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The Adoption and Deployment of Technology in Inventory Management Systems of Public Institutions: A Case Study of Electoral Commission of Ghana (EC)

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Abstract:
Adoption and deployment of technology is universally regarded as essential in enhancing the competitiveness of the economy of a country (Oliveira & Martins, 2011). Today, improving government service delivery has become a vital agenda for most governments. In view of this quality service delivery has become a measure for public sector management (Kaliannan, Awang & Raman, 2007) which has placed a demand on public institutions to adopt Information Technology (IT) in their operations, including effective management of inventory. According to Silver, Pyke & Peterson (1998), effective inventory management seeks to control costs through inventory in total value of the goods and the tax burden in cumulative inventory value. This study examined the adoption and deployment of technology in inventory management systems using Electoral Commission of Ghana as a specific case. A descriptive survey was used for the study. Purposive and convenience sampling procedure was adopted. The study sample was 200 employees from the Electoral Commission of Ghana. Questionnaire was the main instrument used for data collection. Microsoft Office Excel 2007 and the Statistical Product and Service Solution (SPSS) version 21 were used to analyze the data. The findings of the study indicate that IT investment leads to better inventory performance at the Electoral Commission of Ghana. It was recommended that the Electoral Commission of Ghana should ensure proper and efficient integration of information technology in inventory management systems which would further enhance transparency, credibility and integrity of Ghana's democracy.

1. Introduction

These days, information technology (IT) is universally regarded as an essential tool in enhancing the competitiveness of the economy of a country. IT has significant effects on the productivity of firms (Oliveira & Martins, 2011).Today CEOs worldwide recognize the strategic role IT plays in their company's ability to survive and compete with competitors (Al-Mudimigh, 2007). Many researchers have stated the importance of IT in various establishments across the globe. According to Schwartz (2007), IT has brought increase in hotel businesses while Frempong (2007) also concluded that the banking sector has been transformed by the use of IT. Further, to address the concerns of double registration and fraud, the Electoral Commission (EC) of Ghana decided to adopt biometric technology for the 2012 general elections and subsequent elections. Effective adoption and deployment of IT has become very critical for the success of all organisations. Central to the functioning of a competitive organisation is the effective management of inventory. Effective inventory management has become an important operational weapon for products and service firms wishing to survive the competitive pressures (John, Etim, & Ime, 2015). Public service institutions such as the electoral commission of Ghana is not an exception. Just as private-sector organizations have responded to competitive pressures and financial constraints by viewing inventory as a potential source of cost reduction and as a measure of efficiency, public-sector organizations, including electoral commission of Ghana, are also focusing on improving the management of their inventories (Transit Cooperative Research Program, 2000).

Inventory management (IM) is the process of storing goods that contains raw materials, spare parts, products and other material inputs in continuous production process in a safe and cost-effective way till the time of its usage"(Frankel, 2006). The common mechanisms of an IM system contain a system to keep track of inventory, a dependable forecast of demand, knowledge of lead times, a classification system and reasonable estimates of holding costs, ordering costs and shortage costs (Stevenson & Hojati, 2007).

A key objective of technology in moving to inventory control is to consolidate and leverage organizational spending power and to rationalize supplier relationships. This is achieved by centralizing the procurement information and control, while giving the flexibility to end-users to find the product and supplier that best match their needs. (KPMG, 2001 in Mongare, and Nasidai, 2014). Mongare, and

Nasidai (2014), suggest that the decision to use IT within the inventory control could encourage the commitment of establishing relational behaviour.

In spite of the benefits associated with IT adoption in IM, there exist some challenges to its adoption in the organisation. Thatcher and Foster (2002) classify such factors affecting IT adoption into two main categories: Inter Organizational (size, management and readiness) and Extra-Organizational (industrial, governmental and cultural). Price of technology, availability of networks, firm characteristics (size, age, ownership) and learning are quoted by Crespi et al (2004) as factors affecting IT application. In addition, Manueli et al., (2007) have identified Customer Supplier/dependency, Organizational readiness, structural sophistication of the firm, assertiveness, perceived benefits, perceived control lack of time, computer literacy, Subjective norm, mistrust of IT industry, external pressure to adopt, size, sector, status, the manager's age and experience and information intensity as factors affecting any IT adoption decisions. The firms whose managers and employees have IT literacy, skill and expertise as well as access to internal and external support from IT experts, will have more tendency to adopt IT (Windrum & de Berranger, 2002). The firm and its social structures, nature of social links and contract may also influence IT adoption in several different ways (Beckinsale & Ram, 2006; Clayton, et al.2003). According to OECD (2004) factors that possibly impact on IT adoption by firms are competition and rivalry, relationships with business partners, Innovation, Internal capacity, Intra and inter-firm collaboration. Ayeni and Adewunmi (2004) says that IT acquisition raises a number of political questions. The first relates to the dependence of the receiving nations on the supplying nation and this technological dependence could become a political one. So, it is the responsibility of a government institution to select carefully the country from where technology acquisition is made so that no political problems could arise in future. The second question relates to the possible transfer of political power from political elites to the technical specialists.

1.1. Problem Statement
In the Electoral Commission (EC) of Ghana for several years, inventory control has been seen as a function that cost the commission material and waste. While the introduction of e-inventory management systems in the EC of Ghana would greatly increase the accuracy and efficiency of the organisation's operations, the critical question pose is that, what will be the prospect and challenges of adopting technology in the inventory management system at the EC of Ghana? 'The Role and Challenges of IT in IM in an organization" has been done by Racha and Shin (2006). The results of their study revealed that epidemiological data on the effect of IT on IM and challenges encountered by the organizations especially organizations owned and supported by government that venture into the introduction of IT to control and keep stock are scarce and somewhat unreliable and very few information can be found on this topic area. Therefore, this research study would seek to examine IT adoption in IM systems at the EC of Ghana.

1.2. Objectives of the Study
The main objective of the study is to examine the adoption and deployment of IT in inventory management in EC of Ghana. The specific objectives of the study are;
1. To identify the benefits of IT adoption and deployment in IM at EC
2. To explore the barriers to the adoption of IT system in IM at the EC
3. To recommend strategies to the efficient adoption of IT in IM

1.3. Research Questions
1. What benefits do the EC derive from the deployment of IT in IM?
2. What are the barriers to the adoption of new efficient IT in IM at EC?
3. What strategies can be recommended to ensure efficient adoption of IT in IM?

1.4. Research Methodology
This study focused on a descriptive survey of the warehousing employees of the EC of Ghana. The study employed a mixed research approach.

1.5. Population, Sample and Sampling techniques
The study focused on EC's two main stores namely; the warehouse at Sapeiman and the Head Office store with regards to IM. The number of staff delivering this sub-programme is 648 for Programme Based Budgeted Estimates (2014). Using the sample size calculator, the researcher applied 95% confidence interval with an Error of Margin of about ±5% which determined a sample size of 248. For the uniqueness of this study, the purposive sampling technique was used to sample data for the study. The criteria for the selected respondents included been a permanent staff at the head office and a computer literate.

1.6. Research Instrumentation
A well-planned questionnaire was designed based on the research objectives. The questionnaire consisted of three sections; A, B and C. Section A consists of items inferring the demographic data of respondent. Section B consisted of a 5-item. Section C on the other hand looks at the other research questions consists of 8-item (IT) which could impact on the inventory management systems in the EC of Ghana.

1.7. Data Analysis
Data was analysed quantitatively using descriptive statistics. The analysis revealed a response rate of 80%.

2. Findings

2.1. Profile of Respondents

2.1.1. Gender
The sex of the respondents was one hundred and forty (140) for male and sixty (60) female representing seventy percent (70%) and thirty percent (30%) respectively.

2.1.2. Educational level of Respondents
The study revealed that respondents are well educated, twenty-four (24) representing twelve percent (12%) were respondents with professional certificate. The modal class was degree, registered eighty-six (86) respondents representing forty three percent (43%). The rest were holders of Master's degree and Diploma/HND in the frequencies of eleven and thirty-six and fifty-four respectively, constitute eighteen (18%) and twenty-seven (27%) in that order. From the findings, it was observed that high number of degree holders were among respondents indicating that the EC has more qualified staff to handle their duties effectively. Considering the level of education of the respondents of the Commission, it was seen that sixteen (16) at least have diploma/HND certificates while eleven (11) were master's holders.

2.1.3. Rank of Respondents
It was identified that twenty-six (26) respondents representing (13.33%) were at top management; sixty (60) representing (30%) were middle level management while one hundred and fourteen (114) representing (56.67%) were lower level management of the Commission. This indicates that the EC has lower level management than both top and middle level management at its Head Office.

3. Analysis of Research Questions

3.1. The Benefits of IT in IM

3.1.1. IT Helps the Effectiveness of IM in EC of Ghana as It Ensures Proper IM.
The study revealed that IT ensures proper IM in EC of Ghana. The research indicated that one hundred and twenty-five (125) respondents agree to the statement, sixteen (46) disagree to the statement and the remaining nineteen (29) confirmed the statement in a negative response.

3.1.2. IT Improves the Quality, Flexibility and Reliability of Inventory Supply in EC of Ghana
The findings show that majority of the respondents of ninety-six (96) representing (48%) disaffirm the statement that IT improves the quality, flexibility and reliability of inventory supply in electoral commission of Ghana. Forty-four (44) representing twenty-two per cent (22%) of the of the entire responses with the view that IT improves the quality, flexibility and reliability of inventory supply in EC of Ghana while sixty (60) representing thirty per cent (30%) of the responses were uncertain with the statement. It was clear from the study that IT does not improve the quality, flexibility and reliability of inventory supply in EC of Ghana.

3.1.3. Assist the Commission to Collect and Analyse Information
The respondents indicated that IT helps the EC to collect and analyse information. From the results, it was ascertained that ninety-seven (97) of the respondents representing (48.33%) agreed to the statement, forty-three (43) representing (21.67%) strongly agree, forty-seven (47) respondents were uncertain to the statement while thirteen (13) representing (6.67%) each were with strongly disagree and disagree to the statement IT helps the EC to collect and analyse information. The study findings settle with Chopra and Meindl (2001). The use of IT to assist with inventory control decisions can be considered another best practice in material management. IT systems play an important role in the supply chain because it helps companies collect and analyse information (Chopra & Meindl, 2001).

3.1.4. IT Reduce User Intervention and Time Spent in Order Processing within the EC
it was observed that ten (10) respondents representing (5%), twenty (20) representing (10%), forty (40) representing (20%), seventy-three (73) representing (36.67%), and fifty-seven (57) respondents representing (28.33%), strongly disagreed, disagreed, uncertain, agreed and strongly agree to the statement that IT reduce user intervention and time spent in order processing within the EC *r*espectively. This confirms Kim (2005) assertion that IT can greatly reduce user interventions and time spent in order processing.

3.1.5. IT Investment Leads to Better Inventory Performance at the EC of Ghana
 The findings showed that thirty-seven (37) responses representing (18.33%), strongly agreed to the statement, seventeen (17) each of the respondents representing (8.33%), were in favour of strongly disagree and disagree, forty-three (43) representing (21.67%), were uncertain with the statement while eighty-seven (87) respondents representing (43.33%), agreed to the statement. This implies that IT investment leads to better inventory performance at the EC. The findings confirm Economic Report (2000) that IT investment leads to better inventory performance.

3.1.6. IT Helps the EC to Improve Supply Chain Transactions

The outcome of the study revealed a total of one hundred and twenty-three (123) of the respondents representing (62%) agreed to the statement, forty (40) respondents representing (20%) strongly agreed to the statement while thirty-seven (37) representing (18%), were uncertain with the statement. Evidence show that IT helps the EC to improves supply chain and that confirms the literatures. According Vickery et al. (2003), an increase in IT investment results in higher inventory turns and lower inventory holding costs. Similarly, a number of case studies and anecdotal evidence support that IT allows business to improves supply chains transactions (Barua et al. 1995).

3.2. Challenges to the Adoption and Deployment of IT in IM

3.2.1. Management Readiness Affects EC's Adoption of IT in IM

The study shows that 47% forming majority of the responses agree to the statement, 15% of the respondents disagreed, 18% also were uncertain to the statement, 17% strongly agreed while 3% strongly disagreed to the statement. The study revealed that management readiness affects EC's adoption of IT in IM. It is undeniable that, it is not everyone who will welcome the idea of adoption of IT in the IM in most organisation, especially in the developing nations where many are not happy using computers.

3.2.2. Staff Literacy Level Affects Adoption of IT at the EC of Ghana

In confirmation to this statement, agree recorded one hundred and forty (140) representing seventy percent (70%) of the responses agreed to the statement that the staff literacy level affects adoption of IT at the EC. The rest who strongly agreed scored thirty-eight (38) representing (19%), fourteen (14) respondents representing (7%) disagreed with the statement, six (6) responses representing (3%) strongly disagreed to the statement, while two (2) respondent representing (1%) being the least of the responses was for uncertain that staff literacy level affects adoption of IT. According to Tetteh and Burn (2001), level of IT skills greatly has influence on its adoption in an organisation. The firms whose managers and employees have IT literacy, skill and expertise as well as access to internal and external support from IT experts, will have more tendency to adopt IT (Windrum & de Berranger, 2002). This implies that, the staff literacy level affects adoption of IT and confirms the assertion by Windrum and de Berranger, (2002).

3.2.3. Complex Nature of IT Affects IT Adoption at the EC of Ghana

The research indicated that out of the eighty (80) respondents representing (40%) agreed with the statement, twenty-six (26) representing (13%) strongly agreed, thirty-six (36) representing (18%) were uncertain while thirty-four (34) representing (17%) disagree with the statement and the remaining twenty-four (24) respondents representing (12%) confirmed that complexity nature of IT does not affects IT adoption. It was established that complexity nature of IT affects IT adoption at the EC of Ghana.

According to Kamalabadi et al (2008) the process of IT adoption is affected by technological factors such as complexity, compatibility and relative advantage. According to Bandiera and Rasul, (2002), firms may be reluctant to adopt IT due to their unfamiliarity with technology. The findings confirm these assertions.

3.2.4. IT Adoption is Expensive Initial Investment at the EC

The research findings showed that IT adoption is expensive initial investment. From the outcome of the study, thirty one hundred and twenty (120) representing sixty percent (60%) of the respondents agreed to the statement, forty (40) represnting twenty percent (20%) were uncertain with the statement, twenty-four (24) representing twelve percent (12%) disagreed while sixteen (16) representing eight percent (8%) of the respondents strongly disagreed to the statement that IT adoption is expensive initial investment at the EC. According to scholars (Parham, 2004) and (Pilat & Wyckoff, 2003) complementary investments are required to benefit from IT-enabled innovations. IT adoption according to OECD (2004) requires IT skills, organizational change, training and extra expensive cost of investing in hardware and software solutions (OECD 2004).

3.2.5. IT Adoption Has the Challenge of Improper Network Infrastructure in the Company

It was seen that a total of one hundred and sixteen (116) of the respondents representing sixty-eight per cent (58%) agree to the statement while a total of twenty (20) respondents representing ten per cent (10%) disagree that IT adoption has the challenge of improper network infrastructure in the company. Meanwhile forty-four (44) representing twenty-two per cent (22%) of respondents were not certain with the statement.

3.3. Recommendations for the Successful Implementation of IT in IM

3.3.1. Staff Need to be Trained in the Use of Computer

It was observed from the findings that majority of respondents agreed that staff need to be trained in the use of computer. It was realised from the observation that ninety-six (96) respondents representing (48%) shared that view, eighty-four (84) respondents representing (42%) strongly agree to the statement, fourteen (14) respondents representing (7%) were uncertain while six (6) representing (3%) strongly disagree to the statement. Usually, before IT could be implemented in any organisation, requires IT skills which often call for training and extra expensive cost of investing in hardware and software solutions (OECD 2004). Gretton *et al,* (2004) found an association between the positive benefits of IT and the level of human capital and the skill base within firms, and firms' experience in innovation.

3.3.2. IT Adoption Should be Communicated to all Staff

It was observed that 90 of the respondents representing (45%) agreed to the statement that IT adoption should be communicated to all staff, sixty (60) representing (30%) strongly agreed, forty (40) representing (20%) could not confirm the statement while ten (10) representing (5%) fall under strongly disagree. Porter (1985), value chain analysis describes the activities within and around an organization, and relates them to an analysis of the competitive strength of the organization. This endorses Porter (1985) development of value chain theory. It was revealed that IT adoption should be communicated to all staff.

3.3.3. IT Adoption Should be in Phases

The adoption of every new strategy is prudent to be in phases. As cited by Sigma, (2000) and e-business watch, (2003) IT adoption should be in phases so as to ensure better understanding by all stakeholders. This question was asked to confirm to the statement that IT adoption should be in phases. The study shows that one hundred and ten (110) respondents representing (55%) agreed with the statement, twenty-six (26) representing (13%) strongly agreed to the statement, six (6) respondents representing (3%) were uncertain with the statement, thirty-six (36) representing (18%) strongly disagreed while thirty-four (34) respondents representing (17%) disagreed with the statement that IT adoption should be in phases. From the research, it surfaced that IT adoption should be in phases as identified by Sigma (2000) and E-business watch (2003).

3.3.4. IT Usage Needs to be Understood by all Stakeholders

On the IT usage needs to be understood by all stakeholders, aggregate of one hundred and six (106) of the respondents agreed to the statement, four (4) disagreed to the statement while thirty-six (36) were not certain to the statement. The findings revealed that IT usage needs to be understood by all stakeholders. This implies that the EC must ensure that all stakeholders understanding IT usage.

4. Conclusion

The use of IT to assist with inventory control decisions can be considered another best practice in material management. According to Kim (2005) IT can greatly reduce user interventions and time spent in order processing. The author based this literature asked the question whether IT reduce user intervention and time spent in order processing within the electoral commission. Evidence show that IT helps the EC to improves supply chain.

4.1. Recommendations

Based on the findings the following recommendations were made:

1. Regular stocktaking: Accurate and current stock taking is essential to good IM. They provide the information used to find solutions to problems of stock outs and expiry. Management should ensure that the inventory system put in place monitors performance with indicators and produce regular reports on operating costs, inventory and order status, and consumption patterns

2. Awareness and Consistent Training of Staff: Management should implement an IT training programme to make staff embrace technology. The inventory manager should train the staff on the proper way of doing tasks related to inventory. This will enable the EC to achieve efficient and efficient inventory control.

3. Adequate funding to meet IT investments needed: government should ensure that enough funds are allocated and dispatched in a timely manner to cater for the EC's requirements.

5. References

i. Al-Mudimigh, S. A. (2007). E-Business Strategy in a banking Services, A case study of internet banking and commerce. Journal of internet banking and commerce, 12(1). http://www.arraydev.com/commerce/j,bc.
ii. Ayeni, K. & Adewunmi, O. (2004). Production planning and control practices influencing consumer satisfaction in Nigerian manufacturing industry.Journal of Social Science, 9(1), 57-62.
iii. Bandiera, O.,& Rasul, I.(2002). Social Networks and Technology Adoption in Northern Mozambique. 2002Suntory and Toyota International Centres for Economics and Related Disciplines (STICERD) – Development Economics Papers, London School of Economics and Political Science.
iv. Barua, A., Kriebel, C.,& Mukhopadhyay, T. (1995). Information technology and business value: An analytic and empirical evaluation.Information Systems Research, 7 (4), 409-428.
v. Beckinsale, M.& Ram, M. (2006). Delivering ICT to ethnic minority businesses: an action-research approach.' Environment and Planning C: Government and Policy 24(6).
vi. Chopra, S., & Meindl, P, (2001). Supply Chain Management, Prentice Hall, NJ.
vii. Clayton, T., & Waldron, K. (2003). E-Commerce Adoption and Business Impact, a Progress Report, Economic Trends
viii. Crespi, G., Mahdi, S., &Patel, P. (2004). Adoption of e-commerce technology: Do network and learning externalities matter?
ix. E-Business Watch report (2003). A Pocketbook of E-Business Indicators,European Commission, Publications Office, Brussels. Available at http://www.ebusinesswatch.org/studies/
x. Electoral Commission (2014). MTEF PBB Estimates for 2014. Retrieved 15th December, 2014 from http: www.mofep.gov.gh.
xi. Frankel, R. (2006). The role and relevance of refocused inventory: Supply chain management solutions. Business Horizons 49,275—286.

xii.   Gretton, P., Gali, J., & Parham, D.(2994). The effects of ICT and complementary innovations on Australia productivity growth, In OECD (Ed.), The Economic Impact of ICT: Measurement, Evidence and Implications, OECD, Paris, pp. 105-130, 2004.

xiii. John, E. N., Etim, J. J.,& Ime, U. T. (2015). Inventory management practices and operational performance of flour milling firms in Lagos, Nigeria, International Journal of Supply and Operations Management, 1(4), 392-406.ISSN-Print: 2383-1359 ISSN-Online: 2383-2525www.ijsom.com

xiv.   Kaliannan, M., Awang, H.,& Raman, M. (2007). Technology adoption in the public sector: An exploratory study of e-government in Malaysia. Proceedings of the 1st International Conference on Theory and Practice of Electronic Governance, ACM International Conference Proceeding Series, 232, 221-224.

xv.   Kamalabadi, A., Bayat, P.,&Ebrahimi, A. (2008). Identifying and Prioritization of Challenges and Barriers of E-Commerce Implementation in Iran. World Applied Sciences Journal, 5, 590-597.

xvi.   Kim, D. (2005). An Integrated Supply Chain Management System: A Case Study in Healthcare Sector,Lecture Notes in Computer Science, Volume 3590(Aug 2005), pp.218-227.

xvii. Manueli, K., Latu, S., & Koh, D. (2007). ICT Adoption Models.' 20th Annual Conference of the National Advisory Committee on Computing Qualifications (NACCQ), Nelson, New Zealand. Available at www.naccq.ac.nz

xviii. Mongare, E. M., &Nasidai, E. S. (2014). The impact of information communication technology on inventory control systems in transport organization: a case study of Kenya ferry services. European Journal of Logistics Purchasing and Supply Chain Management, 2 (1), 17- 41.

xix.   OECD, (2004). Organisation for Economic Co-operation and Development ''ICT, E Business and SMEs''.

xx.   Oliveira, T., & Martins, F. M. (2011). Literature Review of Information Technology Adoption Models at Firm Level. The Electronic Journal Information Systems Evaluation 14(1), 110-121. Available online at www.ejise.com.

xxi.   Pilat, D.&. Wyckoff, A.(2003). The impacts of ICT on economic performance- an international comparison at three levels of analysis, Organisation for Economic Cooperation and Development, Paris, Paper prepared for the Conference "Transforming Enterprise" US Department of Commerce.

xxii. Porter, E. M. (1985). Competitive Advantage. (pp. 11-15). The Free Press. New York.

xxiii. Schwartz,M. (2007). Impact of IT on hotel industry and Hilton Corporation", 2007. Retrieved April 4, 2011, from http://www.positiveconcepts.biz/pdfs/Impact%20of%20IT.pdf.

xxiv. Silver, E. A., Pyke, F. D. & Peterson, R. (1998).Inventory management and production planning and scheduling, 3. New York: Wiley.

xxv.   Sigma, (2000). The impact of e-business on the insurance industry: Pressure to adapt – chance to reinvent, Zurich.

xxvi. Stevenson, J. W.,& Hojati, M. (2007).Operations management,8. Boston: McGraw-Hill/Irwin.

xxvii. Tetteh, E. & Burn, J. (2001). Global strategies for SME business: applying the SMALL framework. Logistics Information Management, 14.

xxviii.Thatcher, S., & Foster, W. (2002). B2B e-commerce adoption decisions in Taiwan: The interaction of organizational, industrial, governmental and cultural factors. 36th Hawaii International Conference on System Sciences.

xxix. Transit Cooperative Research Program, (2000). Revised Inventory Management Desk Guide, Research Results Digest, Sponsored by the Federal Transit Administration October, 2000.

xxx.   Vickery, K. S., Jayaram, J., Droge, C., & Calantone, R. (2003). The effects of an integrative supply chain strategy on customer service and financial performance: An analysis of direct versus indirect relationships, Journal of Operations Management, 21(5), 523-539.

xxxi. Windrum,P., &de Berranger, P. (2002). The Adoption of e-Business Technology by SMEs. Presented at MERIT - Infonomics Research Memorandum Series.