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Rural Farmers' Perceptions of the Adoption of Internet-enabled Computer in the Eastern Cape, South Africa

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ABSTRACT Unstructured interviews were used to examine the perceptions of farmers about internet-enabled computers using the five main attributes of innovation as an analytic lens. Findings show that internet-enabled computers have relative advantages over other means of obtaining information but rural farmers experience challenges with accessibility. The farmers' sources of agricultural information are incompatible with their needs, suggesting the need for internet-enabled computers. However, the inability to use internet-enabled computers by the participants was cited as a disadvantage. The findings about trialability show that most of the agricultural information obtained through internet-enabled computers did not work when applied to the local context. Positive perceptions by rural farmers about the observability of the effects of the internet-enabled computers for agricultural information were apparent. The findings reflect opportunities and challenges about adoption of internet-enabled computers by poor rural farmers. Based on the analysed data further studies are suggested.

INTRODUCTION

Modern agricultural technologies have emerged in recent times as an important means of motivating change in rural areas because the technologies provide many opportunities to improve farming practices, which in turn, lead to changes in socio-economic and political aspects of rural society (Okon 2015). The spread of these modern agricultural technologies is helped by information communication technologies (ICTs) in the form of internet-enabled computers, as well as include a wide range of traditional media such as newspapers and television. In general, "ICTs have the potential of providing vast amounts of information to rural populations in a more-timely, comprehensive and cost-effective manner, and could be used together with traditional media" (Munyua 2000: 123).

An internet-enabled computer does not only provide access to information networks but also represents ways in which rural farmers can tactfully communicate among themselves to alter the unfavourable perceptions of a situation and other issues in their communities. In this regard, Rahim (1985) states that an information network helps a disadvantaged community to access capital equitably. ICT-based networks can provide the rural or underdeveloped economy with communication facilities that include service delivery systems, payment, online work, and trade that may assist users to mitigate challenges of weak facilities (Maumbe and Okello 2013; Pick et al. 2014).

Despite the many benefits of ICT in rural development, especially as it applies to rural agricultural practices, there is no in-depth research that has determined how ICTs, specifically internet-enabled computers, have been adopted in rural areas of South Africa (Maumbe and Okello 2013). Thus, considering how technologies such as internet-enabled computers have become vital in accessing information for everyday activities that include farming, in this study, the perceptions of rural farmers about internet-enabled computers is the focus. This focus will enable explanation of what could influence rural farmers to accept the use of internet-enabled computers. For the purpose of this study, an internet-enabled computer is regarded

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as an innovation in the rural community because even though it is commonly used in cities across South Africa, the rarity of its use in rural communities makes it an innovation in that context.

Therefore, the key objective of this study is to examine farmers' perceptions of internet-enabled computers that are used to access online information based on a set factors or characteristics of innovation. These characteristics or attributes (as explained below) will help to determine or gauge the adoption decisions of individuals for a particular innovation. The results of this study will not only enhance understanding of how each of the attributes is responsible for the decision to adopt internet-enabled computers in rural communities in the Eastern Cape, South Africa, but also increase understanding of how these attributes can be extrapolated to explain adoption decisions in other rural communities in South Africa. In order to achieve the mentioned objectives, the following question will guide the investigation:

Question: What influences rural farmers' adoption of internet-enabled computers for their farming practices in the Eastern Cape, South Africa?

In the next section, the relevant literature focusing on issues such as ICTs and innovation attributes in adoption decisions will be provided, followed by the context of the study and the methods used to conduct the study. The final section contains the analysis, discussion, and direction for future studies and the conclusions.

Challenges of Internet Access in Rural Areas

South Africa has gone through substantial efforts to make information technology infrastructures available in rural areas by providing access to the internet and other ICT facilities through the establishment of telecentres, but the problem of internet access persists (Attwood et al. 2013). South Africa, like many other countries, is faced with huge internal digital divide that restricts people's access to information technology and its associated benefits (Attwood et al. 2013). Despite this realisation, there is not much concern over the digital gap between South Africa and other advanced economies (Attwood et al. 2013). In 1996, South Africa was placed 14th globally in terms of internet use decisions (Attwood et al. 2013), and a recent study states that South African internet penetration ranks 13th globally (Broadband News 2018). However, internet use in South Africa is geographically centred in urban areas, especially among relatively affluent and educated South Africans (Attwood et al. 2013; Jensen 2002). This is because rural South Africa do not only lack access to internet but are hindered by factors such as lack of computer skills, low literacy and lack of sustainable livelihood, resulting in the near impossibility of bridging the urban-rural digital divide (Attwood et al. 2013). Hence, the South African government adopted measures to overcome the digital divide and low percentages of internet penetration, especially in rural areas, by encouraging the use of ICTs (Attwood et al. 2013).

The internet removed the difficulties of the information system and made what used to be guarded information from affluent territory to common knowledge (Mathur and Ambani 2005; Pick et al. 2014). Hence, the internet is now a chosen means of information with several contents (Mathur and Ambani 2005) allowing people to have access to a wide range of markets at minimum price. The internet has resulted in improved electronic components for business processes across the world to seamlessly integrate (Mathur and Ambani 2005) that even in rural communities, internet access could provide services such as education, e-governance and healthcare (Pick et al. 2014).

The effects of the internet are only felt by a select few in the developing world. As opposed to people in the developed economies, communication tools or devices (such as internet-enabled computers) are not easily accessible to many people living in the developing economies (Mathur and Ambani 2005). Digital telephone has been restricted to providing commercial services to people living in urban locations who are in the category of 'have-nots'. A major difference between the 'haves' and 'have-nots' is that the relative value of time compared to access to costs is apparent in advanced economies where the majority of their population is affluent, while the value of time in poor economies is lower where the majority of the population is poor (Mathur and Ambani 2005). Hence, few poor people invest in internet facilities and devices such as computers in developing coun-

tries such as South Africa. As mentioned, many factors hinder rural areas in developing countries from reaping the benefits of ICT tools such as the internet (Hilbert 2011). This includes, in the context of South Africa, low levels of literacy and language barriers among local farmers (Maumbe and Okello 2013).

Language is major barrier that prevents people from accessing information (Oladimeji 2006). This therefore prevents rural farmers from accessing information that is necessary to increase their agricultural production and improve the marketing and distribution of their products (Bertolini 2004). The challenge of language for rural farmers is heightened by the uncontested dominance of the English language in which ICT products such as internet-enabled computers are made (Oladimeji 2006). Consequently, there is an urgent need to remove the language barrier to scale up information access by making internet platforms multilingual for rural farmers and in so doing, improve their agricultural practices (Oladimeji 2006). Rural areas need current information on market cost and modern agricultural technologies and techniques in their languages in order to improve the quality of their products and adjust to evolving meteorological conditions and requirements of agricultural markets (Oladimeji 2006).

Further challenges identified in the rural areas include poor telecommunication facility with unreliable bandwidth for internet connections, and the internet is often far too expensive for ordinary rural populations in terms of computers and other devices that are used (Ponge 2016; Maumbe and Okello 2013). Some of these challenges have affected the degree to which the innovations that are associated with internet have been adopted and have taken place in the rural areas of South Africa. In the next section, the attributes of innovation will be discussed as they have been used to explain the farmers' likelihood of adopting internet-enabled computers for agricultural information in rural areas in the Eastern Cape, South Africa.

Innovation Attributes in Adoption Decisions

As stated by Rogers (2003), the main attributes of innovation in adoption decision-making are relative advantage, compatibility, complexity, observability and trialability. These are regarded as innovation characteristics that influence the rate of adoption (Lawrence and Tar 2018). It is very important to understand how these characteristics influence the adoption decisions of innovations, which in the context of this study, are how the attributes are likely to influence the farmers investigated in this study to adopt the use of internet-enabled computers for their agricultural information purposes. These attributes, according to Roman (2003), are the most important perceived attributes that are relevant in the way farmers use internet-enabled computers, and they have been employed to reference the analysis of the data presented in this study.

Relative Advantage

Relative advantage refers to the level to which perceived innovation is greater than the idea it superseded (Roger 2003). According to Knudsen and Roman (2015), relative advantage is the expected value or advantages, both tangible and intangible, of an innovation compared to current practice. The degree of relative advantage of an innovation is measured in socio-economic terms as well as its convenience, and satisfaction. Thus, it does not matter if an innovation has many objective advantages if individuals do not perceive it as being advantageous to their needs. In this regard, the more individuals feel positive about the perceived relative advantage of an innovation, the more they would feel the need to adopt the innovation.

Similar to the concept of relative advantage as described by Rogers (2003) is the concept of prominence used by Düvel (1991) to explain further the characteristics of innovation that influence adoption decisions. Düvel defines prominence as the extent to which an innovated product or an idea is perceived as being better than the existing products. In characterising prominence, Düvel argues that the relative advantage concept should be considered from the perspective of relative advantages that includes the advantages and disadvantages of innovation. While there is a general agreement that Düvel might have provided a somewhat different focus to Rogers' (2003) relative advantage concept, researchers hold the view that the concept relative advantage implies that there are relative

disadvantages. In other words, Düvel's (1991) use of relative advantage, which includes the disadvantages and disadvantages of an innovation, is an argument that is similar to Rogers' (1983) argument but made more explicit. The analysis made in this study uses the approach of relative advantage as explained by Rogers (1983), but issues that are considered disadvantages to innovation that arise will be discussed as a disadvantage to adoption decision in the context of the present study.

In the context of internet kiosks, where internet-enabled computers are available in rural areas or poor communities, the relative advantage is an important factor to consider in the use of kiosk services. A good evidence of the relative advantage of internet-enabled computers is the instance of e-government assistance that resulted in efficiency in processing of birth certificates and old-age pensions (Kumar and Best 2006). Internet kiosks in rural areas would help farmers to use computer to access vital information on agricultural development. If the rural farmers perceive that the online information they access through their internet-enabled computers has resulted in achieving their farming objectives, they are likely to adopt the use of internet-enabled computers as one of the tools for accessing relevant information for their farming activities.

Compatibility

Compatibility is the degree to which an innovation is perceived to be consistent with existing values, past experiences and the needs of potential adopters (Rogers 2003; Knudsen and Roman 2015). An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible. The issue of compatibility is closely linked to the existing socio-cultural environment for rural areas and may help to explain the identified socio-economic profile of users.

Compatibility is closely linked to the issue of relevant contents required in the community, and in the case of internet kiosks, researchers have to make efforts to assess the needs and their relevance in the community (Kumar and Best 2006). Thus, the development of appropriate system is central to the continuous existence of the kiosks but supporting the services themselves equally needs consistent government support (Best and Maier 2006).

Complexity

Rogers (2003) refers to complexity as the extent to which an innovation is considered difficult to comprehend and use. This means that a higher degree of complexity for understanding and using an innovated product makes it likely that the innovation is not adopted by many people. Complexity is, therefore, negatively related to an innovation adoption decision (Kapoor et al. 2014).

In rural communities where there is likely to be no or low computer literacy, internet-enabled computers will be an innovation to which complexity may be negatively related in terms of widespread adoption. Although there are telecentres in which access to internet services take place in rural or neighbouring towns to rural communities, the fact that many of the rural population are computer illiterate will affect the adoption of innovation as it applies to internet-enabled computers. In this regard, there is a need to develop simpler interfaces, applications, and appliances (Kumar and Best 2006) because community members will readily adopt innovations that are easy to understand.

Trialability

Trialability refers to the extent to which an innovation may be tried (Scott et al. 2008; Rogers 2003; Vanderlinde and van Braak 2011). An innovation's trialability signifies limited uncertainty to the person considering acquiring it for use and may learn by doing (Cognatek Group 2004). New ideas or innovations require time, energy and resources. Hence, the possibility of trial of innovation before implementation will create favourable innovation decisions if the trial is positive (Scott et al. 2008). According to Turner and Turner (2002) who studied the uptake of computer in supported co-operative work, the lack of trialability resulted in a lack of uptake.

Observability

Observability refers to the extent to which the outcomes of an innovation are apparent to those who want the innovation (Scott et al. 2008;

Rogers 2003). The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it, or as stated by Scott et al. (2008:41), "If there are observable positive outcomes from the implementation of the innovation then the innovation is more adoptable". According to Ramdani and Kawalek (2007), observability, the result of demonstrability, has been shown to be an individual innovation attribute. Such demonstrability results in more discussions about the innovation and people who have adopted it often demand more information about it (Cognatek Group 2004). Farmers' knowledge of the benefit of access to the internet will be enhanced when there are observable impacts in their communities.

METHODOLOGY

This research was conducted in the rural community of Alice, Eastern Cape Province, South Africa. Alice is located 20 kilometres to the east of Fort Beaufort and grew around a military encampment known as Fort Hare. Alice's geographical boundaries are Hogsback, Fort-Beaufort and Middledrift (IDP 2007). Alice is in the Amatole District Municipality, a municipality populated by the isi-Xhosa speaking people known as the South Nguni (IDP 2007).

The participants included in the study were between the ages of 35-68 and isiXhosa-speaking South Africans. The study used a qualitative method in the form of an interview process to collect data from the participants. Purposive sampling that involves the conscious selection of participants was used in the study (Walsham 2017). The ages of 35-68 of the participants were included because this was the age group of most of the participants who were ready to be interviewed. There were few participants who were younger, but they were not included when it became clear they were not active farmers. A few who were older than 80 were excluded because they were few, the age difference was considered a problem, and their age impacted in their ability to understand the subject matter of the research during pre-interview discussions.

Data Collection

The technique used for the data collection in the study included unstructured in-depth interviews in the form of focus group discussions involving 60 participants. Five sessions of focus group interview discussions were conducted, with each of the sessions comprising 12 participants. The main objective of the in-depth interviews was to gather information about how internet-enabled computers are used to access information and investigate how their use may influence the adoption internet-enabled computers.

Questions were drafted for the unstructured interview to investigate the reality of the problem during the data collection process. The interview guide consisted of questions that were used to collect demographic information of participants and to identify the participants' means of gathering agricultural information. Initially, a total of 100 participants agreed to be interviewed after the decision to exclude some of the participants as explained above, but only 60 turned up for the five sessions of the focus-group interview discussions.

Data Analysis aspects

The data analysed were collected from the interview guide used in the focus groups. All interviews were audio-recorded and transcribed and secured to implement the analysis process. Responses collected from the interviews were analysed through a process of identifying and reporting patterns (themes) within the data (Braun et al. 2019). Interviews were organised and transcribed, and the researchers carefully went through each of the participants' interview data, identifying codes using labelling words and phrases. To simplify the reporting of the data, descriptive codes were gathered to obtain the themes used in the discussion of the findings.

To help analysis, the farmers were categorised with letters such as F1 for farmer one, F2 for farmer two and F3 for farmer three, etc.

RESULTS

The five attributes of innovation in adoption decisions underline the analysis of the presented findings. One of the attributes of innovation adoption theory is in terms of its relative advantage; the analysed data that follow are therefore about the perceived relative advantages of internet-enabled computers over other current means the farmers are using to access information for their farming practices.

Relative Advantage: Farmers' Perceived Advantage of Internet-Enabled Computers for Accessing Online Information

Internet-enabled computers are advantageous to people because they allow people to access relevant online information, which in the case of farmers, is used for the purposes of their farming activities. However, this advantage may not be realised as participant (F1) claimed that farmers need assistance to use internet-enabled computers to access information for agricultural purposes. They, therefore, relied on their traditional ways of obtaining information for their agricultural practices such as from agricultural extension officers, fellow farmers, and traditional media (TV, radio, community newspapers). According to the farmer:

Yes, we need information; we need it because it can help us with skills, marketing and other farming stuff. If farmers can be assisted in their farming projects so that they are able to put information on farming into the computers. Because I was a farmer [I] have also learnt how to use the computers in Lovedale College, and I know it has many advantages, more than any other sources of information, but there is a problem of accessibility.

It was quite apparent from F1's response that the farmers need the information they are able to access through internet-enabled computers, but there is a problem of farmers of not being able to use internet-enabled computers for the information needed. In addition, the farmer whose view reflects the members of the focus group in general stated that internet-enabled computers have many advantages, more than other sources of information they were currently using. However, the advantages of internet-enabled computers that enable farmers to access information online are being hampered because of lack of access and unavailability of gadgets such as computers or tablets to access the information. Put differently, inaccessibility of internet-enabled computers to the farmers has not allowed them to experience the advantages of internet-enabled computers over other platforms or means of obtaining information for their farming activities. In this case, lack of access is negatively related to relative advantage as an attribute for decision making to adoption of internet-enabled computers when considered from the current study's perspective. In the absence of the problem of accessibility or lack of gadgets to access relevant online information, it means the farmers recognise that internet-enabled computers are a better means of access to information that they (the farmers) can use for the farming activities. One farmer (F2) simply said:

This computer thing is good but where is the money to purchase them?

F1 and F2 reinforced the view that through the provision of information centres or online knowledge centres where there would be internet-enabled computers, rural farmers would be able to access information more speedily that would enhance their farming practices and sell farming products locally and in global markets. Revealed in these farmers' (F1 and F2) responses is the fact that they concurred that internet-enabled computers would provide them more speedy access to agricultural information than would all other means of access to information that they were currently using. Indeed, farmers further claimed that the establishment of centres where they can use internet-enabled computers to access online information for agricultural purposes would assist them in learning computer skills and enable them to access information about agricultural development, and make marketing-related decisions independently (UNDP 2005) rather than waiting for agricultural extension officers for information. The aforementioned finding highlighted the advantages of internet-enabled computers as opposed to the farmers' traditional sources of information.

In addition, according to one of the farmers (F3):

We need to be able to market our products, and I know this thing you are talking about (internet-enabled computers) can help us better because it allows you to sell a lot even from your home, but it involves a lot of things in terms of online payment system, which we will not be able to set up.

This farmer (F3) emphasized the relative advantage of internet-enabled computers as online marketing tools over all other marketing tools that farmers can use to sell their products. Even though the farmer did mention that there might be challenges regarding online payment, such as setting up an online facility for their potential

customers to pay for their product, the advantage of internet-enabled computers for agricultural information as opposed to other platforms for agricultural information was not lost in her view. She categorically said that internet-enabled computers could help them better to sell their farms produce even from home. This means that the farmers believe that internet-enabled computers are better; hence, such relative advantage points to the likelihood that the farmer would adopt internet-enabled computers if given the opportunity.

The analysed data also showed that several participants claimed that the farmers in rural areas did not have access to internet-enabled computers to access online information in the past; rather, farmers could only obtain information on agricultural development from the extension office using manuals and face-to-face contact with the extension officers. This applies to how they can market their products or the latest marketing opportunities. A participant (F4) claimed it was only possible on very few occasions for farmers to get information on agricultural development from the University of Fort Hare:

There is no public information centre in Alice; it is only a lecturer at the University of Fort Hare that is training farmers and giving us information, but I think that even the information he is giving us is from the one he got from his computer, and he is an expert.

Participant F4 is not disputing the relative advantage of internet-enabled computers but emphasising how the inaccessibility of computers is not beneficial to them. The farmers' allusion to internet-enabled computers is in terms of what he believed it could do as opposed to other sources of information. To the farmer and others in the focus group, the training and agricultural information they were receiving was taken from an internet-enabled computer. Some participants claimed that the radio and television were the only available means of accessing agricultural information. According to a farmer (F5):

As a farmer in this community, I have not used any computer or internet equipment in this community, but I do have a television and a radio. There is a programme on television that starts at about 5:20 am in the morning that teaches different agricultural methods. We want to see what others are doing in the world about agriculture. The ones we see and hear on TV and Radio are the South African ones. I hear the computer will give you everything in the world.

For this farmer (F5), while not discounting the ability of the radio and television to give information, suggested the internet-enabled computer provides better access to information because it offers an opportunity to know "what others are doing in the world about agriculture". The farmer went further to say: "I hear the computer will give you everything in the world". Everything in the world in this context means that internet-enabled computers, as opposed to other sources of accessing information such as radio and television, will give the farmers all the information they want about their agricultural practices. This speaks to why people would want to adopt internet-enabled computers as an innovation. Even though the computer is not new to this farmer and others, it is still a new innovation in terms of its ability to provide agricultural information. What will make them adopt it, as the analysis has shown, is its relative advantage over traditional media such as radio and television.

There are many advantages of internet-enabled computers for rural farmers in the community studied. It is clear that radio and television, which the farmers are used to for obtaining information, are not giving farmers information like internet-enabled computers would do, so there is a need for the establishment of ICT centres that will enable people to obtain computer training and its associated services such as internet services. Other relevant services that can be accessed using internet-enabled computers in ICT hubs such as telecentres include the provision of community and government information, among others (Lesame 2005).

Further comments from participants show that internet-enabled computers will help the farmers better to access online information for their agricultural practices, and this could prove to be a catalyst to upscale agricultural development in their rural communities. F6 echoed the views of many others in the focus group when saying:

The new information that is being brought by this new technology has an impact on our farmers because it will increase their production and the quality of their produce.

The new technology the farmer was referring to is internet-enabled computers. This farmer saw the advantage of the new technology or internet-enabled computers from production and quality perspectives. The farmer added that the new technology would complement the ones they were already using. Hence, the farmer (F6) said:

The new technology is also good. It will be another one because when farmers hear programmes from the radio on how to solve a problem and on how to manage potato production, they can now know how to take care of the potatoes. Unlike when they were not having radio, they don't know how to manage the development of the potatoes up to the maturity stage.

In other words, the benefits of the new technology and the old ones (radio and television) are that they complement each other. Considered from the adoption of innovation perspective, the farmers would be willing to adopt the new technology because of its added advantage to the existing technologies they employ.

Compatibility: Farmers' Perceptions of the Compatibility of Internet-enabled Computer for Online Information

The analysed data reflected that the question of compatibility aligned with the participants' expected experiences in terms of internet-enabled computers. In this respect, many of the participants claimed there had not been notable changes in the farming techniques used in their communities in the past 10 years. Despite the availability of the extension office, participants claimed that similar farming strategies were used because of the lack of alternative sources of information, and these farming techniques were no longer suitable. One of the farmers (F7) stated:

… These days there are very few methods in producing agricultural products such as vegetables; even in livestock, there are few methods that are used. But we see on TV, white farmers' livestock and poultry are different. It means there are things the extension officers are not telling or showing us. What they are showing is not taking us anywhere; it is not relevant to what we want. We are just in one place – not moving forward.

In responding to the questions asked to examine the compatibility of internet-enabled computers, participants F7 instead chose to discuss the incompatibility of their current sources of information. F7 paints a picture of farmers who think the agricultural extension's engagement is not compatible with their present agricultural practices. In other words, internet-enabled computers bore promising information for the farmers, but this was not being promoted by the agricultural extension officers.

Majority of the participants further claimed farmers need information gadgets such as computers to access relevant agricultural information to improve the quality of their agricultural produce because their current sources of information were incompatible with their needs. Going by the farmers' need for internet-enabled computers, it means they will adopt it as a means to access information if they have the means. A farmer (F8) whose view resonated with others in the group, said:

I know there are many agricultural practices that help you to accomplish many things relating to agriculture. With good farming practice, you help your soil to be good and know which crops to plant together. If we get access to an internet-enabled computer or online information, we will get this information on our own. Accessing this service through the telecentres is very difficult because it costs money.

The participant (F8) realised the compatibility of internet-enabled computers to their current and future agricultural information needs and therefore expressed a desire on behalf himself and other farmers in their community for access to internet-enabled computers. For technology such as the internet and computers to be relevant to these farmers, they needed to reflect the experiences and values of the farmers. As explained by the participants, the information they were obtaining from the agricultural extension officers was proving incompatible with their needs, and they would therefore adopt any innovation such as internet-enabled computers if it met their needs for information tailored to their agricultural practices.

Complexity: Farmers' Perceptions of Complexity of Internet-Enabled Computer for Accessing Online Information

The analysed data show that even though the farmers agreed that online information obtained from internet-enabled computers is good for their farming practices because of the vast

amount of information it provides, they were all in agreement that it was still not easy to use. One of the participants (F3) mentioned the complexity in terms of being able to create online payment facilities. Other farmers were not educated in the language of information technology, which is usually English, and they referred to it as a tool for educated people. One of the participants (F8) said her daughter gave her weather reports from her computer and smartphone and would teach her how to find the information herself. According to F8:

She said she would teach me how to check on my phone or the computer at home but … I doubt if I am ready to start leaning again.

F8's reluctance "to start learning again" or to learn how to use a computer is clearly about the assumption that it is difficult to gain this skill. This perception affected F8 and other farmers' adoptive behaviour of internet-enabled computers. In addition, a young farmer (F9), who claimed she was computer and internet savvy, said she had no problem finding what she wanted from the computer, but:

I get put off when I google for information and I get many information pulled up for me and I don't know which one is the information I will use. You have to go through one by one for the relevant information, and this takes time and a lot of data.

For participant F9, while she does not see difficulty in using internet-enabled computer to access information, the fact that she was using Google that does not readily give her the information she wants and thus stays far longer online than anticipated is being construed as difficulty of using internet-enabled computers. F9's response is also linked to the purchase of data mentioned by most participants in terms of being a challenge of internet-enabled computers. In South Africa, data to access the internet is generally very expensive. This poses challenges or difficulties for rural farmers who may want to access information online through internet-enabled computers. A farmer (F10) said:

When I think of data to use, I just give up because you have to read through the information online and your data is burning. The government must do something about this. We are in rural areas. We don't have money like people in cities.

The excerpts from these participants (F8, F9 and F10) clearly demonstrate why some innovations fail because if it is too complex or if factors such as finance are making it difficult for people to access innovations; when such is the case, people will stick to the existing technologies with which they are familiar. The farmers realise the importance of internet-enabled computers for accessing online information for agricultural purposes. However, what is complex or making the use of computers difficult is data costs: rural famers do not have the financial means to buy enough data to remain online or to read the online information.

Perceptions of Rural Farmers Regarding Trialability of Internet-Enabled Computer for Online Information

Some participants admitted that internet-enabled computers would enable them to get the necessary information to improve on existing agricultural techniques and farming products in the community, but the practicability of the information received thus far has not been what they expected. According to one of the farmers (F11):

This thing (internet-enabled computer) will improve farming production because we will get information on how to plant and sell our farming produce, but most of the information we got did not work when we tried it.

F11's response shows that the information the farmers were accessing was not practical to them when they tried to use it. This may be because of the complexity of the information that made the information not triable. Complexity, as explained above, is linked to trialability because something can only be tried if understood. According to Kapoor et al. (2014) perceived ease of use is regarded as one fundamental determinant of trialability. Most of the participants claimed online information, as explained, could assist farmers to improve their agricultural produce and production if it is made available in a way they can easily understand or if it is user-friendly. They also emphasised that the information has to be demonstrably relevant to their agricultural practices. A farmer (F12) who participated in the focus group interview claimed:

Sometimes you will find out that there are farmers in the community who are interested in

learning how to farm and are taught how to prune in whatever way. But most of the information they are getting online is Western-oriented or not applicable, and they cannot be tried in the local context.

According to Cognatek Group (2004), an innovation that is triable has to represent less uncertainty to the individual who is thinking of adopting it. In other words, if there is uncertainty about the efficacy of an innovation, the chances of it being adopted will be limited. The data analysed above are relevant in this regard. A farmer (F13) said:

We need agricultural extension officers to tell us what to do with the information we get online so that we will be confident when we try the information on crops and livestock. If no one explains to us, we will not be able to use some of the information because what if my cattle die through wrong information?

This participant's view captures one of the innovation processes that is largely ignored. It is critical that there is someone on hand to manage the introduction of innovation in the form of practically showing or doing a trial to prove the efficacy of the innovation to the rural farmers. Online information obtained through internet-enabled computers may be something that is widespread across the world, but this does not mean that people would want to use information they receive without evidence of at least a trial that the information works as intended. It is therefore essential that in the context of agriculture in the rural areas, the agricultural extension officers have to be on hand to demonstrate the efficacy of most of the information through trial in order to scale up the uptake of innovations such as internet-enabled computers.

Observability of the Advantages of Internet-enabled Computer for Online Information

Modern agricultural technology will be potent sources of change in rural life if the results of their usefulness are easily observable or seen by the rural farmers. According to Munyua (2000), internet-enabled computers can potentially offer necessary information to the rural communities in a timely, and cost-effective manner and could complement traditional media. This will be achievable if there is evidence of the successful application of computer-based technology for farming practices. A farmer (F14) in one of the focus group interviews stated:

I think I should highlight the fact that we hear of these ideas, especially the wonders of the computer and online world but we haven't really seen an example of a farmer who said my farming practices have improved because of this thing. Seeing it is one of the things that can help us to really want to use or get information through this thing.

F14's response clearly indicates that if the farmers are able to see or observe what internet-enabled computers could offer in terms of agricultural information, they will be willing to adopt it as an information source. In addition, F14'S response reflects why, when people see the results of an innovation either around them or somewhere else, they are more likely to adopt the innovation (Cognatek Group 2004). However, another farmer in the focus group had a contradictory response. According to the farmer (F15):

Our traditional cattle are smaller and different from white farmers'. Their chickens can lay several eggs more than the ones we have. My friend who works for one of these farms told me there is nothing the farmers cannot do with their computers, and I can see with my eyes that there are differences.

The excerpt (F15) above clearly shows the efficacy of internet-enabled computers as an innovation. The farmer's (F5) declaration and admiration of the white farmer's cattle and chickens due to the observable difference internet-enabled computers have made to the white farmers' agricultural products shows that farmers and others in the focus group will adopt internet-enabled computers. This farmer's (F15) response represents the views of the majority of the farmers. The response is a clear indication of how observability as an attribute of innovation can influence adoption. In other words, if results of an innovation are observable, the likelihood of farmers adopting internet-enabled computers is high. A statement that 'seeing is believing' holds sway given the presented responses.

DISCUSSION

The aim of this study was to examine the perceptions of adoption of internet-enabled

computers among rural farmers in the studied communities. Using the five attributes (relative advantages, compatibility, complexity, trialability and observability) of innovation that influence the adoption decision (Rogers 2003), the findings revealed that the perceptions of internet-enabled computers' relative advantages are positive as opposed to other means of access to agricultural information in the rural communities this study investigated. However, these advantages may not be realised because of a lack of accessibility because the farmers complained of lack of accessibility to internet-enabled computers. In other words, opportunities to access information technology such as internet-enabled computers in the communities studied are limited, and this prevents their advantages from significantly filtering through to the farmers. As the analysed data have shown, information technology in the form of internet-enabled computers will help to align farm output to market demands and secure improved quality, productivity and better prices, and adequate access to improved quality farm inputs at minimum costs to farmers.

In addition, the data about the relative advantages of internet-enabled computers over all other sources of information was not discounted by the farmers. This, therefore, means that barring the problem of accessibility of internet-enabled computers, the confirmed relative advantages of internet-enabled computers are likely to encourage the farmers adopt computers as a means of access to agricultural information. The findings of this study in this regard are consistent with past studies. For example, Kabbar and Crump (2006) revealed that the participants in their study adopted the use of computers because of their relative advantage over other sources of information. Equally, Lawrence and Tar's (2018) study shows that teachers' perceptions of the relative advantage of ICT influences their adoption and integration of computers in their teaching. In alignment with our research is Tully's (2015) study. Tully (2015) reported that organic farmers perceptions of the relative advantage of open-source software influenced their desires to adopt the software.

The data analysed about compatibility as an attribute that may influence the adoption of internet-enabled computers revealed that the current sources of information for agricultural practices in the rural communities examined were not compatible with the farmers' needs and experiences. In other words, internet-enabled computers as an innovation would enable the farmers to have relevant information to meet the current farming practices. Internet-enabled computers are likely to be adopted because of their compatibility. Technology compatibility has been one of the fundamental characteristics that would make people to want to adopt it. Teachers who participated in Lawrence and Tar's (2018) study cited compatibility of ICT as a significant factor to its adoption. Compatibility was mentioned to be responsible for the frequency of use of computers by farmers because of its relevance to their needs, according to Pick et al. (2014). Likewise, Huh et al.'s (2009) study concluded that compatibility is a determinant of attitude to adopt information science.

Equally, even though the farmers agreed that information technology in the form of internet-enabled computers will be beneficial to their farming practices, the skills to use computers were lacking among farmers, partly because of the language barrier, that is, farmers' inability to understand English; information technology and the medium used to disseminate information on farming techniques were mostly explained in English. This shows how the complexity of an innovation can be a challenge with respect to its use and curtail its widespread adoption. Complexity can also be linked to challenge of data acquisition to access agricultural information. For example, one of the farmers who reflected a general view of the farmers in the focus group interviewed said, "When I think of data to use, I just give up because you have to read through the information online and your data is burning." Considering how this makes the farmers believe that owning or adopting internet-enabled computers is something not to ponder because of prohibitive data cost, we believe that the question of data to access information is making the adoption complex. Complexity as an attribute of innovation has always been cited by researchers as one of the constructs mediating against the uptake of internet-enabled computers. There is a general perception among farmers in the rural areas that computers are for educated people (Mukerji 2010), and their ownership cannot be sus-

tained by poor rural farmers (Toyoma et al. 2005). In the same vein, complexity of an innovation has been linked to infrequent or poor use (Pick et al. 2014) by those who adopted the innovation.

Complexity in the form of inability or difficulties in operating a computer and questions of trialability of information technology were mentioned as challenges by the farmers, and these factors could affect farmers' adoption of the technology. The findings about trialability show that most of the agricultural information obtained through internet-enabled computers did not work when applied to local contexts because it was Western-based. Hence, some of the farmers called for the agricultural extension officers to demonstrate or try the information in terms of its applicability to their agricultural needs. The farmers' claims regarding trialability as an attribute of innovation is not against internet-enabled computers itself but the information they access through it. In the absence of demonstrability of the practicality of the online information they obtain through computers, the farmers are likely not to adopt computers. In other words, the farmers will not consider computers useful to them if the information they obtain from it is not useful due to the fact it is tried and not practically relevant or not a good fit for its purpose in the local context. What this leads to is either lack of adoption of internet-enabled computers or low adoption rates. The findings regarding trialability is consistent with a previous study by Turner and Turner (2002) who found that lack of trialability contributed to the lack of uptake of computers. In considering the adoption of ICT, Jebeile and Reeve (2003) concluded in their study that teachers reported that trialability among other attributes should be considered. In sum, trialability as an attribute of an innovation is an important consideration before adoption takes place because it enables the adopters to reduce their reservations about an unfamiliar innovation (Alam et al. 2007).

Observability of an innovation is an important factor in adoption of an innovation (Monchak and Kim 2011; Rogers 2003). Majority of the farmers mentioned that information technology's (internet-enabled computers) impacts are readily available in their communities. Although a farmer (F14) whose view represented a few others claimed not to have observed the benefit or the results of the online information obtained through internet-enabled computers, she attests to the fact that observability of what internet-enabled computers signify for their farming practices would prompt them to adopt it. In light of this, the likelihood of the farmers' adopting internet-enabled computers is high, given the explanation of observability as an attribute that explains why they would want to adopt internet-enabled computers. When people see the positive results of an innovation, the chances of them adopting the innovation is increased.

Past studies agree with the findings. Concerning observability, a study on Indian telecentres suggests that observability or visibility influenced the use of the centre (Gollakota et al. 2012). Observability is equally ascribed to the why Indian farmers in Pick et al.'s (2014) study used computers they accessed through telecentres. The study by Weir and Knight (2004) also supports the findings reported in the current research. They reported that the use of telecentres in which computers are used to access online information was due to social networks, which include observability.

From the analysed data, the study has not only shown the perspective in which information technology (internet-enabled computers) in rural agriculture can be approached, but it has also added to the body of literature, especially the literature about rural agricultural practices. These findings are useful for rural agriculture because it underlines the importance of the different attributes of innovation, which in the context of the current study, will provide understanding of the adoption of internet-enabled computers that farmers need to obtain information for their agricultural practices.

Directions for Future Research

The results of the present study suggest that knowing the perceptions of the rural farmers will help in the planning and upscaling their adoption of internet-enabled computers, especially given the drive by the government to bridge the digital divide between the urban and rural dwellers in South Africa. The study underscores the importance of rural agricultural extension officers because they have day-to-day interpersonal communication encounters with farmers. Hence, further research should attempt to determine

what their perceptions of internet-enabled computers in rural agricultural development are. This is necessary because if the agricultural extension officers' perceptions of internet-enabled computers in rural agriculture are poor or negative, there will be challenges in using the agricultural extension officers. For example, future studies could examine the degree to which the agricultural extension officers know about the importance of internet-enabled computers in general and the extent to which they are using them to access the information they give the farmers.

It might also be helpful to understand other socio-structural challenges preventing the spread of internet-enabled computers in the communities studied and other similar communities in South Africa. Such knowledge will enable the government or other rural agriculture development organisations to plan with mitigating factors in mind.

CONCLUSION

This study highlighted the perceptions of internet-enabled computers especially as they relate to the rural communities studied in terms of the levels of their use and what could possibly affect their widespread use. From the findings, it can be seen that a good agricultural extension policy is required to assist farmers to obtain information that is necessary for their farming practices. The study has contributed to knowledge in the areas of internet-enabled computer use to obtain needed information about rural agriculture and rural development. For policy purposes about internet-enabled computer use in rural agriculture, the analysed data may improve understanding of the perspective of how internet-enabled computers can influence rural agriculture in South Africa in particular and rural communities in developing countries in general.

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