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# INFORMATION TECHNOLOGY INNOVATION SPIRALS IN CROSS-CULTURAL COLLABORATION: A CASE OF SOFTWARE LOCALIZATION IN AFRICA

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## Abstract

*There is little doubt that IT innovation can be a driving force for economic growth. Economic theories promote the notion of innovation adoption, in which technological spillover from technologically advanced countries advance growth in less technologically advanced countries. The ability to adopt these technologies is often reliant on previous experience and knowledge. Thus capacity building has been proposed as a central driver to enable the adoption of IT innovation. However, the adoption of innovation and capacity building are subject to significant barriers, which are particular to the context. By viewing IT innovation as a process where IT gets adopted, diffused and assimilated into the organization, we present a conceptual framework that fosters innovation through collaborative innovation spirals. The framework is developed through the analysis of a case study conducted in Ethiopia. The resulting framework presents researchers and practitioners with a potential tool for cross-cultural innovation.*

*Keywords: Innovation, IT Innovation, Culture, Case Study, Africa, Knowledge acquisition.*

# 1 INTRODUCTION

Information systems (IS) innovations have been at the forefront of innovation for the last two decades. IS innovations now enable the complex interactions required to support our globalized economy (Barrett, Jarvenpaa, Silva, & Walsham, 2003). The information technology (IT) artefact, a component of IS innovation, has become the symbol of progress and wealth. It now appears imperative to engage in innovating with IT or fail to participate and reap the benefits of our new global connected economy (Erja & Kalle, 2004).

Literature on innovation and innovation exploitation for economic growth shows differences between nations and their innovative capacity normally attributed to the lack of resources and targeted spending (Furman, Porter, & Stern, 2002). For IS innovations, this includes a country's ability to adopt or imitate innovations from technically advanced countries (Park, Shin, & Sanders, 2007). From an international development perspective, innovation is seen as key to economic growth, and it is recommended that innovations from technologically advanced economies be adopted to help close the economic gap (Corea, 2000). In countries showing low technology diffusion, initial adoptions of innovation often seem promising but fail to diffuse successfully resulting in an overall failure to assimilate the innovation into the organization's value chain. This is also referred to as the "post-adaptation gap" (Robert & Chris, 1999; Zhu, Dong, Xu, & Kraemer, 2006).

Information and communication technology for development (ICT4D) is the heading that encompasses much of the literature on IT and IS in developing countries. The large majority of literature on ICT4D shows an imitator oriented approach toward innovation and not how IT innovations can be used for innovation. ICT4D literature promotes the transfer of innovations from the developed world to developing countries (Fukuda-Parr, 2002). This simplistic view has led to a string of failures leading researchers to investigate alternative strategies and theories on IS in developing countries. These alternative streams of research highlighted issues of cultural uniqueness and context appropriateness of innovations (Kappos & Rivard, 2008; McCoy, Galletta, & King, 2007; Mursu, Olufokunbi, Soriyan, & Korpela, 2000).

Research shows that culture and its value embeddedness affects how other cultures use and adopt technology (Kaptelinin & Nardi, 2006). We believe the challenges facing IT adoption in developing countries has to do with the lack of locally driven incremental innovation that can make IT more appropriate and thus more effective. In contrast to the traditional perspectives that promote a unidirectional flow of innovations and knowledge, we promote a partnership, where the provider of the innovation and the adopter must collaborate and learn from each other in order to achieve a sustainable, context appropriate innovation.

Our study presents a case where such a phenomenon took place. The context is Ethiopia, where software localization project driven by a local governmental organization sought to enhance the Openoffice suite with the Oromo language. From an analysis of the case, we produce a framework that shows that locally driven collaborative innovation can successfully produce a more appropriate IT artefact.

We begin by discussing literature on innovation and capacity building in developing countries. Given the high rate of failure in attempting to stimulate IT innovation adoption in developing countries, we focus our further investigation of the literature on possible innovation barriers. After a brief presentation of our research design, we describe our case study. This is succeeded by our analysis, which is sensitized by literature and structured by our analytical method – thematic analysis. We then propose our framework, presented as a synthesis of our review of literature and the analysis of the case study.

## 2 IT INNOVATION AND KNOWLEDGE PUSH

Studies by the World Bank strongly support the economic benefits of IT innovation adoption, showing that companies in low and middle-income countries that continually adopt innovation statistically have higher sales and employment figures compared to companies that have not (Schware, 2005). As a result, IT innovation in developing countries is heavily marketed as the way to improve organizational profitability and sustainability (Fukuda-Parr, 2002). As the pace of IT innovation, adoption and diffusion multiplies, it will play a bigger and bigger role in our global and local societies, increasing the need for IT innovations (Walsham, 2005).

The majority of ICT4D literature focuses on how developing countries can benefit from the transfer of IT and its associated knowledge from developed countries. We discuss this stream of discourse under the heading of ‘innovation and knowledge push’ as these initiatives promote thrusting global innovation into the local context. We first discuss IT innovation in the context of its economic drivers and how capacity building became the preferred strategy for improving IT adoption and diffusion.

### 2.1 IT Innovation and Economic Development

Fundamentally, innovation research has sought to study how innovation happens (Fagerberg, Fagerberg, Mowery, & Nelson, 2004, p. 4). Innovation is a cross disciplinary field and each field has focused on certain aspects of innovation. In IS literature, innovation research has mainly discussed the characteristics of innovation and how it is adopted and diffused in organizations (Frambach & Schillewaert, 2002; Jansen, Van Den Bosch, & Volberda, 2006; Shane & Ulrich, 2004; Tornatzky & Klein, 1982; Zhu et al., 2006). In economics, research on innovation has mainly discussed the allocation of resources to innovation (Fagerberg et al., 2004). These two fields have many overlapping areas. IT along with its associated knowledge is often seen as a strategic resource needed for innovation. The majority of firms not in the business of developing technology look for existing innovations based on their value and utility; IT is a prime example of such an innovation. IT has not only been proven useful but is seen as a driving force behind economic development (Fagerberg et al., 2004; Shane et al., 2004).

The direct link between economic growth and innovation was embedded in the classic works of economics Adam Smith and Karl Marx. This link dissipated during the late nineteenth and early twentieth century when neo-classical economic theories viewed technology as only an explanatory factor when other factors of production could not explain economic growth (Verspagen, 2006, p. 489). The link was later renewed by Romer and Schumpeter. Schumpeter argued that technological competition was the major form of competition under capitalism, and innovation created new opportunities for commerce and further technological innovation (Fagerberg et al., 2004, p. 15). The neo-classical approach tended to put innovation in a “black box”, while the evolutionary approach attempted to explain what is in that box.

Neoclassical approaches to economic development, despite proven limitations, still permeate development policy and promote the use of technological innovation to solve what is perceived as technical problem (Fukuda-Parr, 2002). Consequently the use of IT in developing countries, similar to developed countries, aims to improve the modes of production with IT innovations. Studies of global economic growth show that investment in equipment and infrastructure, human capital and the effective use of labour will result in per capita economic growth (Schware, 2005).

While it is good to be innovative, research has shown that it is also important to be able to exploit innovations (Fagerberg et al., 2004). In low-income countries, turning an invention into an innovation is often constrained by conditions unsuitable for commercialization, including shortage of materials and available skilled labour and knowledge. For organizations wishing to be more competitive, economic literature points to technology adoption and knowledge acquisition.

Swanson defines IS innovation as a process where a company pursues “IT applications new to an organization”, i.e., the application of IT innovations in novel ways. This view is seen as “adopter

oriented”, and organizations that adopt technology in a new way or for new uses can also be seen as innovators in their own right (Swanson & Ramiller, 2004). Research has shown that organizations must make full use of existing innovations and also seek new innovations to continue to be competitive. The former can be referred to as exploitative innovation and the latter as exploratory innovation. Exploitative innovation takes advantage of existing knowledge and competencies and is primarily engaged in improving efficiency and providing better services to existing clients. This is achieved through incremental innovations. In contrast exploratory innovations are more radical in nature and seek new markets, products, services and clients for the organization (Jansen et al., 2006).

Theories of IS innovation have traditionally been derived from organizational literature (Swanson, 1994). The similarities are well noted but IS presents some uniqueness. Here we take Swanson’s view of the innovation process as comprising of four components: comprehension, adoption, implementation, and assimilation (Swanson et al., 2004). Through this process, IS innovations become selected, adopted and diffused into the organization. As the IS innovation process moves through these phases, greater capabilities are built as knowledge from “know how” is increased creating a foundation for the adoption of more complex innovations. In ICT4D literature there is a strategic attempt to artificially transplant this “know how” knowledge into local organizations through various capacity building initiatives.

There is a vast amount of literature on Innovation; here we focus on the adopter-oriented nature of IT innovation with special emphasis on the adoption gap. This is important because not all attempts at adoption are successful in terms of organizational impact. Initial adoption of innovation often seems promising but fails to be diffused successfully resulting in an overall failure to successfully integrating the innovation into the organization, this is also referred to as the “post-adaption gap”(Robert et al., 1999; Zhu et al., 2006).

## 2.2 Capacity Building

New knowledge can be seen as an innovation in itself and also as a key process in innovation (Shane et al., 2004). Knowledge as a key component makes learning, or the acquisition of new knowledge, the focus of many organizations that attempt at innovation (Liyanage, 2006). Building capacity to innovate through knowledge acquisition is a prerequisite for innovation often described as the foundation of *innovative capacity* (Furman et al., 2002). An organization rarely possesses the knowledge needed for such activities internally and relies on external sources for this knowledge (Andersson, Lindgren, & Henfridsson, 2008). However, simply acquiring this knowledge is not sufficient to produce new knowledge. External knowledge has to be internalized by the organization, and an organization’s capacity to internalize such knowledge is dependent on existing experience and knowledge.

Capacity building is one of the original strategies of development dating back to early post-colonialism (Fukuda-Parr, 2002), although it has only recently received much attention in ICT4D. The aim of capacity building is to transfer skills and knowledge from developed countries to developing countries to give the latter the ability to more effectively transform resources (Park et al., 2007). This approach has been rejuvenated in recent years as the information age has taken root and the knowledge and skills gap widens. Studies addressing the “digital divide” propose that building IT capacity is essential for further adoption of new technologies. However, the basic strategy has been to transfer established western practices and knowledge to non-western developing countries. Rather than co-developing new practices and tools suitable for the new context, existing ones are repackaged to appear indigenized (Fukuda-Parr, 2002). The rationale for this strategy is based on the idea that developing countries do not have scientific knowledge and rather than developing their own, they should adopt western scientific knowledge and not reinvent the wheel (Fukuda-Parr, 2002). This is also based on the idea that innovation and development are linear, and innovation adoption or imitation is essential for developing countries to catch up (Verspagen, 2006).

Increasing capacity through skills and technological knowledge is seen as a way to provide long-term sustainable growth (Schware, 2005). Essentially it attempts to provide people with the skills to foster

their own development instead of dependence on continuous foreign intervention. Lessons learned from the deployment of IT innovations by development agencies have led to the realization that the local populace must be able to manage, sustain and further adopt innovations to achieve long term success (Fukuda-Parr, 2002). While innovation depends on external knowledge along with internal knowledge, few studies in development investigate the formalization of local knowledge.

While attempts of international development through the introduction of IT and IT capacity building are not without merit, the strategies driving the knowledge and technology push are put into question by our emerging understanding of context and the role it plays in technology adoption.

### **3 INNOVATION BARRIERS IN DEVELOPING COUNTRIES**

Understanding use context has been introduced as an important element to IT innovation (Swanson et al., 2004). The concept of use context is derived from IT community discourse about a particular IT artefact (Ramiller & Swanson, 2003). For the potential innovator, understanding the context in which you are trying to innovate is the first right step in the IS innovation process (Swanson & Ramiller, 1997). In the following, we will discuss potential barriers to innovation posed by contextual differences across the global, namely rational views, lack of resources, and local diversity.

#### **3.1 Different Rationalities**

Studies of IS innovation in western contexts have traditionally had two distinct rationalities: system rationality that states that users subscribe to the goal of maximising organizational profits and efficiency. The second is institutional rationality that states actors are actively engaged in conflict and negotiation to fulfil their own self-interest (Kumar, Van Dissel, & Bielli, 1998). Both rational approaches are evident in literature on IS innovation and have promoted IT innovation as a driver for economic change. Critics of the use of western rationalities outside the western context have cited deep cultural differences in questioning their applicability in non-western contexts. For example, IS theories designed to analyse technology adoption, diffusion and acceptance have been found to be practically invalid outside western contexts. McCoy (2007) illustrated this with a study that showed that TAM, a widely used model in IS, does not hold true across cultures. Using Hofstede's dimensions of national culture, he was able to highlight specific dimensions that would prevent this model from being an effective determinant of technology acceptance. For example, the study showed that countries with low uncertainty avoidance, high masculinity and high collectivism posed a problem for the TAM model.

#### **3.2 Lack of Resources**

Low-income countries are in general plagued by the issue of resources availability, or more accurately the lack thereof. Lack of resources is a defining characteristic of developing countries. This has been a rational argument for the need of developing countries to acquire the necessary resources to support an innovation. Literature on innovative capacity advocates the investment in infrastructure and education to spur innovation. A major obstacle to this is financial capital. Lack of financing is a major obstacle to investment in education and technology infrastructure to promote innovation (Furman et al., 2002). Research on developing countries has time and again drawn attention to this issue and it has been a focal point in much of ICT4D research. Lack of capital available to transform the modes of production in developing countries permeate literature on IT in developing countries (Avgerou, 2008).

In Mursu, Olufokunbi et al.'s (2000) study of IT in Nigeria, the authors cite issues that must be taken into consideration when implementing IT innovations in Africa. These include inadequate existing IT infrastructure in many cities and almost non-existent infrastructure in rural areas, shortage of skilled IT workers, and misalignment of the public sector with proposed IT strategies (Mursu et al., 2000). These issues, they say, must be tackled before IT innovations can be productive, sustainable, and affordable.

### 3.3 Cultural Diversity

The culture and its unique values and practices are important factors in the study of IS innovation. Walsham and Sahay (2006) state that IT innovations should play a central role in creating common practices and standards, but local uniqueness also matters. Local diversity will pose issues to globalization and they must be addressed. The challenges of globalization require important consideration for domestic organizations, such as balancing global integration with local responsiveness. The dimension of culture is acknowledged to have a great impact on IS but still little is known about how exactly culture influences the adoption, transfer and diffusion of IT (Frambach et al., 2002). It is encouraging to see that culture is now getting the attention it deserves in IS literature. IS researchers have started to study culture in different contexts. These include culture and innovation, adoption and diffusion; culture and IS strategy, and IT's influence on culture (Kappos et al., 2008).

The discussed barriers illustrate that an innovation stemming from developed and more advanced economies cannot be adopted in the local context of developing countries without considering the local context in which the innovations should be used. The flow of innovations and knowledge from developed to developing countries will continue to be ineffective if there is no clear understanding of the local context. Organizations from the western context, which are the source of many technological innovations, often lack this knowledge.

## 4 METHODOLOGY

This case is part of an ongoing research project on innovating with IT in developing countries being conducted by the primary author. A case study method was adopted for the study IT innovation in Ethiopian organizations. Data collection included semi-structured interviews and secondary data on projects pursued to localize IT. The project took place in Addis Ababa, Ethiopia between August and November of 2009. The researcher has also had experience working in Ethiopia for an international NGO doing IT capacity building. The case used in this paper is a governmental organization in Ethiopia. The organization has a technology development arm that seeks to innovate with IT to better service the organization and its clients.

In order to collect data about IT innovation we adopted a narrative approach. Pentland sees narratives as particularly good for analysing organizational processes because people do not just tell stories, they live them (Pentland, 1999). An explanation of a phenomenon can be achieved through a story that describes the processes or sequences of events. In the study of organizations, narratives are modes of communicating and knowing through the use of stories depicting histories and events (Czarniawska, 1997).

Additionally narratives were deemed appropriate for this study because of the context for two reasons: (1) the idea of storytelling is more in line with the dialectical nature of many African cultures, (2) there was limited documentation on the events and processes that lead to innovations. Telling a story will often help the interviewee remember events in a chronological order. We also believed that inviting narratives was the best way of getting the participants to openly speak about their experiences. Narratives are seen as a good way of engaging in dialog with people in organizations (Czarniawska, 1997, pg. 13), and they can provide insights into the history of the IS innovation process in the organization.

The data was collected through tape recorded interviews, field notes, and relevant documents. The data was analysed using thematic analysis. The following is a description of the case study.

## 5 A CASE OF INNOVATION IN ETHIOPIA

Ethiopia is a nation in east Africa. It had a population of some 80 million people as of 2006. Like many African countries Ethiopia has many ethnic groups. Some 56 ethnic groups contribute to the rich culture of the country. One of these contributions comes through language. Ethiopia's national language is Amharic and it's widely spoken in the north. Another widely spoken language is Aromo, a Cushtic language spoken in both Ethiopia and Kenya.

Ethiopia has very low technology penetration. Several government organizations began projects to increase the use of IT. One of these, an Oromo government organization, began several IT projects to better service their regional offices and constituents. The project included developing web based applications for improving government services to citizens and offering back-office software to support these functions. One of the required tools in these offices was a robust text editor. Initially the government offices were exposed to the Microsoft office suite preinstalled on office computers. An International NGO provided free training on the software suite and those who spoke English were able to use Microsoft office for creating documents for publication purposes. Eventually the government organizations required greater need for documentation in the local language but the language barrier and the cost of the software hampered the diffusion of the innovation throughout the organization

In January 2003 Ethiopia filed an application to join the world trade organization (WTO). By the date of the study in September 2009, the application was well underway and the government started making the necessary preparations to comply with WTO membership. Under the conditions of membership, organizations had to uphold the legal rights of the holders of copyrighted material – this included software. Since the initial adoption of Microsoft office, several new versions were acquired without proper licensing. The organization recognized that they would no longer be able to use this software under WTO membership. The outright purchase of the appropriate licences was constrained due to lack of financial resource.

Acting strategically the organization initiated a project to acquire and localize an open source text editor. The Openoffice suite was selected as the editor of choice. However, the software could not be successfully used as-is in the Ethiopian context. A number of changes to the software needed to be made to localise it. For instance, the Oromo language needed to be added. A local consulting company was employed to execute the localization project. The project team collaborated with the Openoffice community to add the Oromo language to the Openoffice 3.2.0 release<sup>1</sup>. The collaboration accomplished through the Sun Microsystems's wiki interface<sup>2</sup>.

## 6 ANALYSIS

The dataset analysed is a part of the corpus of the previously mentioned ongoing research project on innovation in developing countries. Using semantic level analysis we deduced themes from the data based on our existing framework (Braun & Clarke, 2006). This is a top-down approach or a theoretical thematic analysis. The central concepts explored were: (1) the contrast between the local and global context, (2) the implications of innovation and knowledge push as well as their associated costs, (3) particular challenges in knowledge acquisition and collaboration, and (4) issues of collaboration and ownership.

### 6.1 Local vs. Global context

For the Oromo government agency the contextual distance of the technology use was very apparent. Users did not see the Microsoft office suite as being local product, nor was there any indication that there were attempts made by Microsoft to localize there product. One user said “I will rather call a local person to help me than try to contact Microsoft” [contact would be through the Microsoft support website. There is no phone support contact in Ethiopia]. The lack of technical support for the Microsoft office suite created a view that they were insignificant users of this software and that there was little hope that the software would be adapted to their local needs. Another factor taken into consideration was the licensing costs of the office suite, which was beyond the practical means of the organization. One of programmers noted that even if they had the money the long term strategy was to

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<sup>1</sup> See the project initiation message here: <http://www.Openoffice.org/servlets/ReadMsg?list=discuss&msgNo=64435>

<sup>2</sup> The service is available on the web at: [http://wiki.services.Openoffice.org/wiki/Main\\_Page](http://wiki.services.Openoffice.org/wiki/Main_Page)



go with open source. In general, there are very few large technology companies offering warranty and support in Ethiopia.

## 6.2 Innovation and Knowledge Push and Long-term Costs

The majority of IT innovations introduced in Ethiopia are through international companies, NGO's, or government initiatives. Many of these are development projects where IT innovations are implemented by international NGO's. IT innovations are seen as vital to economic development. However, the costs are beyond the means of many organizations. There are several capacity building initiatives by international NGO's for government and local NGO's to improve service capacity of these organizations.

These initiatives laid a foundation for the adoption of the use of popular software products from the western context. The Microsoft office product was implemented at Oromo because it was what decision makers were exposed to and possessed knowledge of. The training on the suite was offered by many initiatives. However, as one programmer stated, when asked if Microsoft office came in local language would they abandon the open source project, he replied, "If it comes with the \$ \$ no go". The further clarified that the cost issue wasn't restricted to the product, but also to the cost of maintaining the Microsoft software. This included acquiring antivirus software and internet access fees for essential software updates.

## 6.3 Challenges in Knowledge Acquisition and Collaboration

In their quest to innovate with IT the Oromo organization had to acquire the knowledge necessary to modify Openoffice for its unique contextual needs. The majority of the resources came from in country along with expert knowledge from the Openoffice community achieved through collaboration using a web interface. The knowledge was seen as external and difficult to access but valuable. One of the programmers noted that very little was taught on open-source technologies at his university and didn't believe he received sufficient knowledge from his degree. The avenue to acquire this knowledge seemed to be the major hurdle. The programmers spoke, read and wrote English so they were able to read material from the web but for more complex tasks the Internet was a poor tool and needed direct collaboration with knowledgeable personnel with intimate knowledge of the software.

## 6.4 Localization and Ownership

The quest for localization was very important to everyone interviewed. Although the main theme was seeing their local language used in the software, there was a sense of greater ownership when the software was localized. Particularly there was great pride expressed when acknowledging that all the work was done by local organizations and people. Collaboration with the Openoffice community was seen as mutually beneficial and they felt in control of the progress and direction of the project. Being able to understand and control what happens in their local context was very important for feeling secure. One programmer gave the example of the "Teddy Afro Virus"; a virus that was created by an Ethiopian programmer. The virus, named after a local music star, destroyed many files and was off the radar of many western antivirus products. The government had to develop software locally to combat the virus. It is feared that more of these incidents will emerge and greater knowledge of adopted innovations will be required to deal with them.

The themes resonating in the data highlighted our need to rethink ideas about technology adoption and IT innovation in developing countries. While it is acknowledged that acquiring external knowledge is a vital component in the innovation process, applying this knowledge to a unique context is the challenge facing both the creators and acquirers of that knowledge. The case shows us that external innovation and knowledge combined with local expertise through collaboration can be successful. Consequently we see this collaboration circle as just not a single loop but as a continuous spiral.

## 7 COLLABORATIVE INNOVATION SPIRALS

Informed by our review of the literature and our analysis of the case, we synthesize our findings into a conceptual framework (Figure 2). This framework illustrates the process of adoption of innovation as a spiral of collaborative innovation. Through the process of innovation both global and local knowledge were increased. We find this framework to be a suitable conceptualisation of the key themes which arose from our analysis of the case. In the following section, we will describe and discuss the individual components of the framework in greater detail.

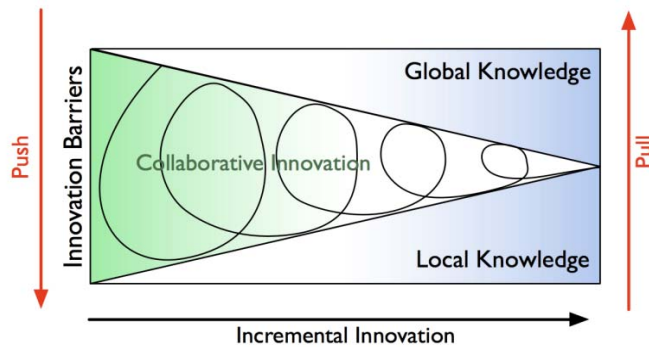


Figure 1. *Innovation Spirals in Cross-Cultural Collaboration*

### 7.1 Innovation Barriers

As we discussed previously, barriers to innovating with IT in developing countries are mainly as result of resources deficiencies and context uniqueness. While removing or reducing these constraints seems monumental, our case study indicates that small incremental innovations can have a significant impact on improved use of IT. IT innovations are most useful in exploiting existing resources with greater efficiency (Grover, Fiedler, & Teng, 1997). The challenge to IT success in developing countries is to do this with the same or greater efficiency. Currently, IT has been unable to do so as the exploitation of resources has been hampered due to context differences between where the technology is developed and tested to where it is implemented. Our research shows that the context is better understood through the eyes of the local populace and needs and wants are better expressed through their eyes. Issues of culture and lack of resources should not be seen as permanent roadblocks as these can be mitigated by careful technological choices and incremental innovations.

### 7.2 Collaboration: Knowledge Push and Pull

The initial challenge when adopting IT innovations in developing countries is that it creates an immediate need for knowledge in order to tailor it to the local context. Expert knowledge is required to effectively exploit the innovation but this is not successfully achieved by a unidirectional push of explicit information about how a particular innovation works. Local adopters, who are the context experts, possess knowledge of IT innovation but will require collaboration with external experts for co-configuration to make incremental innovations possible. This collaboration requires knowledge to flow both ways so external experts can understand the unique needs of the local context and local experts can understand the potential of the technology. This is an ongoing process that leaves both parties with substantial knowledge resources that can be reused.

The case shows this collaboration is initiated with a real and identifiable need and not one assumed by external parties. When the need emerges, the quest for innovation begins with a search for existing innovations to fulfil this need – exploration. The exploitation process begins when a closely matching innovation is found but minor changes are still required to make it effective in the local context. We observed this process in the case study where Openoffice was adopted.

### 7.3 Innovation Spirals

The knowledge push and pull observed in our study is not an independent and finite activity but a continuous process. The study showed that continuous collaboration initiated from the local context continued with a lesser degree of intensity, which we have portrayed as a continuous spiral. The local experts will pull knowledge from accessible resources but may still require further greater knowledge of the innovation. Collaboration at this stage requires action for both local and global contexts and both parties must see the value in the innovation.

In our study, the addition of the Oromo language to Openoffice enabled the wide use of the software which was a major incentive. The collaboration continues with shared understanding enhancements – the successful use of the software in the local context. This process of local and global collaboration progresses as knowledge in both the global and local contexts increases and thus the process of incremental innovation become less taxing on both parties. The local growth in knowledge capacity will create less dependency on external knowledge and contributes to global knowledge. The product of the incremental innovation seen in this case enhanced Openoffice increasing its effectiveness as a general purpose technology. Openoffice will now enjoy greater diffusion in Oromo speaking ethnic groups in Ethiopia, Kenya and many other countries in east Africa. This increases the adoption potential for the adoption of other technologies. Studies have shown that each additional adoption of technology results in greater ease of further adoption (Ravichandram, 2005).

The purpose of this paper was to address the unidirectional transfer of knowledge and technology from developed countries to developing countries. This was presented as a problem and was based on previous literature and evidence from the field. We believe our framework of collaborative innovation spirals supports the abandonment of that strategy and a move towards the recognizing context and culture in the global local IT innovation process. Collaborative innovation originating from the local context can result in incremental innovations that are appropriate to the culture and context, with the purpose of improving usability and achieving productivity.

## 8 CONCLUSION

Using a theoretical foundation we analysed a case of IT innovation in Ethiopia. The analysis produced several themes that were used to build a framework that promotes the use of locally driven, globally collaborated incremental innovation for the development of contextually appropriate innovations. The analysis of the case resulted in a diversion from the dominant literature on IT innovation in developing countries through the focus on locally driven collaboration and the introduction of collaborative innovation spirals. Such collaboration enriches knowledge both locally and internationally.

Our study contrasts with existing literature by promoting co-innovation through innovation spirals. This is different from mainstream views of innovation as previous capacity building suggested pushing knowledge and innovations from developed countries to developing countries through international development initiatives without proper analysis of local contextual needs. The focus on locally driven innovation but with global collaboration highlights a potential shift in the strategy of IT capacity building.

We believe the contributions made in this paper are sound and add to the literature on innovation in developing countries, cross cultural innovation and collaboration. However, the study is not without its flaws. The phenomenon was almost overlooked by the researchers and we believe it required greater emphasis in the overall study of innovation in developing countries. Richer data could have been retrieved to give the case its due merit. The phenomenon was grounded in individual-driven, ad-hoc and geographically diverse collaboration, which prevented the researcher from engage with all involved participants. Collection and analysis of additional views, especially from the western context, could significantly improve our understanding of locally driven innovation in a global context. With that said we do believe we were fortunate to have come across this case and continued research will be pursued in this area.

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