

Analysis of Challenges Associated with Adoption and Diffusion of ICT: A case of Tanzania Firms

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Abstract: ICT adoption is among the important strategies used to maximize potentials of firms. However, the way ICT services are adopted and diffused within the firms tends to be affected by factors such as availability of reliable specialists in the area, governance issues, politics, available ICT infrastructure and financial capability. The variation of these factors makes it difficult for some firms to optimize the benefits of ICT and in some cases they fail to maintain the benefits which have already been experienced. Previous studies have discussed the factors of ICT adoption in specific technologies in the likes of e-commerce, internet and ERP systems in the forms and individual people. However, very few of them discussed the ongoing challenges faced by the firms in specific cultural and economic contexts. This research explores the factors which affect the adoption and diffusion of ICT in Tanzania based firms. This study involves deep discussions between key ICT managers in 13 organisations and other government officials. This research studies the challenges in the adoption context and diffusion contexts. Among others, this study revealed that most of problems associated with adoption of ICT products and services in the firms are based on the procurement processes.

Keywords: ICT infrastructures; firms; adoption; e-commerce; cloud computing; ERP; diffusion and ICT services.

I. INTRODUCTION

Information and communication technology (ICT) adoption has been one of the critical discipline in the Information Systems discipline [1]. A number of studies have explored well the aspects of e-commerce adoption [2]–[4] and in the adoption of cloud computing in the firms [5]. Since the late 1990s, a lot of initiatives in terms of developing guidelines and models for effective adoption of technologies were in place. The examples of the popular technology adoption models include theory of planned behavior [6], the theory of reasoned action [7], diffusion of innovations (DOI) [8] and the technology acceptance model [9]. In similar vein, Venkatesh, et al.[10] proposed the Unified Theory of Acceptance and Use of Technology (UTAUT), which have attracted a number of other scholars to test in other contexts. In addition, other theories have proposed the way technology can effectively be adopted in the form level by considering more organizational-specific contexts. For example, Technology, Organisation and External Environment (TOE) framework was developed in 1990 [11]. However, TOE and DOI were suggested to be the best models to guide the adoption of ICT in organisations[12]. Technology adoption requires readiness issues well considered beforehand [13], [14]. Some of studies (like [1], [5], [15]) have pointed out factors which affect the adoption of ICT in the firm level. In addition, different ICT

adoption models have been proposed as a way of uncovering different acceptance issues. Examples of previous researches which studies technology adoption include Low et al [16] who discusses the determinants of cloud based services while also pointing out different factors including organizational readiness in terms of enthusiasm and ICT skills of both employees and management. Despite of major efforts of existing literatures on technology adoption and diffusion discipline, there is scarcity of studies which highlights the challenges which adopters of technology are facing in procuring and using the ICT based hardware and software. The significance of this research is based on the fact that ICT equipment's need specific procedures which separate them from non-ICT equipment's. The research by Bayo-Moriones and Lera-Lopez [17] suggests that firms face hardwares, softwares as adoption challenges in the course of their applications and operations. Therefore this research explores these challenges by conducting interview with the top ICT sections officers in Higher Learning Institutions in Tanzania on the challenges they face during pre-adoption and post-adoption of different ICT services.

The rest of this research is organized as follows: section two discusses the technology adoption process while section three discusses the ICT readiness. Section four discusses different roles played by ICT in the firms. Section five discusses the research methodology for this research while

section six discusses the adoption and diffusion challenges on ICT adoption in Tanzania context. Section seven is a conclusion of this paper.

II. TECHNOLOGY ADOPTION

Adoption is closely related to acceptance in many researches of information systems. The Concise Oxford Dictionary defines acceptance as ‘...consent to receive or undertake something’. It also defines adoption as ‘...the act of taking up and treating as one’s own’. This shows that adoption is more than just agreeing to a new idea or method. This happens in the case when there are several choices to make because it is about choosing a new innovation, taking it up, and owning it into specific perspective. Rogers [8], when proposing the Diffusion of Innovation (DOI) model, defined adoption as the process of communicating innovation in order to attain the acceptance of intended potential adopters. On the other hand, Hernandez, Jimenez and Martin [18] when analysing the key website features required for e-business activities, consider adoption as the decision to use something and acceptance as post-adoption perception. Easton [19], in his research on diffusion of e-commerce: an analysis of the adoption of four e-commerce activities, asserts that the adoption of technological innovations is a function of a willingness to try new products. Technology adoption can also be defined as an outcome of result of the users’ comparison of the uncertain costs and benefits of using the new technology [20]. This means, a detailed balancing between the intentions of designers and the expectation of users should be considered in the process of ICT adoption. Adoption occurs when intended users accept and opt to use innovations as their best choice in their business activities. In the same vein, Renaud, K & Van Biljon, J [21] in their qualitative study on predicting technology acceptance and adoption by the elderly, felt the importance of differentiating technology adoption and innovation terms. In their article, they defined technology adoption as a process starting from when user becomes aware of the technology up to when the user embrace the technology and make full use of it while giving an example of how teenage mobile phone users embrace the technology without reservation as they cannot contemplate without it. Renaud, K & Van Biljon, J [21] differentiates acceptance from adoption in the context of attitude towards a technology involved while adding that there exists various factors which influences this situation. On insisting their concept, they asserts that user who has purchased a new technology item has not yet adopted it adding that there are other stages beyond simple purchasing and this is where acceptance takes part. In this case, if the user buys an item and then does not accept it, the full adoption has not occurred.

Some of technology adoption models include Technology Acceptance Model (TAM)[9], a model that has been tested in several adoption studies and found by many studies to be

valid, robust and most suitable to study the behavior of technology adoption in organisation level [22]. In some cases, TAM has been used in collaboration with other theories like DOI and Locovou theory [23], [24]. According to Lederer et al.[25], these models worked successfully after being tested in different ICT technologies like ATM, Internet, Access, Word, Excel and Netscape. The main belief they had in using this model are perceived ease of use and perceived usefulness as the major factors influencing attitudes toward use, which tends to affect the intentions to use[3], [26]. The other most used adoption theories are the unified theory of acceptance and use of technology (UTAUT) [27], the TOE framework[28] and the theory of planned behaviour (TPB) [6], [29].

Nonetheless, the firms in have taken significant steps in adopting ICT for strategic reasons although there are unconvincing notable contributions on the performance of some Tanzania Organizations [30], [31]. Vaezi and Bimar[32] asserts that some of the reasons for inability of successfully utilization of ICT reasons are based on lack of effective plan-of-use. In the context of developing countries, the approaches taken by ICT policies show that ICT can play a very important role of an overall national strategy for development. Some of countries focuses on developing ICT as an economic sector to boost exports (Costa Rica and Taiwan) or to build domestic capacity (India, Brazil and Korea)[27]. On the other hand, other countries are pursuing strategies which seek to use IT as an enabler of a wider socio-economic development process. These countries can fall into those which mainly focus on repositioning the economy of the country to secure competitive advantage in the global economy (Trinidad and Tobago and Malaysia) and those which explicitly focus on IT in pursuit of development goals such as the ones set in the United NationsMillenium Goals Summit (South Africa and Estonia) [27]. It is therefore, expected that even in the micro level, IT can contribute towards individual development goals such as health, education, protection of environment, economic opportunities.

The evidence have, however, shown that those countries which takes IT as an enabler for development goals rather than to position their economies in the global market in order to increase export or to build national capacity can definitely achieve higher development levels. On the other hand, those countries which have one single plan of using IT in economic growth, and as such have failed to integrate development imperatives into their national ICT plans, have ended up with narrowly defined IT initiatives that are weak in addressing the goals for development [27].

III. ICT READINESS

Many companies, including large and medium or small size companies in the world have invested heavily in ICT (particularly e-business) during end of 90s by setting up commercial Internet websites but only few of them have seen the benefits of such huge investments [13], [33], [34]. Despite the role of ICT in helping companies to gain

competitive advantages against their rivals, it is a risky action because there is a possibility creating other unforeseen problems. It is therefore suggested to conduct e-readiness assessment prior investing on such projects. On doing so, there is a possibility of identifying the areas that need improvement which in turn might help to make strategic decisions in the future implementation [13], [35]. Despite of the existence of different definitions of e-readiness [36], it is suggested that these e-readiness tools in general measures the following factors; internet access; level of infrastructure development; ICT policies; Human Resources; ICT training programs; network speed; connectivity; quality of network access; applications and services; and relevant content [32], [35], [37].

The Tanzania companies and organizations should therefore have assessed their context for ICT readiness before jumping into the decision of any activity of technology innovation process. The main problem on ICT (or readiness) main problem is lack of common standard assessment policy which could provide unified assessment measures, support relative analysis and comparisons and help in diagnosing problems and deriving solutions [27], [32]. The Digital Opportunity Initiatives (DOI) tries to provide lessons on not only the value of IT in achieving development goals, but also the role which IT can play in development process. DOI presents a framework which highlights the critical interesting areas which need intervention upon the adoption of IT. The areas are Infrastructure, Human Capacity, Policy, Enterprise, Content and Applications[27], [38].

IV. ICT CONTRIBUTION TO THE FIRMS

Different stakeholders in both public and private companies are found to lack some ICT skills. This makes them think that adopting ICT is time wasting and costly project [27]. In the high learning institutions based in Tanzania, ICT plays the following roles to the Tanzania firms:

A. Streamlining Work Procedures

It is believed that if activities are under a control of a specific procedure, there is a great chance of creating uniformity in activities .Neergaard[39] suggests that the ICT helps SMEs workers to stick on the work procedures by streamlining process. ICT use has found to improve accuracy so as to enable business process reengineering or supporting essential activities such as continuous replenishment[23], [40]. For the context of developing countries, it has even been pointed out that there is a significant link between company's e-commerce resources and overall performance gain [40]. On the other hand, the productivity, efficiency and flexibility have been linked directly by the involvement of ICT in the SMEs operations [17]. ICT in the form of e-commerce help to lower cost of information delivery and transfer thereby escaping the use of expensive brochures in publishing are reduce postage

costs. Also, The Internet lowers the cost of market research whereby potential can be reached in both local and international markets at any time [38].

B. Better Client Services

Improving Customer services is among the key pillar for the success of firms. The utilization of IT help companies to act fast in delivery of services through automations thereby ensuring better services towards clients [39]. Customers pressure has been witnessed to be among the motivating criteria for IT usage amongst firms [35]. Generally, the customer services has seem to be subsequently improved by the effective use of ICT [38], [41] while customer satisfaction being one of the key noted advantages [17].

C. Better Record Keeping

It is always been advised to keep safe records in case of emergencies. This has been supported by the use of IT in firms as pointed out that it helps firms to do things correctly. In addition, effective internal control is among the major reasons which convinces firms to use e-commerce applications [41]. Also, IT helps firms to perform just-in-time inventory and enable quick response retailing[23], [40], [42]. Technically, the fact that there are lots of applications out there to use and control records, it is highly advised to utilize them to the maximum possible capacity. It is believed that it might also need skilled people to control these systems therefore it is advised to be aware of tradeoff decisions.

D. Economic Development

For the case of mobile technology, in developing countries especially Tanzania, Mawona and Mpogole[43] pointed out that mobile telephones plays a vital role in financial inclusion among both individuals and the informal small businesses in terms three main dimensions; incremental benefits whereby mobile money services improve the payment process and money transfer without necessarily going to the bank and so saving time and related transaction costs; transformational benefits where it offers the easiest way of managing cash by enabling to deposit on their mobile phone facility, transfer and receive money; and the production benefits where mobile phone money services create employment to the mobile money transfer vendors such as M-PESA, Tigopesa, Ezy money, and Airtel money kiosks[42], [43].

V. RESEARCH METHODOLOGY

The interview was conducted by involving the IT managers to uncover any success and failures which have been encountered and the adoption process of ICT services and products and whether there were any challenges on the assimilation of any ICT services and products. Since for Government owned firm the acquisition of any services and products are controlled by the Tanzania Government Procurements Services Authority (GPSA) [44] which have a clear guidelines which must be followed by the firms, this research involve interview to the procurement managers to uncover any interested ICT acquisition-related information. 13 (thirteen) Higher Learning institutions (HLI) were visited. Six (6) institutions resides in Dar essalaam, One (1) from Tanga, three (3) from Arusha, two (2) from Kilimanjaro and three (3) from Morogoro. The criteria for selecting HLEs as a sample of firms is due to them having similar nature of operations, for example, both have the accounting packages, student data management information systems, computer networks. We asked the HLEs the same set of questions to see their opinions on general process of ICT acquisition and assimilation process.

VI. RESULTS AND DISCUSSIONS

A. Adoption of ICT

Our interest here is to see opinions on the challenges that they ever faced on the process of acquiring ICT products and/or services. The main challenges which were pointed out were as seen hereunder:

Too Long Procedure: It has been noted that the acquisition process takes too long time to be done. This challenge is faced much by Public Institutions. One ICT manager asserted that:

“When it comes to antivirus requests, timing is a challenging situation”

In handling antivirus requests in Tanzania, the main problem is claimed to rely on the procedures in which an acquisition of any product and services should follow Tanzania GPSA’s rules and regulations. The GPSA takes too long time to conduct logistic activities. But, unlike other products like stationery materials, books etc, some of ICT services are time-sensitive and do not allow long time to wait until its time-of-use.. The suggested option on this challenge would be to allow the IT managers to pay for these time-sensitive applications online so as to start the use of the applications (on time) and present the receipts to the respective offices for refund afterwards. But, again, the

procedure of GPSA does not allow this approach. Moreover, none of the Institution was using e-procurement facility. When asked why they don’t use a sophisticated approach one of the ICT managers replied;

“It is difficult to convince top management”

This implies that the enthusiasm of top management in the acquisition of ICT tools is still very low. In this case, the knowledge on the importance of special treatment of ICT tools needs to be disseminated to the top leaders.

High Cost: The process of logistics and procuring management in Tanzania is a resource-demand activity. Most of respondents claim that the price of the ICT tools is too high compared to the retail prices seen in the shops at Kariakoo supermarkets and at the Dar essalaam city centre shops (like Computronics, KVD etc). This research aimed to study the extent to which cost has affected the adoption of ICT services. One manager at Kilimanjaro was quoted saying;

“It appears that some ICT items are bought with almost twice the price of the same on the markets”

They assert that, top managers believe that the procured ICT tools are more reliable because the supplier is well known. Despite these reasons which in one way or another seem to make sense, this study still has revealed one thing. Most of suppliers are given tenders not because they fit most based on the technical and financial factors, but because they are known to the top managers in person. This led the top managers failing to question on the high price and the quality of the products even when IT managers intervene. This was claimed by one of the ICT managers in Morogoro region that:

“The top management tends to influence the final decisions on the best supplier of ICT equipment”.

However, this challenge tends to affect only some of firms with less strict working systems.

Specification Twist: In Tanzania, specifications of the hardware items are another challenge when it comes to ICT adoption. The nature of ICT hardware demands high sensitive on specifications such that if procurement officer do not have some basic knowledge of ICT might end up bring a slightly wrong specified hardware. This study found that out of 13 firms, three of them have faced the challenges of acquiring hardware with wrong specifications. One ICT manager in Kilimanjaro firm, when

asked to propose the solution to the problems associated with specifications asserts that:

“Dealing with specifications is an action which needs proper guidelines being set up to be followed by head of ICT sections, procurement officers and top management”

This study revealed that the firms which have affected by this challenge are well equipped to handle this situation through having well followed procedures when compared to their counterparts who have not faced the challenges before.

The problem of specification can also be addressed in the dimension of the knowledge of the procurement staff. In Tanzania, people who are employed to work in the procurement department, especially in government sectors do not have proper basic knowledge to differentiate ICT from non-ICT services. This makes it difficult for them to inspect the ICT hardware once are brought up by suppliers. One ICT manager said:

“Sometime we notice that the received equipment is of far less specifications compared with the ordered one after it has been placed into the store”

This indicates that, the blames could be on the procurement side. This study suggest that the ICT staff should be involved in the process of not only on inspecting proper ICT equipment, but also on suggesting the proper brand and alternative specifications when in case the written/suggested ones are not available at some moments.

Hardware Quality Trade-offs: Another challenge found in Tanzania firms is based on the tendency where suppliers offers tips to the procurement staff at some times between as a way of showing appreciations in return of the profits out of the supply business. Asked if there is any affect in the acquisition of ICT services one manager said:

“These tips make most of procurement staff to be carried away and make them ignore some of conditions including required specifications”

This comment raised an interest of hearing from suppliers' side. We consulted two leading suppliers of ICT products at Dar essalaam. One of them asserts that giving tips to procurement staff has become a common approach and it have a point that some of procurement staff perceives tips as something a supplier must give out in order to guarantee consideration for be given tender. This study found that the quality of supplies is tempered dramatically since the decisions are based on the amount of tips they provide to the procurement staff and not on the quality of services.

B. Diffusion of ICT

Another objective of this research is to study the challenges facing the ICT usage after acquisition. The following are some of the notable challenges on the diffusion:

Ineffective ICT utilization: This study aims to study the extent of usage of ICT products and services after acquisition. This is due to the fact that, huge budgets have been allocated to the firms but there is no guarantee that the needs were the ones which were proposed by the ICT managers. This study found there are two major sources of ICT products in the public firms; 1) aids from different sources and 2) from the allocated budgets. The examples of aids include the Ncomputing devices found at the Institute of Finance Management (IFM) from the World Bank and the Ncomputing devices at the Moshi University College of Cooperative Business Studies (MUCOBS). However, the extent of usage of these tools is not satisfactory. An ICT manager in one of the firms quoted saying

“There are over forty (40) Ncomputing devices still packed in the boxes for over six months in the store”

This shows that, the aids came the time when they were not needed at this firm. As a result, these devices might end up out dated. This negligence could probably be handled by making effective follow-ups on the utilization of each of available equipment regardless of whether have been purchased from the firm's budget or from external aids.

Software Management Failures: This study found that software maintenance is also affected after the acquisition of software. One of the managers when pointing the major software challenge they face in their firm claimed that;

“Some of software developers are no faithful. They develop codes with poor quality for them to be involved in maintenance at high costs”

However, they also agree that some of blames could be on the firm's side on the selection of reputable software developers who have enough experience in the field. In Tanzania, most of leading companies which deal with software development has organization structure in which the software development section is separate from the marketing section. Therefore, they are not working together hand in hand. In this way of operation, software marketer tends to advertise the functionalities of the systems to be developed to the customers but the final product tends to be

slightly different. One ICT manager in Dar es Salaam who suffered with software problem asserts that:

"They advertised a very good system, but the final system does not match our expectations"

He also hints that they are fed up with frequent maintenance costs they incur in solving several software problems. This study revealed that most of these challenges in Tanzania, especially in the public firms can be addressed by inserting special clause in the ICT contracts since there are many extra issues to be considered beforehand.

Unexpected Hardware Performance: The public firms in Tanzania are moderated by the rules and regulations of GPSA. In this approach, the main variables which dictate the price are specifications and brand of the equipment. This study discovered that the firms are faced by two main challenges which are based on specifications and brands. One manager asserts that:

"We often acquire computers with over-clocked specifications"

Over clocking is the process of forcing a computer or component to operate faster than the manufactured clock frequency [45]. The changes can be on operating voltages where it tends to increase the speed at which operation remains stable [45]. The fact that over clocking affects the lifespan of computing equipments raises some alerts that IT managers might be struggling with qualities of ICT equipments while they would, alternatively, place more efforts on the study in how to make sure that even if they get a working equipment, they still need to question on the parts which constitute the equipment as a whole.

The next hardware challenge which was observed was when the equipment is with the correct brand but it is a fake version (counterfeit). Tanzania is one of the most affected countries with counterfeits in Africa. Counterfeit are goods which infringes the rights of a trade mark holder by displaying a trade mark which is either identical to a protected trade mark or by using an identification mark which cannot be distinguished in its essential aspects from such trade mark, and which thereby infringes the rights of the holder of the trade mark [46]. This study analyses further impacts of counterfeits in Tanzania context. It is revealed by the chairperson of the Confederation of Tanzanian Industries (CTI), in 2012 that:

"counterfeited goods do not only threaten the local industries but also it compromises the quality of the imported goods" [47].

According to the CTI chair person, there is lack of harmonization and proper coordination among various laws and regulatory authorities that enforce counterfeit issues [46], [47].

VII. CONCLUSIONS

This research presents a review of challenges facing Tanzania firms on adopting ICT services and products. It started by presenting literatures on ICT adoption while highlighting common ICT adoption models. It then highlighted the ICT readiness literature while pointing out the importance of firms to be e-ready. The analysis show that Tanzania Firms face a number of challenges some of them being on the adoption phase and the challenges facing diffusion of ICT products and services. In general many of the challenges are experienced on the procurement processes. The future work may look at how specific technologies such as mobile technology are adopted in different groups of firms in Tanzania.

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