USER-CENTRIC INFORMATION AND COMMUNICATION TECHNOLOGY ADOPTION MODEL FOR RURAL FARMING COMMUNITIES IN KENYA

BY

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Declaration

This research is my original work and has not been presented for a degree award or any other awards in any other university

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Abstract

The role of technology among populations in developing countries continues to be a topic of immense interest to researchers. Whereas technology acquisition is easily discernible externally, the ways to which a piece of technology is put to use is a process wrought with various dynamics, some evident and some not.

In the field of ICT today, there are numerous technological devices available and unlike in the past, the device prices have become affordable even to those at the base of the pyramid. Ensuring that the technology is put to efficient use is dependent on many underlying factors such as the relevance, the design, and the cost of use among others. The last decade has seen proliferation of the mobile phones in Kenya. During the same period, there has been increased competition from mobile service providers making the mobile phone a choice device for many Kenyans. Indeed the current mobile phone subscriptions surpassed past projections by considerable margins. Whereas those in formal employment find technology use part of the job or leisure, farmers in Kenya for example, have had to rely very little on technology use except for communication and to a large extent money transfer services such as Mpesa, Zap, Orange Money and Yu cash.

Several researchers in both in developing and developed countries have studied the concept of technology adoption and several models from such studies exist in literature. Nevertheless the studies have tended to concentrate on technology adoption within formal structures, where the users are literate and where resources are readily available. For semi-illiterate users mostly within developing countries, availability of communication infrastructure and technological resources are a big challenge. Therefore the technology needs of such users have seldom been fully understood partly due to assumptions about their requirements and partly due to high costs associated with technology acquisition and deployment within the rural areas.

This research focused on technology adoption process from the standpoint of farmers; more specifically farmers' ability to use and adopt ICT in their daily lives. We enlisted farmers living in rural areas where apart from Mobile phones there is no alternative communication infrastructure. The farmers are organized in groups and are drawn from three different areas of Kenya namely Mtito Andei, Kiangwaci and Bumala each having different geographical and demographic data. The farmers are engaged in both subsistence and cash crop farming and all seem to have had comparable issues affecting them mainly lack of information on the crop

diseases and pests, the challenges posed by middlemen and the need to try different crop varieties. In addition the lack of technological resources was a big challenge to the use of any technological innovation.

The objective was to engage with the farmers from the onset to ensure that we understood the needs from their standpoint and in the pre-study period spent time with them in their homes to gain trust and ensure that the process was user-driven and user participatory throughout. Our approach was a combination of user-centric process and socio-technical experiments to bring to the fore the critical factors that determine adoption among rural agricultural users.

We designed a Case Based Reasoning expert system known as Mobile Interfaced Crop Diagnostic Expert System (MICDES). The system enabled farmers learn about pests and diseases affecting their crops and it also helped us study the adoption process of ICT among the farmers. The MICDES design and development was based on the needs and feedback from several interactions with the farmers. The feedback obtained was used to improve the system continuously and to study the process of adoption among the farmers.

Resources such as computers (laptops and desktops), mobile phones, Internet modems and airtime was provided to ensure that the farmers were able to use the system. To ensure that distance to the centers were not a hindrance and also to accommodate different schedules, we visited the farmers at their homes so that they could learn and use the system comfortably and with added flexibility. To further ensure inclusion, the system was translated into different local languages and we studied the farmers' interaction with it over a period of almost one year. This approach was to ensure that we presented a model that reflected the reality that the farmers were heavily involved in the design and development of the system and not just as ordinary end users.

Training on the system was carried out and quantitative and qualitative data collected through structured questionnaires and Focus Group Discussions (FGDs). The data was collated and analyzed and interpreted using Principal Component Analysis (PCA) and theme coding. The analysis generated the principal components that were significant in explaining the adoption process by the users. Through PCA three components were derived namely; *Usefulness and Persistence of usage*, *Group Dynamics in usage* and *Learnability and Control in usage* that defined the adoption process for the rural farmers. These components had the following constructs respectively; task fit, usability, user friendliness and attitude; self-image and opinion leadership, support system and resources. Together these constructs and the corresponding

variables defined our model, user-centric adoption Information and Communication Model for rural farming communities in Kenya. It is also significant that respondents within the rural areas categorize issues as individual, communal or national and we used the same in this research. The individual determinants are task fit, usability and user friendliness and attitude towards technology; community determinants are self-image and opinion leadership and national determinants are control, having resources for use and availability of support system. The construct corresponding variables are moderated by gender and age. It is noteworthy that unlike in the Unified Theory of Acceptance and Use of Technology model, experience and voluntariness of use were not moderators. This is a significant finding based on our user-centric approach through which we trained the users extensively thereby mitigating the lack of experience. Similarly all our respondents were using MICDES voluntarily.

The research has also put forward an ICT application in seven different languages (5 of which are Kenyan local languages), which are capable of providing farmers with a first line of defense against pests and diseases. This is done from the convenience of their phones and at an affordable cost. This application can mitigate the shortage of agricultural extension officers in Kenya whose numbers have continued to dwindle over the years.

The research therefore makes the following contributions; a user-centric ICT adoption model for rural farming communities; an expert crop diagnostic system with five different local language interfaces, the application of PCA within the context of ICT adoption studies among rural farming communities; the importance of user-centric approach in adoption studies among rural communities and the importance of user-centric approach in mitigating culture, experience and low educational background among rural communities.

We recommend areas for further research such as investigating adoption holistically from the point where resources are not provided, illiteracy, occupation, more cultural dimensions and different application areas to see how the dynamics of adoption change.

We believe that the research and its outcomes have made a significant contribution to academia, policy makers and practitioners who are targeting the application of ICT among rural farmers within Kenya.