CHALLENGES FACING THE USE OF MOBILE APPLICATIONS FOR E-COMMERCE IN KENYA'S MANUFACTURING INDUSTRY

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ABSTRACT
Ever-evolving wireless technology has given rise to a new way of conducting business, namely by using mobile devices that are ubiquitous and convenient to use in electronic commerce (e-commerce). Moreover, a new type of e-commerce has come into play, where business is conducted using applications installed on mobile devices - apps which can be tailored to perform specific services for each organisation. While the use of these apps has the capability of improving the profitability of an organisation, their uptake in Kenya has been low, and there is a paucity of information to explain why. Given this background, the current study was done to establish the challenges faced by users of these apps in Kenya's manufacturing industries. Grounded theory methodology was used to collect and analyse data, which identified technological, security, cost, computer literacy and environmental issues as the main obstacles to the use of these apps. Strategies to overcome such challenges are proposed. The article contributes to the literature by exploring the gaps between the characteristics of mobile applications for e-commerce and their ability to attract usage in manufacturing industries in Kenya. The research may also prove useful in guiding researchers who wish to use grounded theory methodology in their work.

KEYWORDS
E-Commerce Adoption, Mobile Applications, Manufacturing Industries in Kenya, Mobile Applications Users

1. INTRODUCTION
Globalisation, business competition and ever-changing information and communication technologies (ICTs) have revolutionised the way business is conducted (Pavic et al., 2007), where electronic commerce (e-commerce) acts as a catalyst for development in both developed and developing countries (Apulu & Ige, 2011). This has resulted in small and medium-sized enterprises (SMEs) becoming major sources of livelihood, technological advances and competitive advantages in the business environment (Ghobakhloo et al., 2011). While part of these achievements can be attributed to the adoption of e-commerce, which has the potential to enhance business productivity, the use of mobile applications will further improve productivity, since e-commerce is conducted using mobile phones which are ubiquitous (Pete, 2009).

The benefits of mobile applications for e-commerce have, however, not been realised in Kenya due to their low usage (Nakhumwa, 2013). The current research was motivated by this observation, which was made despite the fact that Kenya has overcome communication problems through the widespread use of mobile phones (Zaied, 2012; Zurovac et al., 2011). It could thus be expected that, as the use of mobile phones escalates in Kenya, so the use of mobile applications for e-commerce will likewise increase. Unfortunately, this is not the case - organisations have largely failed to reach the levels of use required to realise the benefits associated with these applications (Kenneth et al., 2012). Moreover, even where organisations have adopted e-commerce, usage levels have remained relatively low, because few Kenyans are willing to use these applications (Magutu et al., 2011). Such low levels of

usage have resulted in low e-commerce adoption rates (Tibbs et al., 2015), which has effectively robbed many organisations of a powerful application that can market their products globally (Ongori & Migiro, 2011).

This apparent unwillingness to use mobile applications for e-commerce has had a devastating effect locally, since it makes no monetary sense for organisations to invest in any applications which their buyers, suppliers and other trading partners decline to use. What is not clear, is why the use of these applications is low in Kenya, where more than 60 per cent of the population own mobile phones (Crandall et al., 2012). In addition, there is scanty information on the challenges users of these applications face in developing countries (Qiang et al., 2012), and the possible strategies that can be employed to overcome them. Such strategies could be useful in endearing consumers to the organisation's products, in addition to helping companies realise a profit and reap other benefits that come with using these applications (Hoofnagle et al., 2012). A significant challenge is how organisations can fundamentally change the mind-set of their customers, partners and staff away from operating in traditional ways, to embrace modern technological innovations (Chen et al., 2001).

With a view to informing organisations on the strategies they can implement to enhance the use of mobile applications for e-commerce in their businesses, the researchers studied the factors hindering the uptake of such apps in the manufacturing industries. The researchers described, interpreted, analysed and attempted to understand those challenges, in seeking a theory that was intimately tied with the evidence gathered from interview data - the aim being that the resultant theory would be consistent with empirical data, as recommended by Orlikowski (1993).

The research reported on here, was guided by the question: What can be learned about the usage of mobile applications for e-commerce by manufacturing industries in Kenya? To address this question, the following subsidiary questions were identified:

1.   What challenges hinder the use of mobile applications for e-commerce in manufacturing industries in Kenya?
2.   What possible strategies can be implemented to enhance the use of mobile applications for e-commerce in the manufacturing industries in Kenya?
3.   Since the use of mobile applications for e-commerce is a relatively new technological innovation in Kenya, grounded theory methodology - which is ideal for exploring relationships in an area where minimal research has been done before (Crooks, 2001) - was used to collect and analyse data. These processes enabled the researchers to develop new ideas, by allowing issues to emerge from the findings, rather than enforcing preconceived ideas on the interview data (Ramenyi, 2013).

The article begins with a discussion of the characteristics of mobile applications, followed by an overview of related existing research and of grounded theory methodology. This is followed by a description of the processes involved in collecting and analysing data, using grounded theory. The findings are presented, along with a discussion, proposed strategies and a conclusion.

2.   CHARACTERISTICS OF MOBILE APPLICATIONS

Mobile phones have evolved over time, from traditional simple phones to high-tech devices which come in personal digital assistants (PDAs), mobile tablets and smart phones. These devices are endowed with characteristics such as mobility, ease of use and the ability to integrate with other software solutions, such as Enterprise Resource Planning. This has created the need for mobile applications or tools which will help open new business opportunities by engaging directly with customers who own mobile phones (Cuomo, 2013).

Mobile applications (commonly referred to as apps), which are types of software designed to run on mobile devices (e.g. smartphone or tablet computer), are generally small, individual units with limited function (3way Communications, 2016). When used optimally in an organisation, mobile apps for e-commerce grant a company a competitive advantage by generating higher revenues (Stafford, 2016).

When mobile applications are used for e-commerce transactions, they increase brand loyalty and engage continuously with consumers through catalogue updates, offers and deals, without being hindered by the limitations of a mobile browser (May, 2001). Retailers can take advantage of features such as location-based services, cameras and push notifications, integration capabilities, mobile payment options, and ease of use (Andam, 2003). Such features go a long way in allowing users to scan a barcode or snap a picture to find the exact product in their catalogue, resulting in increased sales (May, 2001).

Users of mobile applications for e-commerce can access the required information from anywhere, at any time. That means they can also make purchases or sales at any time. This aspect trumps traditional modes of commercial exchange, where purchasers and sellers had to physically meet, and exchange goods and services. Since apps run on mobile devices using wireless networks, their use is possible as long as the user is in a location where s/he can connect to a mobile network (Malloy et al., 2002).

Mobile applications thus represent an effective way of delivering e-commerce to consumers, regardless of time and location, prompting many organisations to offer additional apps (Lee et al., 2005). Organisations with such a competitive advantage grant their workers access to comprehensive data and information on demand, allowing them to use their own mobile devices to view jobs, service histories and customer information, send messages, capture signatures, record asset details and parts usage, view manuals, collaborate with colleagues, and much more (Stanley, 2015).

In a business organisation, Stanley (2015) observes that mobile apps for e-commerce can provide operational solutions such as enabling workers to schedule tasks, dispatch work assignments and track progress. Stanley further notes that these apps can enhance organisations' productivity and efficiency by enabling workers to generate work orders (either individually or in batches), track and manage inventory, manage business and customer data (e.g., warranties, renewals and contracts) and engage in real-time chats with suppliers, managers and customers. These benefits make e-commence apps valuable tools which organisations can use to enhance their operational efficiency.

## 3.	OVERVIEW OF EXISTING RESEARCH

Past research in Kenya mainly investigated the factors influencing the adoption of e-commerce and related innovations (Lule et al., 2012; Magutu et al., 2011; Nakhumwa, 2013; Ongori & Migiro, 2011; Scupola, 2009), however, little research has been done on the challenges of using mobile apps for e-commerce in Kenya. A study by Nyaga and Ogollah (2015) sought to explore the challenges facing mobile network operators in penetrating the mobile money transfer market in Kenya, which was dominated by a single service provider. That study established that innovative products attract customers to such services. Notably, initial customer experience with that service provider determines whether s/he remains loyal or moves to another provider. The study did not address the challenges facing those who use money transfer services or mobile devices for the same purpose - a terrain which this article aims to address.

Using a qualitative research technique, Otieno et al. (2016) investigated the challenges of using and adopting mobile phone money services. Their findings, based on rural poor communities in Kenya, identified as problematic a lack of documents (e.g., national ID cards/passports, required to register as a mobile phone money user), a shortage of

mobile phone money agents, and the paucity of information on how to access and operate certain features on the mobile money platform. Their study did not delve into respondents' use of mobile phone money services as an application to pay for goods using e-commerce, nor did they use grounded theory as methodology which could have led to possible development of theory in mobile phone money services.

From a government policy perspective, and conscious of the benefits a country can realise from e-commerce adoption, the Government of Kenya (GoK) developed an institutional framework for policy development and review, with the aim of supporting ICT development and investment, and ensuring affordability and nation-wide access (Kenya National Bureau of Statistics, 2015). This was a commendable effort, yet to make a significant impact on the economy, further strategies must be put in place to popularise the use of mobile apps for e-commerce. The lack of such strategies could explain the low usage rate and resulting low adoption of mobile apps for e-commerce in Kenya (Kenneth et al., 2012). The current article addresses this shortcoming by proposing strategies to enhance the use of mobile apps for e-commerce, and improve the adoption thereof.

4.   METHODOLOGY

This section discusses grounded theory as defined in Glaser et al. (1968), Glaser (1978), Strauss and Corbin (1998) and Charmaz (2006). Grounded theory, developed by Glaser et al. (1968), is a method used extensively for qualitative research. An inductive theory, it is discovered, developed and verified through systematic data collection and analysis of processes pertaining to a particular phenomenon (Strauss & Corbin, 1998). The theory that is developed when this research method is used fits in with the research data, unlike theories that are derived deductively from grand theory, without the help of data, and which might not to fit into any data.

When Glaser et al. (1968) proposed their grounded theory they argued for an alternative approach, where data is collected and analysed and the results are used as the basis of theory development. This proposition represented a paradigm shift from the deductive approach to theory development, where the research starts with pre-existing hypotheses or theories, and data is collected and analysed to test those theories - that means the theories are proposed prior to data collection and analysis. Deduction thus moves from the general to the particular, which is contrary to the inductive approach of grounded theory, which moves from the particular to the general; (Strauss & Corbin, 1998). Therefore, theory developed using the inductive approach is said to be "grounded in data" (Strauss & Corbin, 1994).

Grounded theory was preferred in this study due to its increased use in information systems research, and its dominance as a paradigm for social research. More researchers have begun doing qualitative studies, which makes it worthwhile to reflect on what can be learned from other work which used the same research method (Hughes & Jones, 2003).

Grounded theory is useful for its procedures which allow researchers to discover and generate conceptual properties and categories from qualitative data. To this end, a number of guidelines and procedures were followed in this study, similar to what Lawrence and Tar (2013) did.

While deciding on the specific area of mobile applications for e-commerce to anchor this research, the literature review conducted enabled the researchers to develop an interview guide for collecting qualitative data from study participants. This was in line with the recommendations of Glaser (2004), who notes that "undertaking an extensive literature review before the emergence of the core category can violate the basic premise of grounded theory", to avoid delving too deeply in the literature review.

4.1.   Data Collection

Data was collected using semi-structured interviews with the customers (buyers), suppliers and staff of firms registered with the Kenya Association of Manufacturers (KAM) at the time of the study (see Table 1). Firms in the manufacturing industries were considered appropriate for this study, because there was a likelihood of them having e-commerce transactions or processes that used (or could use) mobile apps for e-commerce, such as transactions with suppliers (e.g. receiving and processing orders, delivering materials and issuing invoices); e-commerce transactions with customers who purchase goods online; and the in-house management of invoices and inventory.

Table 1: SMEs That Are Members of KAM

Sector	Number of Organisations
Service and consultancy	77
Building, mining and construction	22
Chemical and allied sector	74
Energy, electrical and electronics	40
Food and beverages	181
Leather and footwear	10
Metal and allied sector	75
Motor vehicle and accessories	40
Paper and board sector	69
Pharmaceutical and medical equipment	26
Plastic and rubber	63
Fresh produce	4
Textile and apparel	63
Timber, wood and furniture	19
TOTAL	**763**

Source: KAM (2014)

Beforehand, the researchers obtained ethical clearance and permission to collect data from the ethics committee of their institution, and from KAM. The latter issued a letter of introduction to the manufacturing industries, requesting their assistance in urging their staff, customers and suppliers to participate in the study. KAM and the researchers agreed that the information gathered here would be used solely for academic purposes, while maintaining the confidentiality of the participating firms and respondents. In total, eight SMEs in Kenya's manufacturing sector agreed to participate (see Table 2).

Table 2: SMEs Participating in the Case Study

Manufacturer of
1.   Motor vehicles
2.   Chemicals
3.   Soft drinks
4.   Electrical equipment
5.   Various food products
6.   Tiles and carpets
7.   Vehicle spare parts
8.   Timber products

The eight SMEs supplied the email or postal addresses of most of the respondents, who were contacted and invited to participate in the study. Of those who agreed, sampling was limited to participants who used mobile apps for e-commerce, used e-commerce without mobile apps, or were involved in work processes that could use these apps. Purposive sampling, which could not be fully planned before the study commenced, was thus used as recommended by Lawrence and Tar (2013).

Using an exploratory research technique, data was collected by means of an open-ended face-to-face semi-structured interview guide, developed using Patton's (2005) guidelines (see Appendix1). During the interviews, all participants were asked the same questions, as stipulated in the interview guide, and any subsequent questions were determined by the responses/answers given by each participant.

4.2. Interview Schedules
In-depth interviews were conducted at venues that were convenient for the participants. The researcher/interviewer conducted some interviews in a hotel, and others in the participants' homes (if they were uncomfortable with being interviewed at the office, i.e. customers). Other participants were interviewed at work, which gave the interviewer an opportunity to observe some of the daily transactions and processes the participants were involved in. The initial 35 participants included:
1.   five suppliers of materials to different manufacturing industries
2.   twelve customers (four from motor vehicles manufacturers, one from vehicle spare parts, two from motor vehicles manufacturers, and five from electrical equipment manufacturers and ten from chemicals products manufacturers)
3.   seven staff members who managed inventory from six manufacturing firms
4.   eleven staff members who issued invoices and made payments from six manufacturing firms.

The researchers developed a rapport with the respondents, paying keen attention to their claims in order to interpret situations and statements during the interviews (see Strauss & Corbin, 1998). The duration of the interviews - conducted in English - was determined by the amount of information each participant was able/willing to give. Each session ended when the interviewer realised no new information was forthcoming.
1.   The interviewers requested permission to record the interviews. Interviews were audio recorded, transcribed and checked against the recordings.
2.   Every interviewee was identified, in the transcripts, using a number denoting the session when the interview was conducted, as well as the interviewee. For example, 'B9' was interviewed in session 'B', and was the ninth respondent to be interviewed. Identifier numbers rather than actual names or personal details were used, to maintain confidentiality.
3.   After each interview, the transcripts were analysed immediately to identify the possible emerging theory and determine whether further data collection was needed (see Glaser, 1978).
4.   For each session, the interviewer wrote a memo as record of the initial ideas captured. These were later evaluated against the respondent's account, to establish whether more data needed to be collected, to confirm the emerging theory and to enrich the data analysis process.
5.   Participants were contacted more than once to clarify concepts that had not emerged clearly during interviews.
6.   Phone and short text messages (SMS) interviews were the preferred mode of contact for the participants after the first face-to-face interview. This worked well, since it

enabled the interviewers to contact individuals without making appointments to meet. Telephonic interviews were used more frequently, where possible, since they proved to have similar length and depth to face-to-face interviews, and also allowed for a greater range of participation and flexibility.

7. As incentives, the researchers promised to give each participant information on how to access the article, once it is published.

4.3. Data Analysis

Data analysis was done concurrently with data collection, and used to determine whether more data needed to be collected (Charmaz, 2006). This process was done exhaustively (see Ramenyi, 2013), and at that point the researchers concluded that they had reached "theoretical sampling", which Glaser (1978) and Ramenyi (2013) describe as the point where no new or relevant ideas are forthcoming from data sources (see Figure 1 for this iteration process).
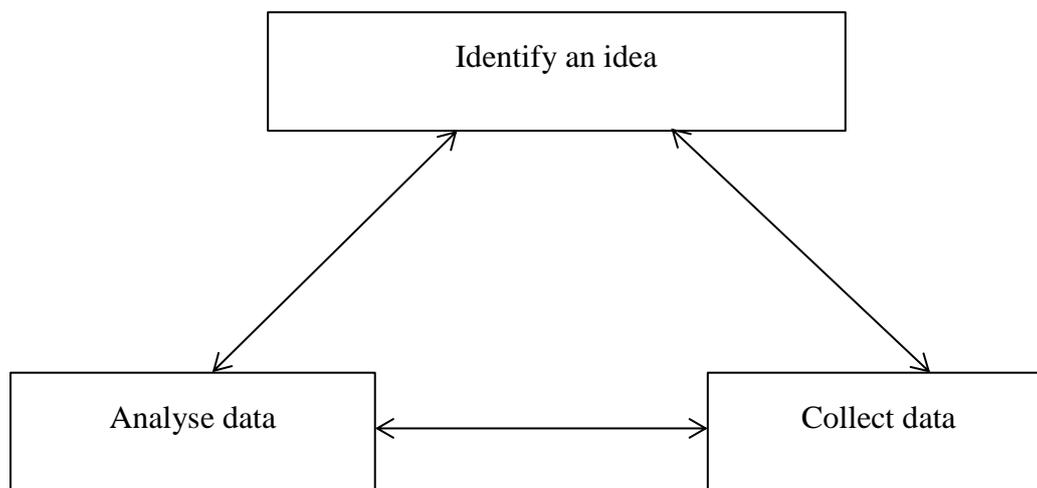
Figure 1: Data Collection and Analysis Iteration (Source)

Data analysis began with the open coding of the interview data, as suggested by Strauss and Corbin (1998). That involves breaking down, examining, comparing, conceptualising and categorising data. A microanalysis was done on transcripts gathered from the interviews, which involved analysing data word by word, sentence by sentence. Next, significant points/concepts emerging as words/phrases were identified and coded using a single word or sentence, which created labels summarising chunks of data or statements (see Strauss & Corbin, 1998). Only data relevant to the study, was used. Codes generated during data analysis were made to fit into the data, rather than vice versa.

Ramenyi (2013) describes two types of code that can be used for open coding techniques: 1) "in vivo coding", which uses synonyms, and 2) where the analyst uses the exact words uttered by the respondents. In this study, both types were used. In some cases, exact utterances best summarised the meaning, in others synonyms were used if they were more representative of an underlying concept. For some of the open codes that were formed from the raw data, see Table 3.

Table 3: Illustration of Raw Data and Open Coding Process

Raw data	Open code
Q. *What are the reasons that made you use/not use mobile applications for e-commerce again?* A. I tell you…. this application requires those young people with high computer skills. Is not for people like me who has not mastered computer skills. Q. *When you talk of "those young people", who are you referring to?* A. The ones who have graduated with computer qualifications from universities and other colleges. Q. *Are there other reasons that made you/your organisation stop using these apps?* A. Other buyers feels that this app is not the best to use and prefer going to do their transactions directly from the bank which one is 100% sure. That is why I changed and decided to be using the bank instead. A. The app was working well for us…. but for some reasons which we did not understand, the management of the company decided that the apps should stop being used until further notice. We stopped using the app waiting for further directives from our seniors.	-Requires young people with computer skills -Perception that the app is for the educated -Influence of other buyers -Directive from management to stop using the app
Q. *Please describe this application in terms of its functionalities.* A. To be frank many times I fail to raise invoices using this app. I keep calling for help, which makes me feel discouraged. If I don't get somebody to help me it becomes a real problem. Q. *Please try to explain how this failure occurs.* A. For me to complete raising an invoice using this app, there are too many steps involved. If I forget one step, the whole process fails. Is not easy to remember those steps always… but I hope that as I continue using this app I will become conversant. But I bet it will take me some time, though. Q. *What other difficulties have you experienced as you use these applications?* A. Several times I got stuck midway as I update the inventory from my phone. This mostly happens when I am in rural, remote areas where there is no Internet connection. Q. *Please share with me any other challenge that you encountered as you used this app.* A. Sometimes I want to use it to send invoice to the company, but if the company is not using the app it cannot work. We have tried to request them to use the app, in vain. Up to now we don't know why they avoid it. Q. *Have you experienced any other challenge with the Internet?* A. Yes. In some instances, the connection is slow hence it takes a long time to complete a transaction. The app only works well with service provider "X" and not with other service providers.	-Failure to recall how to use apps -Using the app involves many steps -Unable to use the app due to lack of Internet connection -Slow Internet connection -Failure by trading partner to use the app to enable mutual transactions - Works well with service providers who have a fast Internet connection
Q. *What personal challenges or threats do you feel the use of these apps have posed or will pose to you in the near future?* A. The app has to be installed in a smart phone and cannot run in our ordinary simple phone. Smart phones are expensive in this country. These apps also consume a lot of data bundles when they are used. Q. *What other challenges have you experiences with Internet connection?* A. There are criminals in the Internet who impersonate the organisations that are genuine. Is possible to send money to a non-existing company. I don't trust all the adverts I get from this app. Q. *What other security challenges have you ever encountered?* A. There are many… when I am asked to register in a company before buying from them, I give my personal details. I later find other companies sending me their stock list and calling me? Where did they get my details from? Were my details given out without my permission? I asked myself!	-Requirement of a smart phone that is expensive -Uses data bundles -Sending money to fraudsters -Receiving fake adverts -Personal details available to unintended companies
Q. *Can you briefly compare the experience you've had in using these apps (e.g. in managing software upgrades and maintenance, etc.)* A. Storage of this app requires a lot of storage space. The updates for this app also take a lot of storage space and use a lot of data bundles. I have to run updates when connected to WiFi otherwise it becomes too expensive to update. It also drains my phone battery so fast	-The app takes up phone storage space -App updates use a lot of data bundles -Drains battery

Note: Q = question, A = answer.

The second step in the data analysis was axial coding, i.e., coding done around the axis of a category where codes are grouped together depending on the similarities of their properties (see Glaser et al., 1968; Strauss & Corbin, 1998; Lawrence & Tar, 2013). While grouping the codes into categories, a continuous comparison was done - cases with cases, events with events, codes with codes - to understand and explain variations in the data (see Charmaz, 2006). The similarities and differences thus identified formed the basis of grouping open codes into categories, as recommended by Strauss and Corbin (1998) and Remenyi (2013). Following the recommendations of Glaser (1978), the researchers continued with open coding, comparing emerging concepts to establish which categories they belonged to until saturation point. For some of the categories formed from the open codes, see Table 4.

Table 4: Forming Categories from Open Codes

| Open code	Category
- Requires young people with computer skills - Perception that the app is for the educated	Lack of computer literacy
- Failure to recall how to use apps - Using the app involves many steps	Lack of ease of use
- Requirement of a smart phone that is expensive - Uses data bundles - The app takes up phone storage space - App updates use a lot of data bundles	Hardware and network connection expenses
- Unable to use the app due to lack of Internet connection - Slow Internet connection - Works well with service providers who have a fast Internet connection	Internet connection problems
- Sending money to fraudsters - Receiving fake adverts - Personal details available to unintended companies	Security concern
-Failure by trading partner to use the app to enable mutual transactions	Business partner issues
-Influence of other buyers -Directive from management to stop using the app	External influence
- The app takes up phone storage space -Drains phone battery	Impact on the device

The third step of data analysis was selective coding, which involved grouping together related concepts, formed during axial coding, into core categories (see Darke et al., 1998). To arrive at groupings, categories were repeatedly compared with one another, and those with similar patterns were grouped into core categories (see Glaser et al., 1968) For some of the core categories formed from the categories, see Table 5.

Table 5: Forming Core Categories from the Categories

Category	Core category
Lack of computer literacy	Lack of computer literacy
Cost of hardware and network connection	Concerns about the cost of using the app
Lack of ease of use, impact on the device and Internet connection	Technology issues
Security	Security issues/concerns
Business partner issues and external influence	Environmental issues

Lastly, data collected from the interviews was reviewed several times and compared with the emerging codes, categories and core categories. This comparison continued until theoretical saturation point - then the coding, grouping of similar codes into categories, and grouping of similar categories into core categories was stopped, as recommended by Strauss and Corbin (1998). At the end of this iteration process, five core categories emerged, as discussed under the findings section.

Figure 2 shows the grounded theory methodology workflow used in this study, outlining the various processes involved.
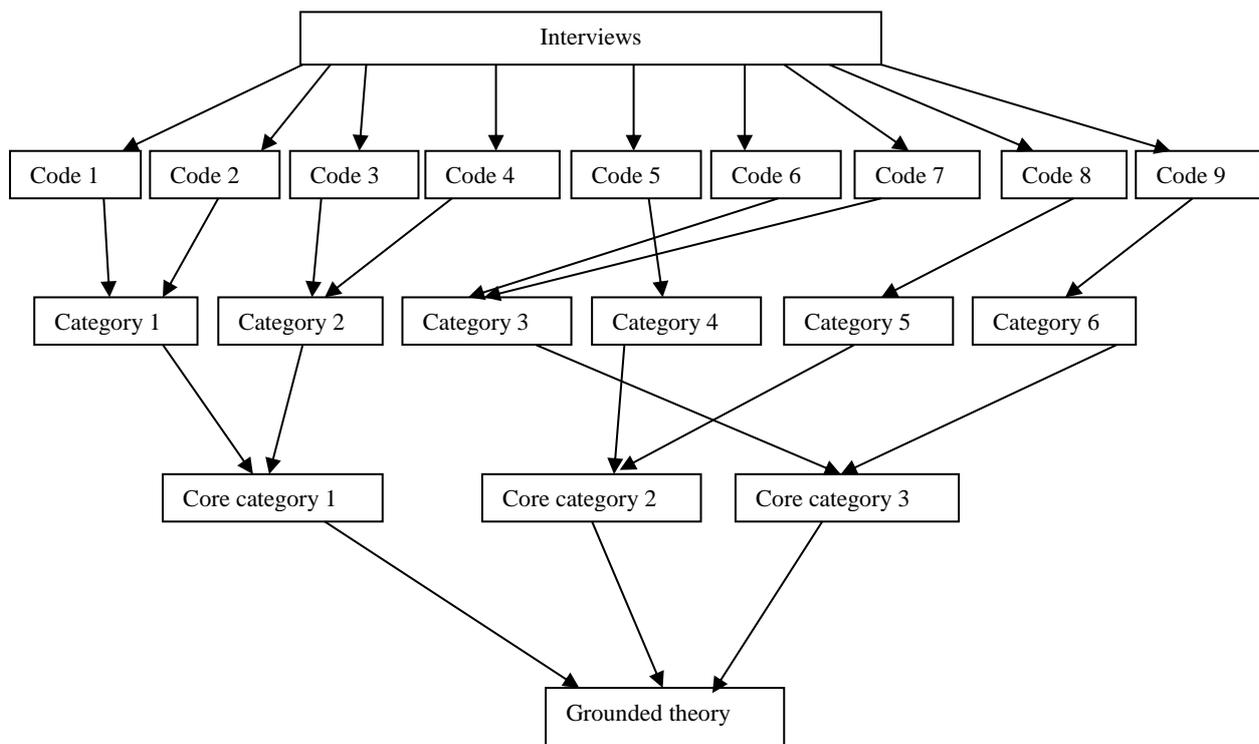
Figure 2: Illustration of Workflow of Grounded Theory Methodology

During the research process, the researchers wrote many memos about observations made, about events, codes, concepts or relationships between concepts and categories. Memos, in this study, were records of what emerged as data was being collected and analysed. This enabled the researchers to understand and analyse the data, as described by Ramenyi (2013). The memos were important in reminding the researchers of what had happened, of key phrases, events and observations arising during the interviews. This record of ideas flowing from the interviews helped create a theory. Some of these memos are shown below.

Memos

M1. The words "Internet in the rural areas" got my attention as that make rural folks who live in remote areas to lack the ability to use mobile applications for e-commerce and enjoy buying and selling products from their mobile phones. I thought of possible strategies of providing mobile Internet provider at the remote rural areas.

M2. "Fake organisations in Internet" got me wondering how users of mobile applications for e-commerce can identify the genuine organisations from the counterfeit ones. I envisaged the emotional trauma that poor businesspersons go through after losing their hard-earned cash to the criminals operating in the Internet who cannot be traced for prosecution. Phishing, espionage and man-in-the-middle came to play in my mind.

5.   FINDINGS

In this section we present the challenges which manufacturing industries face in using mobile apps to conduct e-commerce in Kenya. This report is informed by the outcome of data analysis (discussed earlier). Data from the interviews show that five main challenges hinder the use of mobile applications in Kenya (see Table 6).

Table 6: Core Categories Emerging From Research Data

Core Categories	Frequency of Occurrence
Lack of computer literacy	7
Concern on the cost of using the app	11
Technology issues	24
Security issues concerns	15
Environmental issues	8

Each of these challenges or influences is discussed below.

5.1.   Influence of Technology Issues

Technology-related issues pertaining to the use of mobile apps for e-commerce emerged as the key challenge hampering implementation in Kenya. As shown in Table 5, in 24 instances respondents cited this obstacle. The lack of network connectivity in some geographical locations in Kenya impeded the uptake of mobile apps for e-commerce. One respondent expressed his frustration with using the apps in different locations:

... when I am in remote rural areas in Kenya where there is no Internet connection or poor Internet connection, I cannot use this app to attend to urgent matters in the company. It requires me to wait until I get to a location where I can access the network for me to use this app, which is hinders me from working efficiently. (C6)

Another interviewee said:

I fail to use this app when I am out of the coverage of the local service provider for example when I am out of Kenya or the East African community region, which means that its service is limited within the local service provider network coverage only. (G2)

Service providers' network connectivity problems thus limited the use of mobile apps to specific locations in Kenya, which deters these apps from being used anywhere. In addition, the apps had an undesirable effect on devices, once installed, which made the users of these apps to stop using them. One interviewee, when asked why she had stopped using the mobile apps, responded:

You can't believe it that when I start using this app it drained my phone battery so fast. Since I needed to have my phone on most of the times, the only option was to disable this app and only use it when I have an external power source connected to my phone. (A3)

Other comments included:

The most annoying thing about this app is that when I installed it in my phone, I started get too many adverts some of which are not necessary and some were annoying. (D7)

What makes me feel uncomfortable with this app is that when I install it in my phone, it takes a lot of memory space in my phone, which prevents me from installing other apps afterwards. (E2)

When using this app, I do not easily maneuver my way through it. Is not easy to work with this app. Is very complicated. (A5)

Users thus faced a variety of technological issues which prevented them from using the apps.

5.2.   Influence of Security Concerns

To establish the effect security has on the use of mobile apps for e-commerce, the researchers asked participants several related questions. Various security-related concerns emerged, as was evident from the wide range of responses received. When asked to state his fears about the use of mobile apps for e-commerce, one respondent answered:

To send money using this app is one of my nightmares. I twice sent money to the wrong recipient. My efforts to get back the money was in vain and even the service provider of the app was not able to help me at all. (H4)

Users thus do not consider the apps secure enough to send money, which inhibits their use. This is a concern, because when products are ordered using mobile apps, it is logically convenient to pay for them using the same app. Another respondent said:

When I register to buy products from company X, I give my personal details to that particular company. Afterwards, I realised that I was getting adverts and offers from other companies that I had not given my personal details. I wondered where they got my details from… seems my personal details are being accessed from company X or elsewhere online? (G7)

Thus, when an individual feel that using the app jeopardises the confidentiality of his/her personal details, s/he will avoid using it.

Not only the customers who buy products from manufacturers, but also the manufacturing firms were wary about security. An inventory manager commented:

Our inventory is kept a secret in this company, however, when we send inventory using this app, we always fear that the details of the inventory can land in the hands of our competitors. (C2)

Firms thus feared that using the app would expose confidential business information to their competitors. An invoice manager said:

The greatest concern of our manager is that when invoices and products' prices are sent using this app, the prices of our products, which are kept a secret, can end up in the hands of our competitors who can use it to lower their prices and take away our clients. (J3)

Other researchers found that security concerns were a barrier to the use of technological innovations. Bajwa (2014), for instance, found that when a mobile health app was used, the security of the information stored on and accessed via mobile devices was a major concern for users in Pakistan. Security concerns are therefore not limited to those conducting e-commerce. A study by Benson and Morgan (2014) found that information security concerns plague social networking in America. This confirms that security challenges are not limited to mobile app use in developing countries.

5.3.   Influence of the Cost of Mobile Applications

While gathering information from respondents on the challenges they face in regard to the cost of using mobile apps for e-commerce, several questions were asked. One interviewee said:

> *... this app has to be installed in a smart phone which is an expensive phone, which means that if one cannot afford to buy a smart phone, then he or she cannot use this app. (F11)*

The cost of hardware and software required to run an app can be a barrier to use. Other respondents mentioned that communication costs can be prohibitive. As one interviewee said:

> *When I was using the application, I realised that it was very expensive on data bundles usage, and the longer I stayed online to finish a transaction, the more the amount of data bundles used. If the network connection happened to be slow ... which is common here... the cost is unimaginable. (D3)*

From a similar perspective, an interviewee indicated that when a mobile app for e-commerce is updating, the device uses a lot of data bundles, prompting the user had to limit updates to instances where the device was connected to a Wi-Fi Internet connection. This meant that important updates often failed to install.

Cost was thus a significant consideration. These findings correlate with research by Bajwa (2014), who observed that the high cost of implementing and maintaining mobile health infrastructure was a barrier to the use of related apps in Pakistan. Bajwa's (2014) findings support those of Norris and Soloway (2012), who found out that the provision of Wi-Fi to support one-to-one learning posed a significant financial challenge, the cost of mobile devices and connectivity being equally high in America. Financial outlay is thus a challenge in both developing and developed countries.

5.4.   Influence of Environmental Issues/Concerns

This study found environmental issues to be a barrier to the use of the app. This emerged clearly from the interviewees' responses. As one respondent explained:

> *My relatives and friends have been warning me against using this app to send money. Since they had prior experience in using this app, I decided to heed their advice and stopped using it. (H5)*

Another concurred:

I realised that most of the buyers were not using this application due to the risks associated with it, hence I decided to stop using it also. (C9)

External influences were thus a barrier to the use of the app, while lack of support by the organisation's management was another. As one respondent noted:

Manufacturer X has been reluctant to incorporate this application in our system so that we can use it. We have been requesting for it for a long time, but every time we are told to hold on and wait for the management to deliberate on our request. I think they are not eager to have this application used in this firm any time soon according to my judgement. (B1)

For organisations to transact internally using mobile apps, each stakeholder has to have the app installed and running. If an organisation/individual does not have the apps, it becomes a problem. A staff member who manages payments in a manufacturing industry said:

Our company uses this app for sending paying our suppliers; however, some of them do not use these applications, which make it difficult for us to pay them using the application. We have been advising them to use the application, but they have never heeded to our advice…but we hope one day they will realise the benefits of using these applications and start using them. (C5)

5.5.   Effects of a Lack of Computer Literacy

This study established that individuals who were not computer literate avoided using the mobile applications. Lack of knowledge on how to manoeuvre through the apps emerged as an impediment to individuals who could reasonably be expected to use them. One respondent said:

I tried to use this software…but somehow I realised I was heading nowhere as I was not able to understand the jargon in it. It requires to be used by people who are well trained in computers… not people like me, it is not easy… (A4)

This indicated a lack of understanding of how to use the app. Individuals thus avoided making use of it. At organisational level, staff who did not understand how to use the apps also steered clear of them, as a respondent from a manufacturing firm said:

I tried to use the app to send invoices. I kept calling someone to show me how to complete a process of sending an invoice. Sometimes I sent the wrong figures, which was risky to my employment. I realised that I needed to be trained on how to use it, and since there was nobody to train me, I stopped using it until I get someone to train me on how to use it. (J4)

6.   DISCUSSION AND RECOMMENDATIONS

Mobile applications for e-commerce are viable tools in Kenya's manufacturing industries, and could benefit companies financially. Such apps enable buyers, sellers and organisations to transact business using a mobile device, anytime and anywhere. Their use can thus greatly contribute to the economic growth of the country, by turning Kenya into a 24-hour economy. For this to be realised, the aforementioned challenges must be addressed through appropriate

strategic measures. The identified challenges are herein discussed, compared with past literature and possible strategies proposed.

6.1. Technological Issues

This study established that technological issues are the main hindrance to the use of mobile apps for e-commerce in the manufacturing industries Kenya: as the apps are considered neither easy to use, nor easy to learn, which according to Harris et al. (2016) creates a perceived risk when consumers lack confidence of being able to purchase, download, install and use the apps in their devices. Warkentin et al. (2002) found out that perceived risk resulted from as a consumer's subjective expectation of suffering a loss in pursuit of a desired outcome. This study confirmed this, since the perceived risk was found to be the failure by the users to use the apps effectively, similar to other studies (Chang & Wu, 2012; Forsythe & Shi, 2003; Kim et al., 2008) that have shown that a consumer's perceived risk negatively influences the decision to perform an online transaction.

Network connectivity was found to be the main technological factor that hinder the use of mobile apps in the manufacturing industries in Kenya. Lack of network connectivity in some geographical locations in Kenya resulted to grinding to a halt the use of these apps, and consequently hindering the personnel in some organizations, who work outside their duty stations, from being efficient.

Earlier studies had also found technology-related issues to be a barrier to the adoption of technologies (National Center for Education Statistics, 2000; Goktas et al., 2009; Harris et al., 2016), which indicates that technology-related issues have been a persistent hindrance to the adoption and use of technological innovations, such as mobile apps, for over one and half decade. This therefore called for a paradigm shift from past research, where this research not only identify the barriers of technology adoption, but also propose possible strategies to overcome those barriers. The implementation of the proposed strategies is expected to transform the identified barriers of mobile use to encouragers of the use of these apps.

In order to propose possible strategies that can overcome the technology-related issues that are barriers to use of mobile apps, the details of the technology-related issues need to be identified. Although past research (Forsythe & Shi, 2003; Kim et al., 2008; Aghekyan-Simonian et al., 2012; Chang & Wu, 2012) found technology-related issues to hinder the adoption of technological innovations, the details of the related issues were not addressed. However, Wright (2014) identified lack of Internet connectivity as a technology-related issues which is a barrier to the adoption of educational technologies in the developing world. This study identified the mobile apps technology-related issues to include; lack of ease of use, draining of the phone battery, being source of unsolicited adverts and taking a lot of phone's memory space once installed.

These barriers of mobile apps use can be categorized into performance and psychological risks of mobile apps use. Performance risk is defined by Harris et al. (2016) as a risk that is as a result of an app not perform as expected. This happens when the apps drain the phone's battery, become a source of unsolicited advertisements and use a lot of phone's memory space. These risks are inevitable since when consumers are choosing mobile apps to install, they often do not have the opportunity to try the app with full functionality before making the purchase (Harris et al., 2016). For instance, battery life determines the time one can spend in the app without having to recharge the battery of the mobile device; if the user is away on a trip and does not have the possibility to recharge the mobile device the app may not be used (Zamfiroiu, 2014), which impacts on its performance. In addition, when the app takes a lot of phone's memory space, this slows the speed of the phone and may cause other apps installed in the phone to malfunction, which affects both the phone's performance and the apps installed in it.

Psychological risk involves disappointment, and frustration a consumer encounters (Harris et al., 2016). This study confirmed that this happened when users of the app want to use it but are unable to due to lack of network connectivity, and when the apps become a source of unsolicited adverts, this affects the user's emotions negatively.

6.2.   Security Concerns
The security of mobile applications for e-commerce in Kenya was identified as another challenge. The risk of losing money sent via these apps, and exposure of users' personal details to fraudsters who subsequently sent fake offers/adverts, were red flags to users. Harris et al. (2016), from a study conducted in America, argued that this culminates to a financial risk - loss coming from a stolen credit card number during the purchase transaction or from an installed malicious app stealing account information from the consumer that leads to a financial loss. This suggests that financial risk is a major security factor that impends the use of mobile apps both in the developed and the developing countries.

This study observed that when users of these apps transact business using the apps, their personal details are revealed or fall in the hands of unintended individuals. This exposes them to a psychological risk which is defined by Harris et al. (2016) as disappointment, frustration, and shame that a consumer encounters when their personal information is disclosed. Kim et al. (2008) considered this type of risk to include privacy and security and information risks. This agrees with our findings. It emerged from this research, that there were psychological effects when users realized that their details are in the wrongs hands. There were also fear of what criminals or business competitors could do with the personal or confidential information already in their disposal.

6.3.   Cost Issues
Mobile applications costs can be categorized into transactional and infrastructure cost. Transactional cost in this study was viewed as the cost the consumers incur in incur in using the apps, which includes fee charged the apps service providers, data bundles cost and the cost of the device used. On the other hand, infrastructure cost was considered as the cost incurred for installation and maintenance of the apps by the service providers.

While the cost of infrastructure was found not to impend on the uptake of mobile apps in this study, it however emerged that transaction cost was a barrier to use of these apps. This confirms the findings of earlier studies (Wamuyu & Maharaj, 2011; Mehdipour & Zerehkafi, 2013) that mobile apps services come at a cost for consumers, but infrastructure cost of implementing an infrastructure for wireless technologies was not high. However, studies by Elias (2011) and Crescent and Lee (2011) found out that transactional cost in mobile learning was low without influence on the use of mobile apps used for learning in the United States of America. This is an exceptional case in mobile learning, when comparing the cost of mobile devices, which are used for mobile learning, with the cost of personal computers and laptops which is higher.

6.4.   Environment Concerns
Environmental factors were found in this study to influence the use of mobile apps. This includes lack of management support, peer pressure and lack of partner organizations to adopt mobile apps to allow mutual business transactions using the apps. Past studies have highlighted the importance of environmental factors on technology adoption and use. Norris and Soloway (2012) found that a lack of management support impeded the adoption of technology in American institutions of learning, while Nysveen et al. (2005) and Harris et al. (2016) noted that subjective norms influence the intention to adopt mobile commerce. Subjective norm is defined as "the perceived social pressure to perform or not to perform the

behaviour" in question (Ajzen, 1991, p. 188). One of such social pressures is the peer pressure (from friends, relatives, workmates etc.) which impend on the adoption of technology and use (Bhatti, 2007; Waithaka et al., 2013).

Since environmental issues can hinder the uptake of technological innovations in organizations, it is importance for researchers to consider the social context in which the mobile commerce is used and proposes viable actions that are able to enhance the perception of the mobile apps (Nysveen et al., 2005).

6.5.   Computer Literacy

Lack of computer literacy emerged as another hindrance to use of mobile apps. This corroborates the findings of the National Center for Education Statistics (2000), which found that the lack of an ICT in-service training programme impeded the integration of ICTs in pre-service teacher education programmes in the United States. This is supported by Goktas et al. (2009), who found that a lack of basic knowledge and skills in ICT, and a lack of technical support impeded ICT integration in learning institutions in Turkey. This points to the fact that lack of computer literacy as a hindrance to use of mobile apps is not a reserve of developing counties but in developing countries too. Lack of computer and ICT literacy hampers the use of technological innovations, thus organizations adopting those technologies must put strategies in place to equip users with the necessary related knowledge and skills.

It emerged from this study that there are several factors that hinder use of mobile apps. Earlier studies have found some of these factors as hindering technology adoption/use. However, earlier studies did not go into the depth of proposing possible strategies that can be implemented to enhance the use of these apps, and hence these issues have persistently remained an impediment to use of mobile apps. This study proposes strategies that can be implemented to overcome the identified barriers to mobile apps use.

7.   PROPOSED STRATEGIES

Mobile applications for e-commerce are viable tools in Kenya's manufacturing industries, and could benefit companies financially. Such apps enable buyers, sellers and organisations to transact business using a mobile device, anytime and anywhere. Their use can thus greatly contribute to the economic growth of the country, by turning Kenya into a 24-hour economy. For this to be realised, the aforementioned challenges must be addressed through appropriate strategic measures.

7.1.   Technological Strategies

Technological-related issues that impend use of mobile apps should be addressed to enhance use of these apps for e-commerce in Kenya. To help users embrace mobile apps in the e-commerce context, the apps should be able to attract users who are computer literate and those who are not. This can be realised if the apps are user centred, easy to use, and have interfaces that are easy to access and manoeuver. To achieve this, management of mobile commerce service firms should ensure that their software development personnel are creating an easy-to-use interface and programs that are easy to use as suggested by Harris et al. (2016). In addition, mobile commerce service providers can emphasize on differentiation to make their application more useful and easier to use than those of their competitors (Bhatti, 2007). The developers need to develop apps that do not drain the phone battery or take a lot of phones memory spare to make the apps attractive to users.

Stable Internet connections and network coverage are also needed, and on the other hand, the requisite network coverage should be readily available to users, anytime and anywhere. This seems to be a mirage, as users reported that network coverage was not available everywhere in the country. It makes no sense to provide a mobile app that can only

be used in specific locations. The service providers of the apps should to put strategies in place to ensure round-the-clock, reliable network coverage.

7.2.   Security Strategies
To improve the uptake of commerce-related apps in Kenya, the developers need to ensure that security tools can adequately authenticate the recipients of data - be it monetary, personal details or a firm's internal information, etc. Viable strategies that can be implemented to improve the security of these apps include tightened security measures (e.g., strong password policies to guard against unauthorised access). The configuration of automatic encryption and decryption of information sent via these apps would be useful in preventing eavesdropping and phone tapping, and would ensure privacy and confidentiality. If implemented, such strategies would make users perceive these apps as secure technological innovations that can be used to transfers funds as well as confidential information. The apps should also have enhanced security features able to block the unsolicited adverts, spam, malware etc.

7.3.   Cost Strategies
While mobile apps for e-commerce represent viable tools for transacting business, the cost involved is prohibitive: the study revealed that their use is unaffordable for Kenya's poor. Transactions, hardware and Internet costs thus inhibit uptake. Plans should be made to ensure that the service providers of the apps offer users low-cost smartphones, with adequate features, at affordable prices. Service providers should further offer Internet connections at affordable rates, with network connection across most locations, to expand the potential market of app users.

7.4.   Environmental Challenges Strategies
Mitigation strategies to overcome environmental challenges might include, for example, the developers initiating public awareness campaigns to educate the public and organisations (including the management cadre) on the benefits of using the apps. Marketers could focus their promotion on creating positive perception of mobile apps through advertisement on online mobile commerce service forums and discussion groups, and also find ways to satisfy their existing customers so that they are willing to give positive word of mouth for their service and create positive peer pressure to prospective mobile commerce service users, since word of mouth behaviour can be a useful and effective promotional tool (Harris et al., 2016). In addition, marketers could also use customer loyalty programs to create a peer pressure impact as suggested by Fong and Wong (2015).

Since it emerged from this research that a user's subjective norm can be a hindrance to use of mobile apps, it is important for the management of mobile commerce service firms to use peer pressure to promote their product. Marketers of mobile apps should also find ways to satisfy their existing customers so that they are can give positive word of mouth for their service and create positive peer pressure to prospective mobile apps users.

7.5.   Computer Literacy strategies
The apps' distributors should conduct user training programs on their functionalities and use, to enhance user proficiency. In addition, they should offer a customer service desk and hotline to give technical support and training. The importance of giving support and training has been emphasized in the study of Jeon and Park (2015) who noted that it significantly enhances the perceived ease of use of a technology, such as mobile apps, which as a result enhances its use.

Implementing these strategies would go a long way in overcoming technological and computer illiteracy, resulting in improved use of mobile apps for e-commerce in manufacturing industries in Kenya.

8.   LIMITATIONS
The limitation of this study was the small number of manufacturing firms that agreed to participate in the research. A higher number of participants was desirable, but this was a voluntary study which did not allow the researchers carte blanche: there were privacy and confidentiality restrictions around the buying and selling of products. However, despite the low number of sampled organisations, a sizeable number of respondents participated in this study.

9.   CONCLUSION
The researchers identified five challenges related to the use of mobile applications for e-commerce in Kenya: technological issues, security concerns, cost, lack of computer literacy and environmental issues. Technological issues (lack of ease of use, problems with Internet connections) were significant hindrances, as were security issues and the cost of using the apps.

Technology-related issues play a pivotal significance role in determining whether a technology will be adopted or accepted by its projected users, and they affect the user psychologically and impact on the performance of the mobile apps. The effects/risks identified in this study are not peculiar to Kenya but are also found in other countries as revealed in literature.

Lack of computer literacy was another challenge, though less so than the aforementioned issues. Transactional, and not the infrastructure, cost of mobile apps impends their uptake Strategies were proposed for enhancing the use of e-commerce-related apps in Kenya, and for organisations to realise their benefits. The developers and service providers should continuously evaluate the uptake and use these apps, to identify and address possible future challenges.

It was clear from this study that the mobile applications for e-commerce in Kenya that are currently used in organisations, are not user centric. Developers should ensure that the apps are debugged, and that future versions are more user-friendly.

Lastly, the use of grounded theory proved to be appropriate in identifying the challenges facing the use of mobile applications to conduct e-commerce in Kenya.

Further study using a higher number of manufacturing firms would be necessary to establish and discrepancies in the results. This study only investigated the challenges facing the use of mobile applications for e-commerce in Kenya's manufacturing industry. It could be necessary for a further study to be done to establish the factors that encourage use of mobile applications in Kenya's manufacturing industry in order to enrich this study.

10.   ACKNOWLEDGEMENT

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APPENDIX 1

Please allow me to get some details about you…
1.   Please tell me your full name. (optional)
2.   Which organisation do you work for/do business with? (optional)
3.   What is your role/position in this enterprise?
4.   How long have you been working/doing business with this organisation?
5.   What IT experience or formal qualifications do you have?

About your enterprise
1.   Who is in charge of the design/implementation/deployment of information systems in the enterprise?
2.   Have you been conducting e-commerce transactions?
3.   Do you use (or have you previously used) mobile applications for e-commerce to support the services you offer and manage daily schedules, e.g. billing, raising invoices, payments, managing inventory, etc?
4.   If no, what are the reasons that made you/your organisation not use mobile applications for e-commerce again?
5.   What are some of the reasons that could be making you avoid using these applications in your e-commerce transactions? (If not answered already)
6.   Do you know of any issue that makes you/your organisation not use mobile applications for e-commerce?
7.   If yes, please describe this application in terms of its functionalities. Were there instances when you could not remember how to undertake a function you had done previously? If yes, please explain.
8.   In your experience, what is your feeling on the functionalities of these apps (e.g., are there long, complicated, tedious processes, etc.)?
9.   What benefits do these applications offer you/your organisation?
10.   Can you also tell me how the use of these applications has aided your buying/selling/business process? (If not answered already)
11.   What challenges do you face while accessing these apps via your phone? (e.g. hard/software, service provider or interface-related issues?)
12.   What personal challenges or threats do you feel the use of these apps have posed or will pose to you in the near future?
13.   Can you briefly compare the experience you have had in using these apps (e.g. in managing software upgrades and maintenance, etc.)?
14.   Are you requested personal details while using these apps? If yes, what would you comment about supplying your details online?
15.   What is your opinion of the security of mobile applications for e-commerce?
16.   How secure do you think any information/data you send on these apps is?
17.   What about privacy and trust issues?
18.   What are your fears (if any) about buying goods using these apps?
19.   How secure will you say it is to send money using these apps?
20.   What are your fears (or challenges you encountered in the past) when paying for goods or supplies using MAFEC?
21.   Do you receive adverts of products from these apps? If yes, what is your comment about these adverts and products?
22.   Do you send details your company inventory online? If yes, what are your opinion/fears (or those of the organisation) about sending company inventory online using these apps?

23.   When customers request the prices of your products, do you send them the prices using these apps? If yes, what is your opinion/what are your fears regarding sending product prices using these apps?

24.   Can you further describe your experience or perceptions of using MAFEC for payments or sending money?

25.   Do you get any service, training or technical support from SMEs or service providers of these apps?

26.   So far, what has been your greatest accomplishment as a result of using these applications?

27.   Based on your experience, what would you say are the strengths of using mobile applications for e-commerce from your phone?

28.   How effective or efficient do you think these apps has been to your enterprise?

29.   Can you describe the services you offer and how these apps come in handy in the delivery of these services? (e.g. to your clients, suppliers, marketing, payments, etc.)

30.   In your experience, what factors influence or encourage you/enterprises like yours to use these applications?

31.   What about those factors will discourage such use?

32.   What other impact has the use of these applications had on your buying/business/your enterprise?