials should be of high quality for the efficient operation of a particular system [45]. It is used as an inventory control technique to make available products to meet the customers" demands at the needed time and in the desired quantity with the minimum use of human resource, materials and equipment [46]. This is an effective way of minimising inventory costs by preventing movement of surplus inventories and maladministration of raw materials needed for production [47]. The primary objectives of this technique include; no product defects, no inventory storage with its consequential negative effects, no set-ups and no material handling.

However, its effectiveness depends on; proper material flow system, good customer-supplier relationship, dependable quality with no defects at all times, reliable and timely delivery, methods and components standardization, short distance between supplier and customer and an even production schedules [48].

3. METHODOLOGY

3.1 Study Design and Type

A research design is a plan showing how problems under investigation are solved. This study adopted descriptive cross-sectional survey design.

Descriptive research assists the researcher to collect data by way of observation, description, and recording, analyzing and reporting the conditions operating at that moment from a population (Cooper and Schindler, 2006).

The cross sectional research design is also suitable in finding out the prevalence of a problem or situation in a study by selecting a cross section of a population. The design is helpful in obtaining an overall of the time of carrying out the study according to Ranjit [49]. This means that, cross sectional research enables the researcher to collect data and compare many different variables at the same time without manipulating the study environment.

In this study, the researcher employed both quantitative and qualitative methods (mixed approaches) of data collection. This was coupled with purposive, convenient sampling technique to select the respondents.

3.2 Study Population

According to Ngechu [50], a population is a well-defined or set of people, services, elements, and events, group of things or households that are being investigated. The study population should have some observable characteristics, to which the researcher intends to generalize the results of the study. The study was carried out at Sunyani Technical University. STU employees were **545** in number made the study population including lecturers and administrators. The study targeted the various departments such as the accounts and procurement department, academic affair and faculties, school clinic.

Table 1. Population of study

Department	Population
Accounts and HR	79
Procurement	27
School clinic	47
Academic affair and Faculties	392
Total	**545**

Table 2. Sample size

Department	Population	Sample
Accounts and HR	81	34
Procurement and Public relations	37	17
School clinic	47	20
Academic affair and Faculties	390	165
Total	**545**	**230**

3.3 Sampling Procedure

Sampling as the process of choosing from a much larger population, a group about which a generalized statement is made, so that selected parts represents the total group.

The researcher made use of two sampling techniques namely purposive and convenient sampling. A purposive sampling. This method was used to sample all the heads of departments, the accounts officers, stores and procurement officers.

3.4 Sample Size Estimation

The formula developed by Yamane (1973) for calculating sample size was used to select 230 respondents for the study:

$$n = \frac{N}{1 + N(\alpha)^2}$$

Where

n = the required sample size.
N = the population size (**545**, total population of the employees)
α = Tolerable error/margin of error (which in this study was pegged at (0.05).
n = 545÷ 1 + 545 $(0.05)^2$
n = 545÷ 1+ 1.36
545÷ 2.36
n= 230

A formula adopted by Kathuri and Pals [51] was used in determining the sample size from each bank

n^h =N^h/Nxn where
n^h = sample size of stratum h (that is the sample size for each department)
N = Total size of population
n = Total sample size
N^h= Population size of stratum h (population size of each department

3.5 Research Instrument

The following research instruments were employed for the study; in using this design indicated above, self-administered questionnaire and interviews were used to collect data.

3.5.1 Questionnaires

The researcher used administers questionnaires to collect data from the respondents. The relevance of this is that the questionnaires are convenient and less time consuming.

The questionnaire constituted both closed-ended and open-ended questions. The closed-ended questions were designed in a Likert scale. Bryman (2006), posit that, the Likert scale normally has five or seven categories to show strengths of agreement or disagreement.

3.5.2 Interview guide

The researcher used formal interviewing as a method of data collection to offer a greater chance to explore topics in depth and allow interaction between the researcher and the respondents such that any misunderstanding of the questions and answers provided could easily be corrected. The researcher interviewed the heads of departments by using the interview guide. These were used to tap the vital information that may not be collected using the questionnaires from other officers.

The interview method of collecting data involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. This is to give the interviewee enough opportunity to fully express themselves on issues pertaining to the question.

3.6 Data Processing and Analysis

The researcher after collecting all the necessary data, coded and edited, analyzed and rephrased to eliminate errors and ensure consistency. The

process involves categorizing, discussing, classifying and summarizing of the responses to each question in the coded frames from each response. That was to ease the tabulation work and remove unwanted responses which may be considered insignificant.

Both quantitative and qualitative data analysis methods were used in the data analysis. In the quantitative method, both descriptive and inferential analysis was employed. Statistical analyses with descriptive and inferential statistics were carried out using the SPSS version 21.0. Descriptive analysis with the quantitative data was presented in form of tables, means and percentages. Chi Square test as well as Spearman's correlation was used to determine significant differences dependent and independent variables. A probability (p) value of less than 0.05 was accepted.

The data was also analyzed using the qualitative method. These were the data collected with open ended questions and the interview guides. A qualitatively content analysis of the qualitative approach was used.

4. RESULTS AND DISCUSSION

4.1 Inventory Management Practices Available

The study assessed the effect of inventory management practices on educational service delivery at Sunyani Technical University (STU). One of the research objectives is to find out the inventory management practices that are embark upon by the institution. Amazingly, majority of the respondents agreed to cycle stock (74.8%), in-transit inventories (51.3%), inventory planning and scheduling (78.3%), inventory recording (56.5%) inventory control (72.6%), material requirement planning (MRPI) (78.7%) and safety or buffer stock (57.0%) respectively. This means that the above inventory management practices and techniques are available at the Sunyani Technical University (STU).

The study on the other hand found per the majority agreement that speculation inventory, seasonal stock, dead stock , inventory valuation, First in First out (FIFO) , physical inventory counts, Activity Based Costing (ABC) Analysis, Just- In Time (JIT) inventory, Vendor Management Inventory (VMI) and Economic Order Quantity (EOQ) Model as inventory

management practices and techniques are not practice in the institution.

4.2 Impact of Inventory Management Practices and Service Delivery

The Chi-Square (x^2) analysis on the impact of inventory management practices and service delivery is demonstrated in table 4.2. The data on the impact of inventory management practices shows that inventory plays an essential role towards the survival of the institution interms of the day-to-day activities which implies that the management of inventory management practices and techniques affects the smooth running of the Sunyani Technical University.

This finding agrees with a study by Osei, [52] who notes that inventory planning affects improvement of service delivery in public institutions especially in the hospitals.

The study states and explains further that inventory management practices in the Hospital has an effect on their healthcare service delivery level including inventory planning and scheduling which improved customer service.

From a business perspective, [52] notes that "*Inventory is a major use of capital and for this reason; efficient inventory management is to increase organizational profitability, to predict the impact of organizational policies on inventory levels, and to minimize the total cost of logistics activities.*"

Stock and Lambert [53] also posit that corporate profitability can be improved by increasing sales volume or cutting inventory costs. "*Increased sales are often possible if high levels of inventory lead to better in-stock availability and more consistent service levels. Low inventory levels can reduce fill rates on customer orders and result in lost sales.*"

4.3 Challenges in Practicing Inventory Management

Table 3 shows the Chi-Square (x^2) analysis on the challenges in practicing inventory management. At 95% confidence interval, the study revealed that there are notably low profit margins, lack of training, loss of inventories, un predetermined products demand, opportunity costs, administration costs, theft among workers, conflict of interest in the institution hinders

inventory management practices, poor evaluation and monitoring hinders inventory management practices, strain on resources is a challenge to inventory management practices, weak management systems is a challenge to in inventory management practices and bureaucratic constraints hinders the operation of inventory management systems are statistically significant with the probability values of .000, .000, .000, .000, .000, .001, .001, .007, .000, .002, .000 and .001 respectively. This is an indication that the above staed points are the major challenges that influence the institution in practicing effective inventory management.

The findings agrees with the study by Oballah et al. (2015), Anichebe and Agu (2013) and Ogbo et al. (2014) who found the challenges of inventory management practices as bureaucratic process in procurement, loss of drugs through inventory shrinkages, conflict of interest, weak management system and insufficient funds for procurement.

Table 3. Inventory management practices available

Statement	Yes (%)	No (%)	Total (%)
Cycle stock	74.8	25.2	100.0
In-transit inventories	51.3	48.7	100.0
Speculation inventory	43.9	56.1	100.0
Seasonal stock	32.2	67.8	100.0
Dead stock	46.5	53.5	100.0
Inventory Planning and Scheduling	78.3	21.7	100.0
Inventory Recording	56.5	43.5	100.0
Inventory Valuation	40.4	59.6	100.0
First in First out (FIFO)	35.7	64.3	100.0
Physical Inventory Counts	49.6	50.4	100.0
Inventory control	72.6	27.4	100.0
Activity Based Costing (ABC) Analysis	48.3	51.7	100.0
Just- In Time (JIT) inventory	42.2	57.8	100.0
Vendor Management Inventory (VMI)	30.9	69.1	100.0
Economic Order Quantity (EOQ) Model	43.9	56.1	100.0
Material Requirement Planning (MRPI)	78.7	21.3	100.0
Safety or Buffer Stock	57.0	43.0	100.0

Table 3. Chi-Square (χ^2) analysis on the impact of inventory management practices and service delivery

Statement	N	Chi-Square (χ^2)	f	Sig.
Inventory plays an essential position within the increase and survival of an institution	30	156.565[a]	4	000
Inventory is consequently held to make sure an availability of goods	30	86.043[a]	3	000
It helps to limit the general expenses	30	88.182[b]	4	000
Its plays a significant role in stock management	230	132.348[a]	4	000
Lectures are never delayed in my department	30	23.670[c]	4	000
Research activities are smoothly facilitated and conducted	30	50.652[a]	4	000
It helps predict the response of inventory investment	30	145.165[c]	3	000
Teaching is never interrupted in my faculty	30	56.435[c]	3	007
It has raised the reputation of the institution	30	92.191[c]	3	000
It keep expenses to a minimal with the aid of range discount	30	59.739[c]	3	000
Reading materials are readily available for our students	30	21.861[c]	3	000
Replenishing of books is regularly done	30	30.529[c]	4	000
Examinations are always done as programmed	30	36.400[b]	3	000
Completing students get their documents as and when they need them	30	18.443[c]	4	000
There is a variety of reading materials for students need	30	19.600[c]	3	000
Community outreach activities are timely conducted	30	21.861[c]	3	000

Table 4. Chi-Square (χ^2) analysis on the challenges in practicing inventory management

Statement	N	Chi-Square (χ^2)	Df	Sig.
There are notably low profit margins	230	161.757[c]	3	.000
Lack of training	230	129.635[d]	2	.000
Loss of inventories	230	90.730[c]	3	.000
Un predetermined products demand	230	235.083[e]	4	.000
Opportunity costs	230	96.174[a]	4	.000
Administration costs	230	100.652[a]	4	.001
Theft among workers	230	93.783[a]	4	.001
Conflict of interest in the institution hinders Inventory Management practices	230	71.435[a]	4	.007
Poor evaluation and monitoring hinders inventory Management practices	230	300.435[a]	4	.000
Strain on resources is a challenge to inventory Management practices	230	153.478[a]	4	.002
Weak management systems is a challenge to in Inventory Management practices	230	236.913[a]	4	.000
Bureaucratic constraints hinders the operation of inventory management systems	230	101.261[a]	4	.001

The findings again falls in line with Osei and Mensah [54] studies who revealed "the challenges of inventory management practices and techniques as delays in delivery of drugs leading to insufficient inventories, bureaucratic process in procurement, loss of drugs through inventory shrinkages, conflict of interest, weak management system and insufficient funds for procurement, etc. which were indicated as either occasional problems, major problems or threats to the implementation of effective inventory control practices".

5. CONCLUSIONS

The study on assessing the effect of inventory management practices on educational service delivery at Sunyani Technical University (STU), found a stronger and positive relationship between inventory management practices and effective management of the school.

For instance the study found that cycle stock, in-transit inventories, inventory planning and scheduling, inventory recording, inventory control, material requirement planning (MRPI) and safety or buffer stock were practice by the institution. This means that some aspect of inventory management practices and techniques are not available at the Sunyani Technical University. It was concluded by the majority that, speculation inventory, seasonal stock, dead stock , inventory valuation, First in First out (FIFO) , physical inventory counts, Activity Based Costing (ABC) Analysis, Just- In Time (JIT) inventory, Vendor Management Inventory (VMI) and Economic Order Quantity (EOQ) Model as inventory management practices and techniques are not available.

On the impact of inventory management practices and service delivery the study found out that inventory plays an essential position within the increase and survival of an institution.

The research concluded that there are series of challenges confronting the University in the implementation of the effective inventory management practices. All notwithstanding, the study recalled that inventory management practices to a greater extent has positive effects on the educational deliveries at the University.

6. RECOMMENDATIONS

The study revealed that indeed inventory management practices affect service delivery and therefore came out with the following recommendations:

The study revealed that the Sunyani technical University lack proper training. Therefore, the management of health facilities should decentralize inventory management by having dedicated staff from each department who will be properly trained to use computerized software for managing inventory.

The study recommends that staff on recruitment and during induction should be trained on how to

handle inventory items so that the process of educational service delivery is not affected. This is because most of the teaching staff feel and think that management of inventory is not their responsibility when actually it is the inventory that facilitates their process of delivering the services expected of them.

The study further recommends that in order for the Sunyani technical University to control the balances of demand and supply, an effective inventory management system should be designed and developed for its operations to help minimise inventory costs, lessen product cycle time and enhance information sharing within and outside the organisation.

7. AREAS FOR FURTHER STUDIES

The study mainly focused on assessing the effect of inventory management practices on educational service delivery at Sunyani Technical University (STU). However, there are issues that were not under the scope of this study but actually emerged as the study unfolded, they can be covered in other studies as stated below;

- Inventory management practices and service delivery in public universities.
- Inventory planning and service delivery in higher institutions of learning in Ghana.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Swaleh LA, Were S. Factors affecting effective implementation of inventory management systems in the public sector (A case study of national aids control council). International Journal of Social Science Management and Entrepreneurship. 2014;1(2):17 32.
2. Ziukov S. A literature review on models of inventory management under uncertainty. Verslo Sistemos ir Ekonomika Business Systems and Economics; 2015.
3. Vikram B, Singh P. Collaborative management of inventory in Austrian hospital supply chains: practices and issues. Emerald Journal. 2012;17(3).
4. Adeyemi S, Salami A. Inventory Management: A tool of optimizing resources in a manufacturing industry: A case study of Coca- Cola Bottling Company. Ilorin plant". Kamla-raj; 2010.
5. Hendricks, Singhal F. Purchasing and the management of materials Florida state university, 7th edition, simultaneously, Canada, USA; 2005.
6. Kaufmann R. Inventory planning methods: The proper approach to inventory Planning. The Parker Avery Group; 2014. Available:www.ParkerAvery.com.
7. Akintonye N. The effect of inventory management on performance of German service firms, Journal of Operations Management. 2014;2(1):1-5
8. Gbadomosi OM. Integrated inventory management key to organizational profitability and efficient delivery. Industrial Engineering Letters. 2013;3(9):8-17.
9. Ogbo AI, Onekanma IV. The Impact of Effective Inventory Control Management. Journal of Supply Chain Management. 2014;40(4):17-32.
10. Render. Organizational performance: Mediterranean Journal of Social Sciences, MCSER Publishing, Rome-Italy. 2015; 5(10):June 2014.
11. Tan, Kannan, Handfield A. Supply Chain Management: Implementation Issues and Research Opportunities" The International Journal of Logistics Management. 2019; 9(2):1.
12. Kitheka S. Inventory management automation and the performance of supermarkets in western Kenya. Unpublished MBA Project, University of Nairobi, Nairobi; 2012.
13. Kilonzo JM, Memba FS, Njeru A. Effect of inventory management on financial performance of firms funded by government venture capital in Kenya. European Journal of Business and Management. 2016;8(5):35 - 41.
14. Adams B. Inventory management system. Vikas Publishing House PVT, Ltd.; 2019.
15. Agha NC. Inventory management and cost control in manufacturing industries in Nigeria. The Nigeria Journal of Management Research. 2016;5(2):173-188.
16. Ballou RH. Business logistics management: Planning, organizing, and controlling the supply chain. 4th Edition, Prentice- Hall International, London; 2019.

17. Drury C. Cost and management accounting. ELBS with Publishing House; 2017.
18. Wisner T, Leong G. Principles of supply chain management: A Balanced Approach (3rd Edition), USA; 2011.
19. Annor M. Inventory management in the Ghana Health Service and Its Role in Healthcare Delivery (Master's thesis, Kwame Nkrumah University of Science and Technology, 2012). Institute of Distance Learning; 2012.
20. Kotler P. Marketing management: Analysis, planning, Implementation and control. England cliffs, NJ: Prentice – Hall; 1997.
21. Gbadomosi OM. Integrated inventory management key to organizational profitability and efficient delivery. Industrial Engineering Letters. 2013;3(9):8-17.
22. Lu, Song, Regan S. A brief history of inventory management: Scientific approach to inventory Management software. Inventory systems software Blog; 2016.
    Accessed on April 11, 2021
    Available:https://inventorysystemsoftware. wordpress.com.Management Journal, 41(1):169-176
23. Baily O. The impact of increasing demand visibility on production and inventory control Efficiency. 2018;33(4).
24. Thonemann, Brown, Hausman J. Role of inventory management on customer satisfaction among the manufacturing firms in Kenya. International Journal of Academic Research in Business and Social Sciences. 2016;4(1).
    ISSN: 2222-6990
25. Bucao SDC, Carreon ABG, Lauengco TJD, Young MN. Designing a computer-based inventory system of crystal clear water refilling station: A case study. 2020 IEEE 7th International Conference on Industrial Engineering and Applications (ICIEA); 2020.
26. Chakrabarty R, Roy T, Chaudhuri K. A production-inventory model with stochastic lead time and JIT set up cost. International Journal of Operational Research. 2018; 33(2):161-178.
27. Rosenblatt SB. Vocational interests and personality awareness for advertising students: an experiential approach; 1977.
28. Tastaldi L, Haskins I, Perez A, Prabhu A, Rosenblatt S, Rosen M. Single-center experience with the modified retromuscular Sugarbaker technique for parastomal hernia repair. Hernia. 2017;21(6):941-949.
29. Eckert SG. Inventory management and its effects on customer satisfaction. Journal of Business and Public Policy. 2007;1(3)1. (ISSN: 1936-9794),
30. Amahalu N. Inventory management and financial performance: Evidence from brewery firms listed on Nigeria stock exchange. International Journal of Research in Business, Economics, and Management. 2018;2(3).
31. Ismail K, Isa CR, Mia L. Evidence on the usefulness of management accounting systems in an integrated manufacturing environment. Pacific Accounting Review; 2018.
32. Drury C, Tayles M. Product costing in UK manufacturing organizations. European Accounting Review. 1994;3(3):443-470.
33. Muralidharan K, Raval N. Six Sigma marketing and productivity improvement. A Quarterly Journal of the National Productivity Council. 2017;58(1):107-114.
34. Badorf F, Wagner SM, Hoberg K, Papier F. How supplier economies of scale drive supplier selection decisions. Journal of Supply Chain Management. 2019;55(3): 45-67.
35. Ballard R. Methods of inventory monitoring and measurement. Logistics Information Management; 1996.
36. Abd Karim N, Nawawi A, Salin ASAP. Inventory control weaknesses–a case study of lubricant manufacturing company. Journal of Financial Crime; 2018.
37. Palevich R. The lean sustainable supply chain: how to create a green infrastructure with lean technologies, Pearson Education, Inc., London; 2012.
38. Augustine AN. Effect of inventory management on organizational effectiveness. European Management Journal. 2013;3(8):52-76.
39. Heizer J, Render B. Operations management (10th Ed.). Upper Saddle River, N.J.: Prentice Hall; 2011.
40. Flores BE, Whybark DC. Implementing multiple criteria ABC analysis. Journal of Operations Management. 2012;7(1): 79-85.
41. Gonzalez J, Gonzalez D. Analysis of an economic order quantity and reorder point inventory control model for company XYZ. Unpublished Project, California Polytechnic State University, San Luis Obispo; 2010.

42. Hanson O, Ackah D, Agboyi M. Assessing the impact of efficient inventory management in on organization. International Journal of Advanced Research in Computer Science and Software Engineering. 2015;5(8):96.

43. Owoeye ES, Adejuyigbe SB, Bolaji BO, Adekoya AF. Computerized inventory management for a manufacturing industry: A case study in Nigeria. African Journal of Science, Technology, Innovation and Development. 2015;6 (4):275279.

44. Stevenson BU. Operations management (10th edn.). New York: McGraw-Hill Publishing Inc.; 2010.

45. Tambovcevs A, Tambovceva T. ERP system implementation: benefits and economic effectiveness. International Conference on Systems. 2013;218.

46. Benmofatt KK. An assessment of just in time procurement system on organization performance: A case study of Corn Products Kenya Limited. European Journal of Business and Social Sciences. 2015; 4(05):40-53.

47. Wanjohi EW, Mugo R, Wagoki J. Effectiveness of electronic inventory system on customer service delivery in selected supermarkets in Kenya. European Journal of Business and Management. 2013;5(32):46-59.

48. Munyao RM, Omulo VO, Mwithiga MW, Chepkulei B. Role of inventory Management practices on performance of production department: A case of manufacturing firms. International Journal of Economics, Commerce and Management. United Kingdom. 2015;3(5). ISSN 23480386

49. Birech KW. The effect of performance contracting strategy on the performance of state corporations in the Energy sector in kenya. Unpublished MBA Thesis University of Nairobi; 2011.

50. Ranjit. Purposive sampling. In L.M. Given (Ed.) The Sage Encyclopedia of Qualitative Research Methods. Sage: Los Angeles. 2011;2:697-8.

51. Ngechu V. Questionnaire based Gastroesophageal reflux disease (GERD) assessment scales. Indian Journal of Gastroenterol. 2004;30: 108. DOI:10.1007/s12664-011-

52. Kathuri, Pals. Research methodology: Methods and techniques, 2nd edition. New age International Publishers, New Delhi, India; 1993.

53. Osei ME. The effect of inventory management practices on service delivery at St. Martin's hospital, Agroyesum, Amansie-west. A thesis submitted to the Department of Information Systems and Decision Sciences, KNUST School of Business in partial fulfillment of the requirements for award of the degree of Master of Business Administration. (Logistics and supply chain management option); 2015.

54. Stock JR, Lambert DM. Strategic logistics management. 4th ed. Singapore, McGraw-Hill; 2015.