CAN INVENTORY CONTROL SYSTEMS OF NATIONAL HEALTH LABORATORY SERVICES, KZN ASSIST TO RECOVER BILLIONS OWED BY KZN HEALTH DEPARTMENT?

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ABSTRACT

The National Health Laboratory Services recently complained to Parliament that the KwaZulu-Natal provincial health department is failing to pay R1.2 billion owed for laboratory tests. In dealing with non-payment and inventory management at NHLS KZN the study conducted involved 65 participants drawn from 16 laboratories, 8 hospitals and 8 clinics in three KZN districts, namely, Sisonke Municipality, Ugu District Municipality and Umgungundlovu.

The study was based on post positivist research paradigm with both a survey and qualitative document analysis and interviews conducted with key stakeholders. The key findings in the study highlight the critical need to manage inventory so as to lower holding costs, avoid stock outs and satisfy customers (Stevenson, 1999:561, McHugh, 2006, Lee, 1996 and Chen and Simchi-Levi, 2004). In order to avoid stock outs and achieve satisfactory levels of customer service, inventory must be viewed periodically (Stevenson (1999:561, Cachon and Fischer, 2000, Ferguen and Heching, 1999). Over 77% respondents supported the view that NHLS need to introduce electronic data interchange (EDI) that can assist in coordinating the flow of materials from laboratories to health departments so as to improve quantity and allocation decisions. For debt collection to improve at NHLS, it is therefore important to introduce min-max system, build to order, build to stock, ABC analysis, vendor managed inventory (VMI), electronic data interchange (EDI), automatic pipeline inventory and order based production control system (APIOBPCS), stochastic inventory systems and genetic algorithm (Smaros, Lehtonnen, Appelqvist and Holstrom, 2003, Van der Laan and Salomon, 1997:264).

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INTRODUCTION

The National Health Laboratory Services (NHLS) recently complained to Parliament that the KwaZulu-Natal provincial health department is failing to pay R1.2 billion owed for laboratory tests. In November 2011, the NHLS pleaded for help from MPs saying that non payment for laboratory tests ordered by various provinces was bringing the organization to the verge of collapse as they faced a cash flow crisis. The debtor's collection period has since been reduced from 160 days to 45 days in order to deal with the culture of non payment by various provincial departments. Other provinces complete their outstanding payments to the NHLS within an average of 68 days, with the Western Cape doing so in the shortest amount of time (46 days). However, payments from KwaZulu-Natal are delayed by more than 315 days, while Gauteng is close to 200 days late on payments. Through the intervention of the Parliamentary Health Portfolio Committee and in particular the chairperson Monwabisi Gqwana, the Health Minister Aaron Motsoaledi appointed a judge to negotiate with KZN Health Department over the non payment of R1.2 billion bill. The province and the NHLS were locked in a row over how much the provincial health department owes. It is against this background that a judge was appointed to resolve the creditor-debtor dispute between KZN Health Department and NHLS. The Health Committee Chairpeson Monwabisi Bevan Gqwana indicated his unhappiness regarding the fact that the negotiations facilitated by the judge had not been completed (Mohamed, 2012, SAPA, 2012, Waters, 2012, Hweshe, 2012).

The Gauteng Health Department which was previously a problematic debtor, had agreed to pay their debt of about R500 million by June 2012. The promise to pay came after thirty regional laboratories of NHLS were forced to shut their doors over billions in unpaid bills owed by provincial departments. Laboratory services across Gauteng, most notably in Pretoria West, Germiston, Edenvale, Carletonville and parts of Johannesburg, have been shut down. Access to much-needed laboratory
services for scores of poorer communities have been cut off, while the jobs of several thousand of staff employed by the NHLS are in jeopardy. The training of staff has come to a complete halt in an effort to save costs as the NHLS awaits payment from KZN and Gauteng. The implications of the closure of regional laboratories are that the turnaround time of results is going to be affected. The laboratory services are no longer going to be available to people directly, people will have to bring their blood or tissue specimen directly to the labs, according to the spokesperson for NHLS, Kaamini Reddy (Hweshe, 2012, Kahn, 2012, Mohamed, 2012).

The Eastern Cape owed R118m, Limpopo R52m, the Free State R34m, North West R33m, the Western Cape owed R22m, and the Northern Cape and Mpumalanga owed R10m and R4m respectively. Various provinces are trying to cut costs by reducing the volume of tests ordered by doctors. Their consumption is brought in line with what they can afford and NHLS had stopped charging VAT to provinces in order to ensure affordability. Despite all these efforts, the debt owed by provinces continues to accumulate. The NHLS owed creditors about R450m, down from R750m at the end of last year (Kahn, 2012, Hweshe, 2012, Waters, 2012).

"If we can't get our money in time we can't pay our creditors in time. If we can't pay our creditors in time, we don't get our supplies on time. If we don't get our supplies on time, we don't deliver the services on time. And if we don't deliver services on time, the public sector pays with a lot of money on the shelves, or under stocking, which could result in stock outs and unsatisfied customers, as customers have to bring their blood or tissue specimen directly to the labs, according to the spokesperson for NHLS, Kaamini Reddy (Hweshe, 2012, Kahn, 2012, Waters, 2012).

NHLS is a public health laboratory service, with laboratories in all the nine provinces, employing six thousand seven hundred people. The NHLS provides diagnostic and pathology services for both communicable diseases such as HIV and TB as well as non-communicable diseases such as diabetes and cancer and is mostly used by health departments, the military and prisons. NHLS also have a reputation of analyzing tissue samples to identify cancer. Its activities comprise of diagnostic laboratory services, research, teaching and training, and production of sera for anti-venom. Reagents and media. NHLS is the largest diagnostic pathology service in South Africa with the responsibility of supporting the national and provincial health departments in the delivery of healthcare. The NHLS provides laboratory and related public health services to over 80% of the population through a national network of laboratories. Its specialized divisions include the National Institute for Communicable Diseases, National Institute for Occupational Health, National Cancer Registry and Anti-venom Unit (Khan, 2012, Hweshe, 2012, Waters, 2012, Mohamed, 2012).

Given the current state of affairs, is NHLS-KZN that is still using a manual inventory management system currently able to recover debts from KZN Department of Health? Are the bills that are disputed by provincial health departments correct? Is the reason for non-payment provided by KZN Health Department that services rendered by NHLS are expensive as compared to other service providers acceptable? Some provincial health departments are disputing the figures presented to them by NHLS and some provinces such as KZN prefer to pay a flat rate. KwaZulu-Natal health department spokesperson Chris Maxon said that the department was in the process of paying back its debt to the NHLS.

We are currently paying, as per interim agreement with NHLS, R43 million a month. The amount they are indicating is in dispute and the minister has appointed a judge to mediate on the amount in dispute,” said Maxon

Whatever the reasons for non-payment may be, it is unacceptable for government departments to demand free services from NHLS and thus refuse to pay. Even the ANC MP Morwesi Segaisi Dwisai rejected the reasons cited by KZN Health Department and emphasized that they "should pay what they owed the organization". Such views were equally supported by Democratic Alliance's Shadow Ministers of Health Patricia Kopane and Mike Waters (Hweshe, 2012, Kahn, 2012, Waters 2012, Mohamed, 2012).

Before the study was conducted the following explain inventory management systems at NHLS, KZN region.

“Currently, inventory is controlled at sub-inventory level. Once the order has been placed, suppliers deliver and anyone at the laboratory receives and signs delivery notes and invoices, as not all laboratories, especially the small ones, have inventory clerks. After the items have been checked for correct quantities and quality, meaning correct temperature and observable leaks, they are unpacked and receipted on the system. Bin cards or stock cards are updated. This updating exercise is supposed to be done immediately, but sometimes due to business or staff shortage, it gets postponed for later, which in most instances slipped for the rest of the cycle. This shortcoming results in laboratory managers doing physical stock taking every end of the month, as the information on bin cards could be inaccurate or unreliable, meaning a lot of time lost instead of just confirming only few or certain items. Also this shortcoming could lead to overstocking, meaning money on the shelves, or under stocking, which could result in stock outs and unsatisfied customers, as service could be disrupted” (Mkutshulwa, 2012: 3).

An inventory is a stock or store of goods. Firms or organizations stock hundreds or even thousands of items in inventory, ranging from small to large. Inventories are a necessary part of doing business, but too much inventory is not good, as it is costly to maintain. Organizations lack what needs to be done and how to plan, order, re-order and keep adequate quantities of stock in order to maximize profits. In a statement of financial position, inventory or trading stock is a current asset together with cash and cash equivalents and debtors. The management of one current asset has an impact on the other. As much as the current study was on inventory management, there are impacts on how NHLS dealt with cash payables, cash receivables together with cash and cash equivalents (Stevenson, 1999: 558).

Stevenson (1999: 595) mentioned that inventory control could be referred to as proper managing of stock according to demand and lead time. Inventory levels should be carefully planned in order to balance holding costs and reasonable levels of customer service. Successful inventory control requires a system to keep track of inventory transactions, accurate information about demand and lead times, realistic estimates of certain inventory related costs, a prioritization system for classifying the items in inventory and allocating control efforts.

RESEARCH METHODOLOGY AND RESEARCH SITES
2.1 Aim of the study
The aim of the study is to determine the accuracy of inventory control systems currently used at NHLS, KZN region, and when findings are done suggestions and recommendations will be forwarded to the management as to what could be done.

2.2 Research objectives
To establish the efficiency of the inventory control systems used at NHLS, KZN region, in providing information on the availability of stocked items.
To establish the ability of the inventory control systems used at NHLS, KZN region, in facilitating timely requisition processing.
To establish the benefits of periodic reconciliation of inventory balances with physical counts towards reducing costs.

Population, Sampling and Pilot Study
About 65 participants drawn from 16 laboratories, 8 hospitals and 8 clinics in three KZN districts, namely, Sisonke Municipality, Ugu District Municipality and Umgungundlovu participated in the study. The study was based on post positivist research paradigm and critical theory epistemology with both a survey (questionnaire) and qualitative document analysis and interviews conducted with key stakeholders. A pilot study was conducted at Kokstad and Umzimkulu laboratories and 10 participants were involved (Cresswell, 2003: 7).

Various public health centres participated in the study. Greytown, Appelsbosch, Montobelo, Greys, Edendale hospitals based at Umgungundlovu District, Scottburgh, King George, R.K Khan, Clarewood within eThekwini South, Ngwelezane, Umphumulo within the jurisdiction of eThekwini North and Kokstad, Rietvlei, Murchison, St. Andrews based at the South Coast region also participated. The research cohort used in the study involved doctors, professional nurses, phlebotomists, clerks, financial managers and laboratory managers. There are 1550 NHLS employees at KZN region that formed the population frame. Both probability and non-probability sampling strategies such as stratified, cluster and quota sampling were used to select 10 pilot study participants from Midlands business unit and other 65 study participants drawn in other two regions of KZN. A questionnaire consisting of 22 questions was distributed to laboratories, hospitals and clinics using emails and face to face distribution. Follow up interviews were conducted with various key informants to get background information as well as up to date information that is not easy to capture in a questionnaire. Various other qualitative sources such as newspaper articles, speeches of politicians and public health professionals were used (Cooper and Schindler, 2000:243).

The map of KZN in figure 1 orientates the reader to various health centres that participated in the study. About three business units of the NHLS KZN participated in the study. About 10 laboratories at the Midlands Business Unit were invited to participate in the pilot study of which at least 7 returned the completed questionnaires and accepted to be included.
interviewed. There was one participant per laboratory. The laboratories are Kokstad, Rietvlei, Greys, Edendale, Greytown, Appelbosch and Montobello. There were no changes effected in the research instrument as a result of the pilot study as questions were clear to all participants. The research instruments were valid and reliable. A fully fledged study was then rolled out to eThekwini South and eThekwini North laboratories. An informed consent form was distributed to participants and permission to conduct the study was provided by the KZN NHLS head office in Durban.

**Research Questions**

The following research questions guided the data collection process as well as data analysis:

What are the inventory management models that companies could introduce in order to ensure that there is optimum level of stock?

What inventory control systems, policies and procedures should be implemented by companies in order to ensure that there is continuous availability of inventory whenever it is needed?

What inventory control efficiency models, web-based information systems, electronic supply chain models and replenishment models assist laboratories in optimal stock management?

What are optimal inventory control systems, cost reduction inventory system, fixed population mean and maximization algorithm models are required by laboratories in order to monitor inventory levels and project re-order levels?

**Data Analysis**

The data is categorized according to thematic areas. The seven themes are inventory management, inventory control, benefits of inventory control, inventory policy, inventory control efficiency, computers and inventory and inventory control systems. The qualitative data is coded according to the above themes and analysed using NVIVO 9 software. There were 22 questions in the questionnaire used to collect quantitative data. A Statistical Package of Social Science (SPSS) is used in presentation and analysis of the quantitative data. The data is presented in bar charts as per question, discussed and analysed according to the seven thematic areas. The recommendations are also made based on the thematic areas (Laudon and Laudon, 2007:240).

**Key Theoretical Issues**

The theoretical issues that were considered in the study are based on inventory control systems used by most companies and were linked with what NHLS, KZN region is currently using. This section will cover thematic issues such as inventory management, inventory control, benefits and pitfalls of inventory management, inventory policy, inventory control efficiency, computers and inventory, inventory control systems, electronic data interchange and the value of shared information, build to order and build to stock models, electronic supply chain, automated replenishment programmes and vendor managed inventory, optimal inventory control, stochastic inventory systems and expected maximization algorithm and fixed population mean.

Inventory management entails reduction of laboratory supply expenses, use of desired quantity on hand, re-order point using min – max system (placing an order when supply levels reach their re – order point). The lack of management policy at NHLS results in holding a lot of stock as well as unavailability of life threatening inventories that are required to sustain the public health system (McHugh, 2006, Stevenson, 1999:561, Keller, 2009:505, Lee, 1996). The NHLS chief financial officer Dev Erriah described the inventory management at NHLS as follows:

"We live from hand to mouth. We prioritise payroll. Our creditors are being very tolerant, but we get daily threats of service breaks," he said.

According to Stevenson (1999:561) what is lacking at NHLS, is an effective inventory management process that have the following:

- A system to keep track of inventory on hand and on order,
- A reliable focus of demand,
- Knowledge of lead times and lead time variability,
- Reasonable estimates of inventory holding costs,
- Ordering costs and shortage costs, and
- A classification system of inventory items.

The inventory management system at NHLS lacks elements of build-to-order (quantify the value of product differentiation) and build-to-stock (inventory stored in finished goods form with same inventory and backorder costs) (Lee, 1996, Van der Laan and Salomon, 1997). Inventory control in the laboratory context is concerned with customer service and costs of ordering and carrying inventories. Like all public sector health institutions NHLS's customer service and cost minimization is compromised by the lack of modern day inventory management tools such as bar code scanners (Mentzer and Ponsford, 1991).

The key consideration is to balance availability of stock and equally reducing holding costs. Both are problematic at NHLS, due to manual counting, irregular stock taking and replenishment of stock. Inventory control assists with reduced cost, lower inventories, better obsolescence, better coordination, better budgeting tools, better and improved supply chain management. Due to manual purchasing processes that are in place in most laboratories within NHLS, KZN region, efficiently managing supplies might not reach a satisfactory level and competitive edge over the competition might not be reached also (Mkutshulwa, 2012:11).

Amongst measures that could be used is inventory turnover, which is a ratio that indicates a yearly frequency that inventory is sold and a higher ratio indicates good performance. Another useful measure is inventory days, which indicates expected number of days of sales that can be supplied from existing inventory, where a high number of days might imply excess inventory while a low number might imply a risk of running out of stock. At NHLS most inventory and services are rendered to public health institutions that pay after 46 days according to the recently agreed upon debtor collection period, but there are debtors that pay after 315 days which have a negative impact on availability of inventory and the ability to pay creditors (Kahn, 2012, Stevenson, 1999:561).

Cachon and Fisher (2000) stated that the supplier is the retailers’ only source of inventory and therefore stock outs at the supplier causes replenishment delays for the retailer. He also mentioned that if inventory is reviewed periodically and within each period the following sequence of events occurs:

Retailer’s order is placed,

- The supplier receives orders,
Inventory shipments are received and released, customer demand occurs, inventory holding and backorder costs are charged.

At NHLS, KZN region there is no uniform reorder point and no reorder policy, may be because of the manual systems mainly used. In many settings stock outs are encountered at the end of the very period in which they occur, through emergency orders and production runs (Federgruen and Heching, 1999). NHLS, KZN region do place emergency orders as well, due to stock outs that are linked to poor credit control, poor inventory management and control. The benefits of inventory control includes, among other things, reduced cost, lower inventories, better obsolescence, better coordination and working relationship between distribution and manufacturing and better tools for budgeting. Most of the above benefits are not enjoyed by NHLS due to manual stock control that is challenged by debtors such as the various health departments that are refusing to pay their debts because the amounts owed are being disputed and the minister of health even appointed a judge to facilitate negotiations between debtors and creditors, i.e. NHLS and various health departments (Lambert and Stock, 1993:480, SAPA, 2012).

Federgruen and Heching (1999) stated that developments in the area of yield and revenue management have demonstrated that major benefits can be derived by complementing a replenishment strategy with the dynamic adjustment of a commodity's price as a function of its prevailing inventory and the length of its remaining sales season. They continued to say that backup arrangements between retailers and their suppliers permit multiple deliveries during a season with the portion of adjustments by the retailer after the first couple of weeks of the sales season.

NHLS, KZN region do not encourage backup orders, as this could result in multiple payments, may be it is because of the manual processes that are mainly used currently. The pitfalls of inventory control that are prevalent are the challenges that are experienced by companies when trying to control inventory. The literature on dynamic pricing strategies assumes that one of the following situations prevails:

With the exception of an initial procurement at the beginning of the planning horizon, no subsequent replenishments can occur.

No inventories can be carried from one period to the next, effectively decomposing the supply decisions on a period by period basis (Federgruen and Heching, 1999). NHLS, KZN region encourages one order per month and that should be enough in that month and no carry over to the following month is allowed, to discourage overstocking.

Policies are rules or guidelines that express the limits within which action should occur and these rules often take the form of contingent decisions for resolving conflicts among specific objectives (Mintzberg, Quinn and Goshal, 1999). The inventory policy is to be considered because of the rate at which deviations are recovered in inventory, and this will have a profound effect on production fluctuations. Using an inventory policy, inventory discrepancies can be corrected each time production or distribution requirements are set so as to avoid excessive overshoots and undershoots around the target level (Disney, Naim and Towill, 2000). NHLS, KZN region could have an inventory policy that is monitored, to avoid inventory overstocking and under stocking that is currently experienced.

Inventory control efficiency is the measure of how well the resources expended are utilized and what is the ratio of resources utilized against the results derived, and effectiveness of the degree to which a goal is achieved. In inventory control, the performance measure, which is an analysis of both effectiveness and efficiency in accomplishing a given task, of percent orders filled at each facility will discourage efforts by managers to trans-ship orders to other locations for quick fulfillment (Mentzer and Ponsford, 1991).

At NHLS, KZN region performance is measured, and among other things, financials, including stock days, but cannot be totally accomplished because of manual processing, which could result in inaccurate information on both the efficiency and effectiveness of inventory control.

Laboratories around the world are exploring the use of vendor managed inventory system (VMI) and ABC classification of stock according to the Pureto principle. At NHLS CD4 count and viral load reagents are among others, items that fall under A and specimen jars items that fall under C. Smâros, Lehtonen, Appelqvist and Holmström (2003) stated that VMI is one of the most common types of automatic replenishment programmes, where the vendor is given access to its customer's inventory and demand information. Implementing VMI can enable substantial inventory reductions as well as an opportunity to shift from make-to-stock to make-to-order production, improve customer service and reduce obsolescence.

VMI presents an opportunity to increase inventory management and production efficiency, especially for C-products, without having to face the potential inefficiencies caused by increased ordering frequency. Benefits of VMI are likely to be greater when the product range is wide, meaning, when there are several C-products. To meet completeness requirement, optimization algorithms require accurate and complete data (Smâros, Lehtonen, Appelqvist and Holmström, 2003).

Web-based information systems play a crucial role in modern material management. Firms increasingly use electronic data interchange (EDI) to coordinate the flow of materials from manufacturing through to customers. EDI systems require computer links between a firm, its suppliers, its shippers and customers. These links are used to place orders with suppliers, to register items leaving a supplier, to track as items travel towards a manufacturing plant and to register their arrival. Links can also be used by suppliers to send invoices to purchasing firm, in this case provincial health departments. EDI systems enhance and speed up communication between suppliers, shippers and purchasing firm and also eliminate paper work. These web-based systems are rapidly transforming material management, allowing even small firms to achieve a much better balance between supply and demand, thereby reducing inventory in their systems and reaping associated economic benefits. Firms that are not adopting these systems may find themselves at a significant competitive disadvantage. With National Health Insurance that is being implemented by the National Department of Health, the use of electronic data interchange will be essential in order to track inventory that leaves NHLS laboratories to various
health centres, conduct effective and efficient stock taking, prevent continuous stock out and over stocking. This can be a good initiative to manage inventory, control debtors and ensure that accounts payables are done timeously (Hill, 2009:583-584).

The roll out of NHI requires periodic counting system, perpetual counting system and cycle counting of inventory (Muhlemann, Oakland and Lockyer, 1992:379, Kruger, de Wit and Ramdass, 2005 and Heizer and Render, 2008:488). NHLS, KZN region could benefit from the use of a tracking management system, as this could lessen the burden of purchase processing, doing physical counts and also reduce the risk of running out of supplies, as the region is currently experiencing all of the above.

Optimization of the performance of systems and error minimization models such as Automatic Pipeline Inventory and Order Based Production Control Systems (APIOBPCS), Genetic Algorithm (GA), simulations, economic order quantity, production order quantity model, quantity discount model, probabilistic model, safety stock model and fixed period model systems are some of the optimal inventory control measures that most laboratories are using (Heizer and Render, 2008, Disney et al, 2000, Cachon and Fisher, 2000 Lee, 1996, Småros, Lehtonen, Appelqvist and Holmström, 2003).

The simulation model was used to investigate the effectiveness of increased visibility of customer sell-through data on the performance of a manufacturer’s production and inventory control. The following were found:

Simulations demonstrated that by combining traditional order data with sell-through data available from VMI customers, the manufacturer could benefit even from a partial increase in visibility.

Benefits of VMI are likely to be greater when the product range is wide, i.e. when there are several C-products. Increased visibility is greater for short planning cycles, because of the positive effects it brings, such as increased opportunities to react, without sacrificing production efficiency (Småros, Lehtonen, Appelqvist and Holmström, 2003).

NHLS, KZN region could benefit on the part of inventory control, as this is not a manufacturing company, and benefits could be even more greater as C-products are more than A and B-products. Lack of demand visibility is a challenge for NHLS, KZN region as well, as overstocking and under stocking are experienced, resulting in product obsolescence and poor customer service respectively (Mkutshulwa, 2012:32).

Within NHLS, KZN region an order is placed before the level reaches zero so as to continue working whilst waiting for the process to take its course, and also because the Q units ordered could be less or not available from the supplier immediately. Physical counts although not done after an item is withdrawn but are done every month and discount models not appropriate. Since demand is not always known, extra units are ordered to reduce stock outs to meet a prescribed customer service level, meaning that NHLS, KZN region is closer in using probabilistic model and safety stock more than the rest of the other models (Mkutshulwa, 2012:35).

The other inventory optimization models that laboratories are using are Stochastic Inventory System, Expected Maximization Algorithm and Fixed Population Mean. Stochastic Inventory System is a cost reducing inventory process that includes the option of product disposal suing either a push or pull disposal strategy. This remanufacturing and redesign is relevant to safe disposal and recycling of medical waste that is an environmental concern for most health institutions (Van Der Laan and Salomon, 1997:264-278).

Expected Maximization Algorithm is used to estimate the return flow parameters and only produces, appoint estimate and not a destiny. Fixed Population Mean (FPM) method helps to estimate the performance of a closed queuing network with the number of jobs, by analyzing its open network counterpart to calculate the expected steady-state cost. This is applied by letting departures from the customer or laboratory node exit the system and creating Poisson arrivals to the production node (Toktay et al., 2000).

Every company, including NHLS, KZN region has goals to achieve and controlling inventory is one of them. If then EM algorithm only produces a point estimate and not a destiny, it is not for NHLS, KZN region. NHLS, KZN region is experiencing delays from suppliers, sometimes because of overseas vendors and therefore local suppliers would work to decrease lead times. The use of information-intense monitoring of product would be a good idea and also the system should incorporate fixed ordering costs, as this would help in achieving budgeting purposes (Mkutshulwa, 2012:38).

Results, Discussion and Interpretation of Findings
Inventory Management
At least 79% of the respondents stated that they agree that inventory management is concerned with the level of customer service so as to have right goods, sufficient quantities, in the right place and at the right time. At least 17% were neutral and at least 4% disagreed. At least 88% of the respondents stated that they agree that the clinical laboratory has limited control in terms of supply and demand, as test ordering is driven by patient volume and individual physician determination of the type and frequency of laboratory tests, 8% was neutral and 4% disagreed. At least 83% of the respondents stated that they agree that to ensure an optimum level of supplies that meet test demands, laboratory managers must focus on inventory management, which includes among other things, the reduction of supply expenses, 17% was neutral and no one disagreed. At least 98% of the respondents stated that they agree that to efficiently manage supplies, it is critical to determine the optimum quantity on-hand as well as most effective reorder times, 2% was neutral and no one disagreed. At least 52% of the respondents stated that they agree that companies are reducing their inventory costs by treating inventory items differently, positioning them according to risk and opportunity and thereby giving them more flexibility should anything go wrong, 48% was neutral and no one disagreed. At least 58% of the respondents stated that they agree that inventory theories and models can make a contribution in quantifying benefits of inventory management, 38% was neutral and 4% disagreed.

The overall 77% of the respondents agreed that managing inventory is crucial, 22% was neutral meaning that they were not sure about the importance of customer service, overstocking and under stocking and 5% disagreed, meaning that there is lack of information on inventory management. At least the 77% agreement among respondents implies that they have knowledge of what
needs to be done. Inventory clerks in the few laboratories where they are employed do periodic manual stock taking, but this is not helping much as under stocking and over stocking is still experienced. Management could communicate with both procurement and finance section supervisors in educating staff on inventory management, as there is lack of information.

Stevenson (1999:561), McHugh (2006), Lee (1996) and Chen and Simchi-Levi (2004) agree that inventory management is critical so as to lower holding costs, avoid stock outs and satisfy customers. In the study, at least 79% of the respondents indicated that inventory management is concerned with the level of customer service, to have right goods in sufficient quantities, in the right place and at the right time. NHLS, KZN region, fully supports customer satisfaction but lowering holding costs and avoiding stock outs depends on effective inventory management, which is almost impossible with manual inventory control systems.

**INVENTORY CONTROL**

At least 79% of the respondents stated that they agree that managers have to measure their performance so as to judge the effectiveness of inventory control, 15% was neutral and 6% disagreed. At least 62% of the respondents stated that they agree that the supplier is the retailer’s only source of inventory and therefore stock outs at the supplier causes replenishment delays for the retailer, 35% was neutral and 3% disagreed.

At least 52% of the respondents stated that they agree that reorder policies are simple to implement and intuitively reasonable, 44% was neutral and 4% disagreed.

The overall 64% of the respondents agreed that inventory has to be controlled effectively, 31% was neutral as there is no re-order policy in place, and 4% disagreed as they don’t know the effectiveness of inventory control. Inventory is not effectively controlled at NHLS, KZN region, judging from the 31% neutral respondents. The 64% agreement implies that they agree with the statement of controlling inventory effectively and how to, they don’t know.

Stevenson (1999:561), Cachon and Fisher (2000) and Federgruen and Heching(1999) agree that to avoid stock outs and achieve satisfactory levels of customer service, inventory must be viewed periodically. In the study, at least 79% of the respondents indicated that they agree that managers have to measure their performance so as to judge the effectiveness of inventory control. NHLS, KZN region, do experience stock outs now and again.

**Benefits of Inventory Control**

At least 90% of the respondents stated that they agree that benefits of inventory control includes, among other things, reduced costs, lower inventories, better obsolescence, better coordination and working relationship between distribution and manufacturing and better tools for budgeting, 10% was neutral and no one disagreed. At least 87% of the respondents stated that they agree that employees find a direction, as stock items won’t just get finished unnoticed and customers get satisfied, as they will get quality and continuous service, 13% was neutral and no one disagreed.

The average 81% of respondents agreed that benefits include, among other things, reduction of carrying costs, continuous service and offering better tools for budgeting, 19% was neutral as they were not sure of the benefits and 2% disagreed as they know nothing about benefits of inventory control. The 81% agreement of the respondents implies that they know of the benefits that NHLS, KZN region could have, should inventory be controlled effectively. The trend for a continuous service is above average but sometimes breakdowns are experienced due to under stocking and discrepancies caused by manual inventory control systems. There is a tool for budgeting at NHLS, KZN region, income statements are used where direct materials are looked at.

Both Lambert and Stock (1993:480) and Federgruen and Heching (1999) agree that among the benefits of inventory control is helping with budgeting, revenue management and continuous service. In the study at least 90% of the respondents indicated that they agree that benefits of inventory control includes, among other thing, reduced costs, lower inventories, better obsolescence, better coordination and working relationship between distribution and manufacturing and better tools for budgeting. NHLS, KZN region could benefit in linking budgeting and inventory control in both statements of financial position and statements of comprehensive income statements compiled according to Public Finance Management Act of 1999.

**Inventory Policy**

At least 65% of the respondents stated that they agree that the inventory policy is to be considered because of the rate at which deviations are recovered in inventory, 33% was neutral and 2% disagreed. At least 87% of the respondents stated that they agree that inventory discrepancies have to be corrected each time production or distribution requirements are set, so as to avoid excessive overshoots and undershoots around the target level, 13% was neutral and no one disagreed.

The average number of 77% of respondents agreed that there are deviations and or discrepancies that need to be attended to, to avoid over and under stocking, 19% was neutral as they know nothing about inventory control policy and 2% disagreed as they don’t know the importance of inventory policy. There is no inventory policy in place at NHLS, KZN region, at the time of the study. Deficiencies that are experienced are due to under stocking and discrepancies to manual inventory control systems used.

Disney et al (2000) mentioned that inventory discrepancies have to be corrected so as to avoid excessive overshoots and undershoots. In the study at least 87% of the respondents indicated that they agree that inventory discrepancies have to be corrected each time production or distribution requirements are set, so as to avoid excessive overshoots and undershoot around the target level. Discrepancies result from incorrect documentation, when information on stock cards is different from the actual stock-on-hand, which is only corrected when physical counting is done.

**Inventory Control Efficiency**

At least 42% of the respondents stated that they agree that ABC analysis divides on-hand inventory into three classifications on the basis of annual dollar volume, 56% was neutral and 2% disagreed. At least 44% of the respondents stated that they agree that VMI(Vendor-managed inventory) is one of the most common types of automatic replenishment programs, where the vendor is given access to its customer’s inventory and demand information, 50% was neutral and 6% disagreed. At least 46% of the respondents stated that they agree that VMI presents an opportunity to increase inventory management
and production efficiency, especially for C-products, without having to face the potential inefficiencies caused by increased ordering frequency, 52% was neutral and 2% disagreed.

The average 44% of the respondents agreed that inventory has to be classified according to the Rand value and also that inventory has to be vendor-managed, 53% was neutral as they were not sure as to how inventory is classified and vendor-managed and 4% disagreed as they don't know about the importance of inventory control efficiency. Inventory is classified according to Rand value, meaning, more expensive, A-items have to be more efficiently managed than less expensive, C-items. Vendor managed inventory (VMI) could help vendor know how much inventory each laboratory is carrying and can then deliver according to needs. Both inventory classification and VMI do not exist at NHLS, KZN region.

Småros et al (2003) and Heizer and Render (2008:485) agree that vendor-managed inventory (VMI) help with the classification of inventory, accessing customer inventory and demand information in order to manage inventory and production efficiently. In the study at least 46% indicated that VMI presents an opportunity to increase inventory management and production efficiency, especially for C-products, without having to face the potential inefficiencies caused by increased ordering frequency. VMI and inventory classification is not used at NHLS, KZN region but direct materials on income frequency. VMI and inventory classification is not used at NHLS, KZN region.

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CONCLUSIONS AND RECOMMENDATIONS

If NHLS, KZN region had inventory policies on inventory management, inventory control, benefits of inventory control, inventory control efficiency, computers and inventory and inventory control systems, the researcher would not be looking at high percentages of neutral respondents.

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The 85% agreement implies that respondents support the statement as they know that information and documentation on inventory will never be accurate in a manual system, due to staff shortages and ignorance.

CONCLUSIONS AND RECOMMENDATIONS

Based on the data collected, the researcher would conclude that inventory control systems that can effectively manage and control inventory are needed at NHLS, KZN region, so as to help with budgeting, revenue management, proper allocation of inventory items, balancing supplies and demand and increase the level of customer satisfaction. If budgeting is not done properly due to inaccurate information, it could be impossible to do the following: Manage revenue, accounts receivables and accounts payables,
Allocate inventory items properly according to the ABC approach,
Balance supplies and demand,
Increase the level of customer satisfaction,
This means that to effectively control inventory, all of the above must be available as one impact on another.

It is further noted that the manual usage of inventory control systems is causing under stocking and overstocking. In order to avoid this, the use of manual inventory control systems has to be reviewed so as to be competitive with other companies especially private providers of laboratory services. NHLS KZN region needs to develop a reorder policy as part of the inventory policy as a matter of urgency. The implementation of debt collection policies supported by modern devices in invoicing is essential. There is a need to classify inventory according to how expensive items are and exploring the use of VMI where the vendor visits customers to assess levels of inventory. The VMI approach can work well in public hospitals where medical doctors request test that can be conducted at laboratories managed jointly by the public health staff and the laboratory staff. A web based system can be explored to link NHLS with hospitals. Computer systems that are currently used in public hospitals such Inkosi Albert Luthuli Central Hospitals where referral from other hospitals are sent for further tests can be extended to other health centres. MEDICOM system that is used at IALCH can be extended to all laboratories based in hospitals as part of the roll out of the NH. The orders and inventory can be tracked using MEDICOM and other web based systems to avoid disputes between NHLS and provincial departments of health regarding the amount of inventory and the value they are owing to suppliers. The intervention by the national minister of health to invite the judge to facilitate debt control negotiation will be unnecessary in future since computer printouts are going to be provided indicating the date, time and destinations where inventory was delivered and tests conducted. This could alleviate disputes emanating from services being rendered together with the levies charged.

As it will be costly to employ inventory clerks to all the laboratories, the organization could benefit from web based information systems, e.g. Electronic Data Interchange (EDI), as they are used to do the following:
Place orders with suppliers,
Register items as they leave the supplier,
Track items and register their arrival,
Invoicing,
Speed up communication between supplier, shipper and purchasing firm,
Eliminate paper work,
Rapidly transform material management,
Place a firm or organization at a significant competitive advantage.

FURTHER RESEARCH
Further research is encouraged both from the procurement and finance sections so as to highlight some of the topics that could help the organization improve the supply chain management. It is also imperative to conduct a study on debt collection, management of cash equivalents, credit control and credit collection schedules.

REFERENCES

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REFERENCES

31. Management Science, Vol46, No.11, pp.1412-1426
33. European Journal of Operational Research, Vol.102, pp.264-278

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