OBAFEMI AWOLOWO UNIVERSITY

A STUDY OF THE APPLICATION OF TECHNOLOGY TO INVENTORY MANAGEMENT IN COMMUNITY PHARMACIES IN LAGOS, NIGERIA

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CERTIFICATION

This is to certify that this research work titled: 'A Study of application of Technology to Inventory Management in Community Pharmacies in Lagos, Nigeria' was conducted by Matthew Adesoji ADEGBITE for the award of degree of Doctor of Philosophy (Technology Management) in the African Institute for Science Policy and Innovation, Faculty of Technology, Obafemi Awolowo University, Ile-Ife, Nigeria.

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DEDICATION

This research work is dedicated to the glory of Almighty God, who made the way for the research work and who saw me through; to my late mother, Mrs. Abigail Aina Adegbite, who through hardship and endurance, ensured that I become educated in life; and to my wife, Titilayo for her unwavering support and encouragement.

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ABSTRACT

The study investigated the types of technologies applied to inventory management in community pharmacies in Lagos, Nigeria. It also examined the factors influencing the use of technologies and assessed their impact on business performance and inventory management. This was with a view to recommending strategies for enhancing technology application to inventory management in the industry.

The study covered registered community pharmacies in Lagos, Nigeria and data were collected using questionnaire, observation, interview, case study and focus group discussion approaches. Two sets of questionnaire were used. The first set was administered on 150 selected pharmacists to garner information on the profiles of the pharmacies: the type of technologies used for inventory management, factors influencing the uses and their effects on business performance. The second set was administered on 750 selected patrons of the selected community pharmacies. The questionnaire elicited information on their perceptions on the quality of services rendered by the pharmacies. Furthermore, two community pharmacies using manual inventory management were selected as case studies. Inventory management procedures of the two pharmacies were compared before and after installation of Electroclerk, inventory management software. Focus group discussion, consisting of eight pharmacists, was conducted. Secondary data were collected from publications, journals and records of relevant stakeholders. Descriptive and inferential statistics were employed for data analysis.

Results showed that browsing (67.8%), website (71.9%), e-mail (75.8%), telephone (87.5%), and chatting (76.8%) were adopted by the respondents. In the case of mobile phone technologies, telephone (94.0%), e-mail (87.3%), SMS (86.4%), Internet (71.4%), telephone conferencing (17.2%), and bluetooth 16.7%) were adopted. Other technologies adopted included electronic payment (42.0%),

computer system (53.3%), Closed Circuit Television (CCTV) (18.6%) and barcode (9.3%). There was a significant difference in the areas of application ($F = 12.04$, $p \leq 0.05$) of the technologies. The uses of the technologies were high in accounting integration (3.40), printing invoices (3.75), grouping of products (3.63), and generation of reports (3.69) and fairly high in purchase order generation (3.38), automatic reordering (3.23), and expiration date tracking (3.05). Barcode scanning was rarely used. Based on a 5-point Likert scale, the technologies had high impact on inventory management in the areas of tracking of medicine (3.60) and record keeping of inventories (3.54). They had impact in business performance in the area of customer waiting time (3.46), patronage (3.45), availability of more time for pharmacist (3.42), and customer satisfaction (3.31). Also, case study revealed an increase in sales, purchases, stock level, order frequency, and patronage; and a decrease in time taken to generate purchase order and carry out stocktaking, pilfering, medicine expiration, stock-out, and customer waiting time. It further showed that determination of ordered quantity and inventory monitoring became faster. Furthermore, acquisition cost ($F = 10.957$, $p = 0.000$), sustainability cost ($F = 12.805$, $p = 0.000$), fear of technology application ($F = 5.551$, $p = 0.003$), fear of loss of social interaction ($F = 6.458$, $p = 0.002$), limited knowledge of pharmacist in technology application ($F = 4.932$, $p = 0.042$), and size of pharmacy ($F = 3.242$, $p = 0.000$) were significant factors ($p \leq 0.05$) influencing the use of the technology.

The study concluded that technology application to inventory management in community pharmacies enhanced business performance and inventory management.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Application of technology in every facet of life is turning the world into a global village and affecting all phases of human endeavour, be it leisure, business, or education (John de Gier, 2000). The global economy is undergoing a series of sweeping changes, driven by rapid technological progress particularly in the industrialised countries. These changes are fundamentally altering the methods and organisation of the production of goods and services, and the skills, information, infrastructure as well as institutions needed to operate an economy efficiently. So broad and far-reaching are these technological developments that researchers see the emergence of a new industrial revolution within the developed and newly industrialised countries (UNCTAD, 1994). Success in an increasingly competitive marketplace of the modern enterprises depends critically on the quality of data, information, and knowledge with which enterprises apply to their business processes in the diverse scope of activities.

The aim of any profession is to see that optimal services are provided to those who need them. It follows that the fundamental goal of pharmacists is to make medicines and pharmaceutical services available to all who need them. The elements of good pharmaceutical services include accessibility, quality, continuity, and efficiency (Sosabowski *et al.*, 1998). In addition, Ilori (2002) also argued that one of the distinctive features of the success of the developed countries has been the development and application of technology. Much of their wealth and power have derived, directly or indirectly, from their ability to bring science from the laboratory to useful application through technology and innovation. This shows that technology and innovation are the key tools for their high rate of industrial development.

Inventory is the amount of stock or merchandise that is available for sale to present and future clientele (NCPA, 2008). Inventory can also be defined as any resource held to meet internal or external customer demand and it is one of the more visible and tangible aspects of doing business. Raw materials, goods in process and finished goods all represent various forms of inventory. Inventory remains one of the most important assets that most businesses possess, because the turnover of inventory represents one of the primary sources of revenue generation and subsequent earnings for the company (Investopedia, 2010). Inventory exists because there is a difference in the timing or rate of supply and demand. If the supply of any item occurred exactly when it was demanded the item would never be stored, but that seems impossible especially for pharmaceutical businesses that keep so many medicines as inventory. All businesses keep inventory, however, the inventory held by organisations vary (Slack *et al.*, 1998). Inventory is typically a pharmacy's largest asset and in a community pharmacy, medicines and other health related items are kept as inventory. Proper inventory management has a strong and direct effect on a pharmacy's return on investment, therefore it is important for a community pharmacy to have proper inventory to serve its customers (Carroll, 2006).

Inventory management is a discipline that encompasses the principles, concepts and techniques for determining what to order, when to order and how much to order. The right amount of inventory involves the balance between what is required to service your customers and what is financially practical. Inventory system for pharmaceutical businesses has the capacity to track inventory, forecast needs, and generate reorders to maintain adequate inventory (Zipkin, 2000).

Traditional or convectional inventory management practices in community pharmacy involve the use of a bin card for each medicine item. Purchases are entered on to the bin card and sales are deducted to give a balance of such medicine item on a daily basis. Traditional inventory management practices are being made obsolete by increasing global supply chains, contract manufacturing, dynamic

life cycles and multi-channel distribution. Inventory management processes and technologies are actively re-evaluated by companies because of serious consequences of traditional inventory management, which includes but not limited to: lack of inventory control, excess inventory levels, frequent stock-outs and costly deliveries, workflow interruptions and expensive rework, and increased health system labour requirements. A minimum buffer level of stock, called safety stock is usually maintained to curtail the incidence of stock-out, which include loss of customers, sale and profit, and goodwill. However, some customers whose order cannot be filled are ready to wait (i.e. backorder).

Efficient inventory management is essential to community pharmacies. The development of inventory management is a dynamic activity, which involves new approaches, techniques as well as emerging challenges. It is imperative that these challenges are met, because competition in the industry is based on continuous improvement in customer services and reduction in inventory costs.

An efficient inventory management framework not only seeks to optimise the available resources in order to enhance productivity levels, but also a key to improving customer service, cash flow, and profitability margin. Efficient inventory management, which may sound simple, is in fact more complex than most managers perceive, because it requires tacit knowledge and technical know-how. In addition, it is based on a complex framework that requires unique tools and techniques if success must be achieved. Thus, effective inventory management consists of optimising two goals: minimising total inventory investment and carrying the right mix of products to satisfy patient demand (Carroll, 2006). The company should be in a position to meet customers' demand in terms of quantity and quality (Mpwanya, 2005).

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