The ubiquitous mobile technologies use is changing how entrepreneurs interact with customers. With that background, this work seeks to facilitate women entrepreneurs’ (WEs’) empowerment within a developing patriarchal economy. A mobile marketing application to support rural WEs’ sharing of processed goods information was co-created and evaluated with them. This book presents strategies to empower this marginalised group implementing technological solutions contextualised to their specific needs.
MOBILE TECHNOLOGY FOR EMPOWERMENT: A CASE OF WOMEN ENTREPRENEURS IN FOOD PROCESSING SECTOR IN TANZANIA
MOBILE TECHNOLOGY FOR EMPOWERMENT: A CASE OF WOMEN ENTREPRENEURS IN THE FOOD PROCESSING SECTOR IN TANZANIA

Publications of the University of Eastern Finland
Dissertations in Forestry and Natural Sciences
No 375

University of Eastern Finland
Joensuu
2020
Opponent: Professor Judy Van Biljon, PhD.
School of Computing
University of South Africa
P.O. Box 392
SOUTH AFRICA
email: vbiljja@unisa.ac.za
ABSTRACT

Empowerment is altering the power relations that constrain entrepreneurs’ possibilities and sovereignty and adversely affect their wellbeing. Empowerment of women entrepreneurs is imperative, given the vital role women play in developing their countries’ economies. Women entrepreneurs create employment opportunities, improve productivity, create wealth, and grow the economies of their communities. Empowerment expands their capability of carrying out development activities similar to those of their male counterparts.

Mobile technology use plays a significant role in facilitating the empowerment of women entrepreneurs in developing countries. The fact that mobile device (cellular phone) ownership has grown exponentially in Sub-Saharan Africa and that a mobile phone is now almost ubiquitously used in everyday life, lays the ground for our case study in Tanzania. Research has shown that the use of mobile phone simplify access to market information, increases the volume of sales by connecting sellers with potential customers, reduces the cost of searching for the market for the products and fosters the expansion of business networks. This tool, therefore, can enable women entrepreneurs to define a wide range of business opportunities not previously available to them due to lack of know-how.

Until now, however, there has been a gap in the literature regarding how technology could improve the business of women entrepreneurs in Tanzanian context. This is because there has been no comprehensive research on how to empower women entrepreneurs in overcoming sociocultural challenges and enhance their access to market information using mobile technology applications. Moreover, no ICT project has incorporated the voices and expectations of women entrepreneurs of creating solutions of accessing market information in the food processing industry in the context of Tanzania. Against this background, this study focused on developing a mobile application that contextualises Tanzanian women entrepreneurs’ needs of improving their business performance in the food
processing industry. The study comprises five papers, denoted by PI, PII, PIII, PIV, and PV. The study adapts the Design Science Research (DSR) methodology by Johannesson and Perjons (2014), which involves five stages: problem explanation, user requirements, design and development, demonstration, and evaluation of the designed artefact. Co-creation and co-design processes were at the centre of the DSR methodology deployed in the study. The thesis employs a mixed-methods research approach, and qualitative data dominates the study. The data were collected in rural Iringa, Tanzania, from 170 women entrepreneurs and 5 customers. These participants were engaged in different stages of the application development process. Research facts were collected through face-to-face interviews, focus group dialogs (co-creation workshops), observations, questionnaires and document review. The collected facts were then scrutinised through qualitative content analysis and descriptive statistics.

The findings show that women entrepreneurs operate their business in an unfavourable environment – manifested by restricted access to market information, inad-equate capital, gender inequalities, patriarchal ideology, lack of packaging materials for their products and lack of business skills. These results led to the co-design, co-creation, development, demonstration, and evaluation of a mobile marketing application for empowering women entrepreneurs in obtaining and sharing information regarding goods at the market, hence fostering better business performance. Therefore, in this regard, the study developed mobile application solutions that addressed the problem of lack of access to market information that women face while conducting their business. The mobile application enhances women entrepreneurs’ ability to recognise possible consumers and to make comprehensive choices concerning when and where to sell their goods. Thus, it empowers women to improve and make business on their own while sustaining their everyday responsibilities as determined by societal structures. Furthermore, my work suggests a way of extending and strengthen DSR by assimilating co-creation and co-design (participatory design strategy) by recognising end-users’ opinions both at the start of the design and development experience and throughout the subsequent stages of the DSR process to achieve a meaningful creation and solution.

Universal Decimal Classification: 004.382.745, 316.462, 334.722.1, 621.395.721.5

Library of Congress Subject Headings: Mobile computing; Mobile apps; Smartphones; Cell phones; Small business; Entrepreneurship; Businesswomen; Power (Social sciences); Success in business; Creative ability in business; Performance; Markets; Small business marketing; Food industry and trade; Mixed methods research; Qualitative research; Tanzania
Yleinen suomalainen ontologia: mobiililaitteet; mobiilisovellukset; mobiilipalvelut; matkapuhelimet; älypuhelimet; pienyrittäjät; naiset; sosiaalinen vahvistaminen; voimaantumisen; kehittäminen; osaamisen kehittäminen; markkinointi; elintarvikeala; elintarviketuotanto; kvalitatiivinen tutkimus; Tansania
ACKNOWLEDGEMENTS

Foremost, I would like to express my special gratitude to almighty God for guiding me and giving me strength throughout this study. I owe my deepest gratitude to my supervisor, Calkin Suero Montero, PhD, and feel very privileged to work under such a senior researcher. Her humanity, way of thinking, way of linking concepts and ideas, and her ‘why’ and ‘what’ interrogations helped the development of this work a great deal. Moreover, I am very appreciative for all the time she took to discuss this research with me and for her endurance in coaching me the academic writing. Further, I would like to give my truthful thanks to my supervisor, Prof. Markku Tukiainen for his supervision and support that prompted critical thinking and focus in me.

In Tanzania, I am sincerely indebted to my supervisor, Dr Esther Rosinner Mbise of the College of Business Education, for her constructive criticism and guidance, which was a great part of what made this output possible. Likewise, I deeply appreciate the support and efforts of Prof Matti Tedre, Dr Jarkko Suhonen and Dr Mikko Apiola. Their consultations, training and advice expanded my research knowledge and enabled me to produce this work in its current form. I would also like to recognise the management of College of Business Education (CBE), particularly Prof. Emmanuel Mjema, the rector, for granting me study leave and financial and material support that all enabled me to complete this study.

I also want to thank my fellow PhD candidates, Anna, Ezra, Moses, Godfrey, William, Mzomwe, Joel and Agbo, for their contributions, particularly in group discussions. Moreover, I want to thank all members of the EdTech research group, Dr Michael John Haule, Dr Solomon Sunday Oyelere and Dr Nasibu Mramba, for their assistance during my PhD work. Many thanks to Hussein Mtaalamu for his efforts to design and develop the mobile application for women entrepreneurs, which is an important component of this research.

I thank my pre-examiners, Professor Tim Unwin and Associate Professor Salma Ismail, for their comments and valuable suggestions on the manuscript of this thesis. Also, I am extremely honoured to have Professor Judy Van Biljon from the University of South Africa as my opponent.

Furthermore, I would like to acknowledge my children, Florian, Gloria and Philipo, and my sweetheart Nersebis Josephat Msuha, for their patience, encouragement, support and motivation throughout my PhD studies. Equally, I thank my lovely mother, Anitha Cosmas Mahay, for her prayers and encouragement during the study process. I dedicate this dissertation to my late father, Florian Dominikus Kapinga.

Joensuu, April 16, 2020
Alsen Florian Kapinga
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBE</td>
<td>College of Business Education</td>
</tr>
<tr>
<td>DSR</td>
<td>Design Science Research</td>
</tr>
<tr>
<td>ICT4D</td>
<td>Information and Communication Technologies for Development</td>
</tr>
<tr>
<td>JSON</td>
<td>Java Script Object Notation</td>
</tr>
<tr>
<td>SIDO</td>
<td>Small Industries Development Organization</td>
</tr>
<tr>
<td>SLF</td>
<td>Sustainable Livelihood Framework</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Querying Language</td>
</tr>
<tr>
<td>SSA</td>
<td>Sub-Saharan Africa</td>
</tr>
<tr>
<td>TCRA</td>
<td>Tanzania Communication Regulatory Authority</td>
</tr>
<tr>
<td>UML</td>
<td>Unified Modelling Language</td>
</tr>
<tr>
<td>USSD</td>
<td>Unstructured Supplementary Service Data</td>
</tr>
</tbody>
</table>
LIST OF ORIGINAL PUBLICATIONS

This thesis is based on data presented in the following articles, referred to by the Roman numerals I–V.


AUTHOR'S CONTRIBUTION

The publications included in this dissertation are original research articles on the design and development of a mobile application adapted to the context of women entrepreneurs in Iringa, Tanzania. The author was the main contributor to all articles, from I to V, in the implementation of the mobile marketing application and in the different stages involved in designing the science research framework, including: problem explication, definition of user requirements, design and development, demonstration and evaluation of use. The author's contributions to each of the article are detailed below.

I) Research paper one (P1): I am the main author of this article, which focused on identifying the challenges of women entrepreneurs in the food processing industry. I selected the research setting, collected the data, analysed the data, and developed the first draft of the research paper. The co-author co-drafted the research methodology section, helped to analyse the data, drafted the discussion and conclusions sections, and provided guidance and comments for improving the manuscript. All authors participated in editing the final version of the paper.

II) Research paper two (PII): I am the main author of this article, which investigated the usage of mobile technology by women entrepreneurs for retrieving market information. I was responsible for collecting data, analysing the data and writing the first draft. The second author co-designed the research methodology and data collection instruments. All co-authors provided comments for improving the article.

III) Research paper three (PIII): I am the main author of this article, which is on user requirements and architectural design of mobile technology for women entrepreneurs. I was responsible for collecting data, analysing the data and developing the first draft of the research paper. The second author co-designed the research methodology and data collection instruments, as well as directing the co-design strategy described. The co-authors of this article provided comments to improve the article and made contributions toward the final version.

IV) Research paper four (PIV): I am the main author of this article, which is on the role of incubators in the business growth of women entrepreneurs. The data gathering and presentation of results were done by the first and third authors. The first draft of the article was also created by the first and the third author. The second author co-drafted the research methodology and implementation section. All co-authors provided comments for improving the article and contributed toward the final version of the paper.
V) Research paper five (PV): I am the main author of this article, which is on the demonstrated and evaluated mobile technology solution to the challenges faced by women entrepreneurs in Iringa, Tanzania. I was responsible for collecting and analysing the data for this research paper, and I also wrote the first draft. The second author co-designed the research methodology and data collection instruments, as well as directing the participatory design strategy described. The co-authors provided comments to improve the article and made contributions toward the final version of the paper.
# CONTENTS

ABSTRACT ...................................................................................................................... 7
ACKNOWLEDGEMENTS ................................................................................................. 11

1 INTRODUCTION ........................................................................................................ 21
  1.1 Background and motivation for the research ................................................... 22
  1.2 Research questions .......................................................................................... 25
  1.3 Structure of the Dissertation ........................................................................... 26
  1.4 Research methodology and process .................................................................. 27
  1.5 Main results and contributions ........................................................................ 29

2 REVIEW OF LITERATURE ....................................................................................... 33
  2.1 Women entrepreneurship development ........................................................... 33
  2.2 Mobile applications in African contexts ........................................................... 35
  2.3 Women empowerment in the context of ICT4D .............................................. 38
    2.2.1 Feminist theories ....................................................................................... 41
      2.2.1.1 Liberal feminism .................................................................................. 41
      2.2.1.2 Social feminist theory ......................................................................... 42
    2.2.2 Institutional theory ..................................................................................... 43
  2.4 Summary ............................................................................................................ 45

3 RESEARCH DESIGN ................................................................................................ 47
  3.1 Design science research framework ................................................................... 47
  3.2 Stages of the DSR framework .......................................................................... 48
    3.2.1 Explicate the problem ............................................................................... 48
    3.2.2 Outline the artefact and define requirements .......................................... 48
    3.2.3 Artefact design and development .............................................................. 49
    3.2.4 Artefact demonstration ............................................................................. 49
    3.2.5 Artefact evaluation .................................................................................... 49
  3.3 Artefact development with DSR, Co-creation and co-design ......................... 50
  3.4 Research paradigms ........................................................................................... 52
3.5 Research ethics ................................................................................................. 52
3.6 Summary ........................................................................................................... 53

4 THE DEVELOPED ARTEFACT ........................................................................ 55
4.1 Problem explication ......................................................................................... 55
4.2 The requirements definition .............................................................................. 56
4.3 Mobile application design and development ................................................. 59
   4.3.1 System architecture design ........................................................................ 60
   4.3.2 Mobile technology implementation ............................................................ 61
4.4 Demonstration of the mobile application ....................................................... 63
   4.4.1 Training workshop ...................................................................................... 64
   4.4.2 In-the-wild field-testing ............................................................................. 65
4.5 Evaluation of mobile application ....................................................................... 66
   4.5.1 Usefulness of the designed artefact ............................................................. 67
   4.5.2 Comparison with existing related projects .................................................. 70
   4.5.3 Mobile marketing application and sustainable livelihoods ......................... 73
4.6 Summary ........................................................................................................... 75

5 DISCUSSION OF THE RESULTS ..................................................................... 77
5.1 Interpretation of results ..................................................................................... 77
5.2 Research contribution ......................................................................................... 80
5.3 Limitations of the study ..................................................................................... 82

6 CONCLUSIONS ................................................................................................. 83
6.1 Answers to the research questions ................................................................. 83
6.2 Future research ................................................................................................ 85

7 BIBLIOGRAPHY ................................................................................................. 87
1 INTRODUCTION

Today’s women entrepreneurs contribute greatly to the economic development of Sub-Saharan Africa and other developing economies. They play a vital role in job creation opportunities for many unemployed individuals, as well as in increasing productivity and wealth at the community level (Wasihun & Paul, 2010). In addition, women entrepreneurs play an extremely significant role in poverty reduction in emerging economies and enrich gender impartiality among marginalized groups (Buskens & Webb, 2013). Also, women entrepreneurs improve the wellbeing of the society by doing business jointly through their entrepreneurial groups. However, despite their contribution to the general economic growth, women entrepreneurs encounter several social challenges, including a lack of market information regarding how, where and when to sell their products, limited participation, and unequal representation in business domain as opposed to men (Magesa, Shimba, & Magombola, 2013). Therefore, empowerment through technology could represent a cornerstone for raising these women’s voices and of enhancing their participation in order to place them on equal footing with men in business domains. Mobile marketing application technology appears to be one of the avenues for empowering women entrepreneurs in the context of Tanzania, as mobile technology can improve availability of market information, expand business links, support the identification of potential customers, increase sales, and foster the creation of a more favourable business environment (Jensen, 2007; Sife, Kiondo, & Macha, 2010). In particular, it could empower Tanzanian women entrepreneurs in the food processing sector in identifying potential customers for their goods and in accessing market information readily. Furthermore, it could allow women entrepreneurs to expand their business to several stakeholders, eventually improving it, and to make sound decisions about what and where to trade at a specified time. A mobile application can enable women entrepreneurs do commerce at their own pace while attending to family matters, and hence reducing travel costs to and from the market, decreasing expenses of pursuing market information and improving household social relationships.

Within this context, a mobile application was developed in the present research. The mobile application was created through a Design Science Research (DSR) approach that integrated co-creation and co-design elements into its development process. The approach involved end-users in several stages of the research agenda: explaining the problem, defining the user requirements, and developing, demonstrating and evaluating the developed artefact. In line with these stages of DSR, numerous pragmatic studies were carried out with the end-users: (i) to explicate the problem that served as the basis of the project, (ii) to identify the users’ requirements, (iii) to design and develop the application, (iv) to demonstrate the
solution in a real setting environment and (v) finally, to evaluate the application development to ascertain its usability and impact on sustainable livelihoods. Our research demonstrated that the designed mobile marketing application could connect several users through their mobile devices to internet cloud services acting as a cloud family for exchanging and sharing information (Kapinga, Suero Montero, & Mbise, 2017). Furthermore, the mobile solution was developed with MySQL workbench, which worked well with the user interface, the middleware (the language of processing), and the back-end service (data storage).

The rest of this chapter offers background information on women entrepreneurs and mobile application technology, the research questions, the structure of the dissertation, the research process and methods, and the results.

1.1 BACKGROUND AND MOTIVATION FOR THE RESEARCH

Women entrepreneurs are those who create new products and processes, undertake threats and handle economic uncertainties while engaging in a commercial enterprise. Women entrepreneurship involves taking risks while merging assets in a different approach to take the lead in a prospect in the immediate environment involving the production of services for market consumption (Okafor & Mordi, 2010). Women entrepreneurs comprise the greatest feasible and veritable engine for self-sustaining economic growth in developing countries (Ayogu & Agu, 2015), (Regum & Yasmeen, 2011), Goveas & Aslam, 2011). There has been substantial growth in the quantity of women entrepreneurs in developing countries, mainly because of the need for cash income to keep up with family expenditures, alleviate poverty and meet basic needs (Tambunan, 2009).

Previous studies (Kapinga, Suero Montero, & Mbise, 2019, Belwal, Tamiru, & Singh, 2012; Rathee & Yadav, 2017) indicate that women entrepreneurs played an important role in the growth of economies in Sub-Saharan Africa (SSA) and other developing countries. Sustainable economic growth of developing economies rests on the participation of women entrepreneurs in the workplace and the full utilisation of their entrepreneurial skills. Women entrepreneurs support campaigns on poverty alleviation by being engaged in the income generation with their enterprises in society. Moreover, women entrepreneurs are able to provide basic education for their siblings and accommodate their aged parents (Dzisi, 2008). The contribution of women entrepreneurs is visible in wealth creation at the household level, family welfare and the quality of residence (Ayogu & Agu, 2015). Women entrepreneurs also contribute to economic prosperity, which is manifested in business creation and innovation, employment and job creation, and payment of taxes to governments (Dzisi, 2008).

Women entrepreneurs have substantial influence on Tanzania’s economy, especially, in the agricultural sector, where they contribute 82 percent (Ellis, Blackden,
Cutura, MacCulloch, & Seebens, 2007). They create jobs in their businesses, which boost Tanzanian economic growth by enlarging the taxation pool and improving community wellbeing. In the food processing chain sector, they create market opportunities for other women by selling raw products, such as cashew nuts, sunflower seeds, groundnuts, and tomatoes.

Nonetheless, women entrepreneurs in many Sub-Saharan African countries are underprivileged because regulative, normative, and cognitive factors that are deeply rooted and embedded in cultural expectations and institutional structures impede their progress (Magesa, Shimba, & Magombola, 2013). Women entrepreneurs operate their business in unfavourable environments embedded in the societal and institutional structures, and these include lack of initial capital, and an unequal distribution of responsibility (Kapinga & Suero Montero, 2017) and gender inequalities (see Ihugba & Njoku, 2014). These cultural challenges restrict women’s ability to access market information, production resources, and suitable education.

Therefore, there is a need to raise the voices and enhance the skills of women entrepreneurs’ to enable them to perform better in their respective enterprises. It is imperative to enable women entrepreneurs to engage actively in entrepreneurial activities on equal footing with men entrepreneurs. Empowerment of women entrepreneurs involves improving their ability to access education, identify business opportunities, increase income, control their life choices, and monitor their entrepreneurial activities (Metcalfe, 2011).

In academic circles, the question of empowering women entrepreneurship has attracted several studies because of its pivotal role in the wellbeing of women and communities at large. Some of these studies include: Amine and Staub (2009), who looked at social marketing among women entrepreneurs in sub-Saharan Africa; Jagero & Kushoka, (2011), Magesa, Shimba and Magombola (2013), Jamali (2009) and Okurut and Ama (2013), who focused on the challenges facing women entrepreneurs in Arumeru district, Tanzania and in Botswana respectively. Furthermore, Alvarez and Barney (2014) studied poverty reduction through women entrepreneurship, and Ming-Yen and Sion-Choy (2007) and Belwal, Tamiru and Singh (2012) focused on factors determining the performance of women entrepreneurs. In addition, Shinnar, Giacomin and Janssen (2012) focused on gender, culture, and women entrepreneurship, while Rahman (2016) concentrated on how information and communication technologies empower women entrepreneurs.

As demonstrated by these studies, there have indeed been attempts of empowering women entrepreneurs in the business arena. Nevertheless, there is limited evidence of the efforts of empowering Tanzania’s women entrepreneurs through the use of information technology. That is, the available mobile applications in Tanzania focus on groups other than women entrepreneurs in the food industry. For example, Gomera, Oreku, Apiola and Suhonen (2017) developed a mobile application for mobile training in micro business; Mramba, Tulilahti and Apiola (2016) developed a mobile application for street vendors; and Misaki, Apiola and Gaiani
(2016) developed a mobile application for small scale farmers. Similarly, though many studies use a design science research (DSR) approach within information and communication technologies for development (ICT4D) arena, few of these use truly participatory design (co-creation and co-design). Statistics have shown that ownership of mobile phones technology is growing in emerging economies (Poushter, 2016). This, in turn, has increased opportunities for disadvantaged groups, such as women entrepreneurs to participate in the economic development activities. Tanzania, for example, has witnessed significant growth in mobile phone technology in terms of an increase in the numbers of operators and subscribers (Kapinga et al., 2017). According to the Tanzania Communication Regulatory Authority (TCRA), as of December 2018, there were over 40 million mobile subscribers in Tanzania (Kapinga et al., 2017; TCRA, 2017). In this respect, many Tanzanians possess cellular phones and that there are many opportunities of transforming the use of mobile phones from social to business communication – for instance, record keeping and selling and buying online. Studies (Kapinga et al., 2017; Komunte, 2015; Komunte, Rwashana, & Nabukenya, 2012; Munyua & Mureithi, 2008) have proved that mobile phones play a noteworthy role in empowering women entrepreneurs by simplifying their business functions. Mobile technology can enable women entrepreneurs to recognise easily possible clients, reduce search expenditures, transmit cash and market the goods (Kapinga et al., 2017). Further, mobile technology usage has the potential of enhancing sales, connect sellers with potential customers, enhance the worth of goods, and increase business connections (Mpogole, Usanga, & Tedre, 2008). Figure 1, presents the trends in mobile phone ownership increase in Tanzania over a period of ten years.

![Voice Telecom Subscriptions](image)

**Figure 1:** Trends in mobile phones ownership in Tanzania
It is in this context that this study aims at developing a mobile application in the food processing industry for women entrepreneurs in developing economies. The application was developed based on the DSR framework in order to guarantee scientific rigour, to suggest rules for choosing strategies and approaches in the design and enact the activities (Johannesson & Perjons, 2014). This framework provided procedures for connecting the study to the present knowledge base, thus guaranteeing cumulative development of knowledge.

We report the design of a technology solution in the food processing industry for women entrepreneurs through a collection of five articles – denoted as PI, PII, PIII, PIV, and PV – and the present introduction. In PI, I present the main sociocultural obstacles confronted by women entrepreneurs and the recommended strategies for alleviating them. PII is grounded on the findings of PI – and reports on an exploratory study as to whether women entrepreneurs used mobile phones for accessing market information or just for social interaction. PIII was built on PII – and focuses on assessing user requirements, establishing the architectural design, and developing the application in collaboration with women entrepreneurs. PIV explores the role of incubators as a transversal strategy of expanding business. PV presents the extent to which the explicated problem was resolved, and users’ needs were satisfied in the design of the mobile application in question. In other words, the article reports on how the demonstration and evaluation were carried out in a real-life scenario to ascertain the feasibility and the sustainable contribution of the application to the livelihoods of end-users.

1.2 RESEARCH QUESTIONS

The practical objective of this dissertation is to empower women entrepreneurs into getting information about markets through mobile technology so as to improve their business performance in Tanzania’s context. The research questions addressed in this dissertation are as follows:

Research question 1: What are the sociocultural challenges facing women entrepreneurs in business activities in Iringa, Tanzania?

Sociocultural challenges were important in the exploration to form the basis for identifying challenges that might be resolved through the application of technology. Mobile technology is an avenue of addressing sociocultural challenges facing women entrepreneurs. It simplifies access to market information and reduces travel costs to marketplaces. This justifies the design of a mobile technology application which is tailored to the needs of women entrepreneurs and is meant to empower women. Furthermore, the sustainability of mobile applica-
tions in real-life settings is important in terms of their appropriateness for mobile devices and business development.

**Research question 2:** What are the roles of mobile phones in supporting women entrepreneurs’ access to market-related information in Iringa, Tanzania? This question aimed at identifying the contribution of mobile phones and its outcome in the growth of businesses owned by women entrepreneurs. The mobile technology system should support women in acquiring market information, identifying possible buyers, expanding business networks, accessing market information and making business decisions such as what and where to sell.

**Research question 3:** What are the important user information and technological innovations that could bridge market information access to end-users? The question intended to identify significant business information in the designing and development of technological solutions that could simplify access to market information for its end-users. The findings enabled the identification of the contents to include in the designed mobile technology solution to meet the needs of the target users.

**Research question 4:** How does the mobile application empower women entrepreneurs in acquiring market information? The objective of any mobile application system is the attainment of realistic success. The mobile marketing application system is developed to enhance the business performance of women entrepreneurs by helping them to identify potential customers and expand their business network. This question, therefore, explores the knowledge and attitudes of women entrepreneurs toward the mobile application. The question focuses on the demonstration and appraisal of the application to ascertain how well it addresses the difficulties they had expressed and satisfied the defined user requirements.

### 1.3 Structure of the Dissertation

The rest of this dissertation is structured as follows:
- Review of the literature (Chapter 2);
- Research approach (Chapter 3);
- DSR cycle of mobile application development (Chapter 4);
- Interpretation and discussion of the results, research contribution, and limitations of the study (Chapter 5); and
- Conclusions, suggestions for future research work (Chapter 6).
1.4 RESEARCH METHODOLOGY AND PROCESS

This study was conducted in rural Iringa region, one of the regions of Tanzania mainland situated in the Southern Highland. Iringa was preferred because it is among the leading regions in agricultural production and many women entrepreneurs attempt flourishing their business there. The population of the study was composed of women entrepreneurs in the food processing sector. A total of 170 participants (women) were involved in different stages of the study based on the DSR framework and 5 customers participated during the demonstration and evaluation stage. The age cohort of participants were ranging from 20s to 50s years old. They started doing business as young people between 20- 30 years (at this age started being assumed with family responsibilities). In addition, majority of women interrogated had primary education. Furthermore, majority were married over 90% and they had vast knowledge in food processing.

The objectives of this dissertation were to respond to the research questions related the aspects of developing a mobile marketing application system. These aspects explore the challenges that women entrepreneurs face and that could be addressed through mobile technology, as well as scrutinize the contribution and impact of mobile phones in supporting women entrepreneurs gain market information. These aspects also delve into identifying the requirements of end-users in designing and developing a mobile application, and demonstrating and evaluating the utility, functionality, usability, performance, simplicity and generality of the developed solution for accessing information (Kapinga et al., 2019).

The motivation of the research was to empower women in the Tanzanian context by supporting the enhancement of their business development performance, given the challenges they confront, which are embedded in societal and institutional structures. Empowerment of women entrepreneurs through technological solutions is ideal since technology could allow them to be involved in business while still attending to family matters. The rapid penetration of mobile phones into emerging economies in general, and into Tanzania in particular, has raised interest in transferring utility value of mobile phones from the social to the ICT4D realm with a view of enhancing women entrepreneurs access to market information at their own pace.

This pragmatic research was carried out within a DSR framework to generate an innovative product (Hevner, March, Park, & Ram, 2004). The purpose of the design was not only to create an artefact that could address a specific business challenge that women entrepreneurs confront, but also to contribute to the contextual knowledge about the artefact and combined methodology. The artefact targeted by this study was intended to bridge the knowledge gap in the existing stated and anticipated access to market information among women entrepreneurs. Five stages
were identified through the DSR framework: problem explication; outlining the artefact and defining the requirements of end-users; co-designing and developing the artefact; demonstrating the artefact; and evaluating the artefact. As Johannesson and Perjons (2014) note, the method as defined may appear extremely chronological. Nevertheless, it should be remembered that the stages are interconnected and are always carried out in an iterative way, moving back and forth between all the activities of problem explication, requirements definition, development, and evaluation (Johannesson & Perjons, 2014). The research cycle process was carried out to arrive at the final stage in DSR (evaluation of the artefact).

DSR’s problem explication was addressed by research questions 1 and 2 in the dissertation. These questions explored sociocultural challenges and investigated the use of mobile technology for accessing market information. An ethnographic approach was applied in Paper I, whereby information on the challenges in doing business was collected. Thirty-seven (37) participants were involved in the study. The mixed-methods approach which was used in Paper II explored the use of mobile technology in the business realm. In this study, 43 participants were involved. Similarly, mixed research methods were applied in Paper IV, and fifty-two (52) participants participated in data collection.

The definition of requirements, design and constituent development were the focus of research question 3. The question aimed to discover business information and technological innovations that could simplify access to market information, define functional and non-functional necessities that described system behaviour and define the general characteristics of the application. Paper III, which focused on user requirements, design and development of the application system, applied a DSR approach strategy (with co-creation and co-design elements). A qualitative research approach was used to collect information deemed important for inclusion in the mobile application. This method articulates an interpretivist worldview, in which the inquirer must explain the procedure of meaning construction and clarify what and how meaning is embodied in the language and actions of social actors (Schwandt, 1994). A quantitative research approach was also employed to collect empirical data from the participants regarding mobile phone usage, product information and product display. This method presents a post-positivist worldview, which should lead clearly to the reason for certain social or psychological phenomena (Ryan, 2006). In this study, 33 participants were involved in eliciting user requirements, designing, and developing mobile solution.

Research question 4 focused on the demonstration and evaluation of the application by the end-users (women entrepreneurs) in determining whether it had enhanced their access to market information. Co-creation and co-design strategies were applied to enhance the DSR approach in the ICT4D realm and to reveal any shortfalls of the application for further improvements. Finally, Paper V presents the results of the demonstration and evaluation. The research instruments, such as interviews, direct observation, and focus group discussions, were used to obtain data
for scrutiny. According to Kothari and Garg, (2014), an interview involves oral-verbal stimuli presentation and oral responses. All interviews were organised into categories and themes and scrutinised using conventional qualitative content analysis (Hsieh & Shannon, 2005). The direct observation rules were strictly adhered to in observing and recording outcomes of the study (Bryman, 2012). Further, exploratory focus group discussion helped the study in understanding the opinions expressed by participants of the study about the suitability and hurdles of the designed artefact. A total of five (5) women entrepreneurs and five (5) customers of the produced goods participated in the study. Table 1. Shows the connections between research questions, DSR components, the research methods and research papers.

Table 1. Connections between research questions, DSR components, research methods and research papers

<table>
<thead>
<tr>
<th>Research Question (RQ)</th>
<th>DSR Component</th>
<th>Method</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ 1</td>
<td>Problem explication</td>
<td>Ethnography, co-creation Mixed methods Prototyping, observation</td>
<td>I II IV</td>
</tr>
<tr>
<td>RQ 2</td>
<td>Requirements definition, design and development</td>
<td>Prototyping, observation, co-creation</td>
<td>III</td>
</tr>
<tr>
<td>RQ 4</td>
<td>Demonstration and evaluation</td>
<td>Co-creation &amp; co-design, interviews, exploratory focus group discussion, observations</td>
<td>V</td>
</tr>
</tbody>
</table>

1.5 MAIN RESULTS AND CONTRIBUTIONS

This section presents the findings regarding the problem definition, user requirements, design, development, demonstration and the assessment of the developed application envisioned to allow women entrepreneurs to acquire information about the market at their own pace while still attending to family obligations.

The key findings from the demonstration to evaluation stage of the mobile application development indicate that women entrepreneurs benefitted a great deal from the application. It enabled them to access market information, save time, reduce the cost of travelling, identify potential customers, and foster business network expansion by sharing information with a large number of end-users. I summarise the findings of the research in the five papers published in academic journals and conference proceedings as follows.
**Paper I** examined the sociocultural challenges encountered by women entrepreneurs in the food processing chain industry in Iringa, Tanzania. These challenges include deficiency of market information, inequality in societal responsibility and inadequate capital. Furthermore, the paper indicates that women entrepreneurs employed an array of transversal approaches in tackling these sociocultural challenges (Kapinga & Suero Montero, 2017). One of these strategies was the formation of economic groups and clubs. Finally, the study suggested intervention through mobile technology to mitigate the challenge of accessing market information. The widespread usage of mobile phones provided an opportunity to design solutions that are manageable and easily accepted by the users.

**Paper II** investigated the use of mobile technology for retrieving market information, Tanzania, by women in the food processing industry in the developing economies, particularly Iringa, Tanzania. The research obtained a well-rounded opinion on the issues, limitations, and advantages of using mobile phone technology in acquiring information about the market. The study indicated that, unlike the existing reports, mobile technology solutions were not used to obtain appropriate market information for the growth of business. Rather, the mobile phones were used to facilitate social ties. Furthermore, the study suggested a credible solution focusing on a virtual platform for acquiring market-related information and fostering business growth among the target end-users.

**Paper III** explored women entrepreneurs’ requirements in the development of technological innovation for accessing market-related information. Using a DSR framework, the study identified business information suitable for the development of a mobile application, such as product information, product display, and market-related communication. *Product information* consisted of product ingredients, usefulness, and weight. *Product display* requirements were that the application should display sellers’ and clients’ contact details, photos, and prices. Finally, *market-related communication* requirements involved women entrepreneurs’ ability to place and receive orders, make provisions for the delivery of goods and receive responses through the application. They also required the ability of making a follow up on customer satisfaction with the goods produced – for instance, the price, taste, packaging or worth of the product to the marketplace.

**Paper IV** explored and highlighted the existing influence of incubators in business development in developing economies. The findings showed that business incubators offered training to the incubatees and enhanced the timely availability of market information. Furthermore, the research established that absence of contextualisation of the services offered by incubators made their support less impactful to the target group. Thus, the paper recommended the establishment of services tailor-made to the demands of the intended group and providing appropriate training beyond business management. The paper also advocated the government’s investments in new incubation centres that should be established across the country.
Paper V demonstrated and evaluated the developed mobile application to measure the scope to which the identified problem and the requirements of end-users were resolved in terms of realising the goal of empowering women entrepreneurs in business. The mobile application was found to empower women in acquiring market-related information more conveniently. The co-creation and co-designing of a mobile application that contextualised the context of Tanzania’s women-owned businesses facilitated the acquisition of market information to improve businesses, and thus the livelihood of women entrepreneurs. The study established that access to market-related information increased as an outcome of the co-designed mobile phone application.
2 REVIEW OF LITERATURE

2.1 WOMEN ENTREPRENEURSHIP DEVELOPMENT

Entrepreneurship has been construed along several different dimensions. Entrepreneurship is a dynamic process of vision, change, and creation. It requires energy and passion applied to the formation and implementation of innovative ideas and brilliant solutions (Kuratko, 2017). According to Hisrich & Peters, (1992), entrepreneurship is the dynamic process of making incremental wealth by individuals who shoulder the major risks in terms of equity, time and/or career commitment or provide worth for some product or services. Entrepreneurship is characterized by readiness of taking calculated risks in terms of time, equity, or career; the capability of formulating an effective undertaking team; the inventive skills of marshalling the desired resources; the important skill of building a solid business plan; and the vision of recognising opportunity where others see chaos, contradiction and confusion (Kuratko, 2017). Entrepreneurship plays an important role in the creation and growth of business as well as in the growth and prosperity of regions and nations (Hisrich, Peters, & Shepherd, 2013). Also, entrepreneurship involves initiating and constituting change in the structure of business and society (see also, Hisrich & Peters, 1992). An entrepreneur is an individual who identifies business opportunities where others see anarchy, contradiction, and misunderstanding. As Kuratko (2017) points out, entrepreneurs are aggressive catalysts for change within the market place and are the champions of today’s market place. In addition, they unify and combine aspects of production, run the enterprise, assume risks and control economic uncertainties associated with operating an enterprise. The main objectives of entrepreneurship are novelty, profitability and progress, and hence, the business is manifested by inventive strategic practice and sustainable growth. Therefore, women entrepreneurs are innovators who recognise and seize openings, transform those openings into feasible ideas, increase values in terms of time, effort and skills, assume the risks of competition in a marketplace to implement these ideas and reap the rewards of these efforts.

According to the ILO 2018 report, women entrepreneurs account for up to a third of all businesses in the formal economy in the world. Nevertheless, due to societal inhibitions many of them are confined to operate in the informal economy (International Labour Organization, ILO 2018). As revealed by Okafor and Mordi (2010), these women are characterised by a desire for accomplishment, being a locus of control, proactiveness and risk-taking tendencies. Women entrepreneurs can gain self-confidence of undertaking all the work that was once the entitlement of men and perform it brilliantly, and often better than men perform. As argued by Jamali (2009) women entrepreneurs contribute greatly to new business, leading to the growth of the economy and development in Sub-Saharan Africa. Likewise, Wasihun and Paul (2010) maintained that women entrepreneurs have the potential...
of increasing employment by creating job opportunities for countless unemployed people in society. With the increasing demand for self-employment in developing countries, and in Tanzania in particular, women entrepreneurs provide job prospects in remote areas and hence cannot be neglected. As noted by Rathee and Yadav (2017) women entrepreneurs generate jobs for themselves and others in the community and provide diverse solutions to management, organisation and business challenges. Moreover, they play a major role in agriculture and home-based industries, such as food processing. Entrepreneurship, as the main strength for economic transformation, needs more women to be engaged in its processes. In addition, in order for women entrepreneurs to contribute fully to economic development, availability of capital for business start-up, presence of reliable market for their goods, good processing technology, availability of market information, and business skills are prerequisite for the success (Kapinga & Suero Montero, 2017).

However, women entrepreneurs are confronted with various hurdles in their business development. The main challenges facing women entrepreneurs are the dual role of women and overlapping responsibilities, in other words, running a business and taking care of a home and children (Langevang, Hansen, & Rutashobya, 2018). Furthermore, women often face a high degree of illiteracy in rural areas, insufficient market information, capital and packaging material, and unsuitable education and training in childhood – all of which impede the production of high-quality products (Kapinga & Suero Montero, 2017; Jayakumar & Kannan, 2014). Moreover, negative attitudes toward businesses owned by women and a scarcity of business premises seriously impede the whole performance of female-owned enterprises (Kapinga & Suero Montero, 2017). Jagero and Kushoka (2011) argued that traditional production roles, laws and regulations, taxes, corruption and bureaucracy keep women entrepreneurs from starting and running businesses. Table 2 summarises the major sociocultural obstacles encountered by women entrepreneurs in developing economies.

Table 2. Summary of challenges facing women entrepreneurs in developing economies

<table>
<thead>
<tr>
<th>Measurement Item</th>
<th>Descriptions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited access to capital</td>
<td>Deficiency of capital, collateral encounters and assets for loaning, inflexible suitability conditions for acquiring financial facilities</td>
<td>Jamal, 2009; Kapinga &amp; Suero Montero, 2017; Magesa et al., 2003; Wasihun et al., 2010</td>
</tr>
<tr>
<td>Poor processing technology</td>
<td>Old milling machines, lack of knowledge of food processing</td>
<td>Kapinga &amp; Suero Montero, 2017</td>
</tr>
<tr>
<td>Inappropriate education and training access</td>
<td>Gender inequality in education access, unsuitable education access</td>
<td>Amine &amp; Staub, 2009; Yusuf, 2003</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Unequal division of labour</td>
<td>Family responsibilities are not equally distributed, patriarchal ideology</td>
<td>Ihuba &amp; Njoku, 2014</td>
</tr>
<tr>
<td>Social attitude</td>
<td>Dominance of patriarchal ideology, dishonesty in the household</td>
<td>Scott et al., 2012</td>
</tr>
</tbody>
</table>

## 2.2 MOBILE APPLICATIONS IN AFRICAN CONTEXTS

Mobile applications are increasingly being developed for mobile devices (smartphones and tablet PCs) in developing economies, and these are appropriate communication tools not limited by time or place (Dinh, et al., 2013). Mobile phones they have been designed as the platform of choice for generating, dispensing, and consuming inventive digital solutions and services in developing economies. The expansion of mobile infrastructure in the region has brought about mobile-based solutions that directly appeal to the local interests and cultures. The acknowledgement of mobile phones in developing economies has improved attention in literacy and presented new opportunities for communities that are depressed, marginalised and less privileged (Velghe, 2013). Mobile phone users accrue a rich understanding of numerous services through mobile applications (for instance, iPhone apps, Google apps) which run on the devices and/or on distant servers through wireless networks (Dinh et al., 2013).

Mobile applications are removing obstacles in conducting business and producing new opportunities in several business areas, including record keeping, advertisement, and promotion. Mobile applications in marketing are one interesting area for empowering women entrepreneurs through enhancing business performance. Advances in mobile technology have permitted the establishment of an extensive variety of applications (Harrison, Flood, & Duce, 2013) that can be used in empowering women entrepreneurs, such as mobile marketing applications.

With the increase in mobile phone usage, the development of mobile application represents a means by which women can overcome the challenges associated with undertaking a business venture. Such challenges, such as accessing market information for their products, emanate from societal structures. Mobile phone applications are ubiquitous because they allow users to obtain information and perform transactions wherever they are and whenever they want. In developing economies and in the rest of the world, mobile applications can improve opportunities for social and economic development (West, 2012). The application of mobile technology could therefore enable women to harness and tap into various opportunities available in a given locality, in terms of access to market for the development of
their business. Availability of information related to the market enables an entrepreneur to promote sales by enticement of value offered to stimulate interest in purchasing a good and, thus, generates responses in the form of an order, a request for further information or a visit to a retail outlet (Kerin, Hartley, & Rudelius, 2009).

Furthermore, mobile applications could improve access to capital and market information, helping women entrepreneurs serve a broader geographical area and reach new customers. In this respect, mobile applications can empower women and other disadvantaged groups in society to harness various chances for business development (West, 2012). A mobile application can enable women entrepreneurs to break into established markets and supply chains, and thereby gain foothold. Thus, a virtual platform could allow women entrepreneurs to have the same freedoms and opportunities available in men to accessing business networks.

Further, a mobile application can enable women entrepreneurs to know the price variation found among other producers of similar products, such as peanut butter. According to Aker and Mbiti (2010) finds that, the introduction of mobile phones enables to access information related to the market, hence reduce dispersal of grain prices across markets by 10 percent. Access to market information enables an entrepreneur to set competitive product prices, attracting more customers and gaining competitive advantages over their competitors. Also, access to market information is a well-organized means for reaching large number of customers and receive immediate feedback about the products. Access to market information it has the advantage of being tailored to match the needs of precise target market (Kerin, Hartley, & Rudelius, 2009).

However, many mobile phone users use the phones mainly for managing personal affairs and family bonds, and not for economic development or business motives (Mpogole, Usanga, & Tedre, 2008). As a result, access to market information that could facilitate intelligent resolutions on where and when to trade the processed goods is still a challenge for women entrepreneurs. Consequently, this study examines the potential of a mobile phone application in offering market information in a dispersed population and in an area with deprived communication infrastructures, such as rural Tanzania (Jensen, 2007).

Mobile applications play a significant role as an advertising platform for products to a large part of the population. The Mobile Marketing Association (MMA), (2009) defined mobile marketing as a set of practices that allows organisations to communicate in a collaborative and applied manner through any mobile device or network. It involves the circulation of whichever type of message or promotion that increases value to the end-users while improving the income of an enterprise. Mobile marketing has unlocked opportunities for women entrepreneurs to communicate and involve customers in a more active manner (Smutkupt, Khairit, & Esichai-Kul, 2010). It encompasses communication, which is an imperative part of marketing tactics, and flexibility, which allows communication to move forward without the constraint of needing to be in a static position at a definite point in time. It is a
set of processes for creating, interacting, bringing worth to customers and handling client relationships whereby both women entrepreneurs’ and stakeholders’ benefit. Moreover, the importance of mobile marketing lies in its advantage of improving communication by providing customised, timely and location-precise information without constraints of space and time (Smutkupt et al., 2010). The distinctive features of mobile marketing lie in its ubiquitous nature, its capacity for personalisation and making private transactions, being a two-way communication enablement and integration of co-creation and co-design elements that consider user experience (Sunny & Anael, 2016). In this light, mobile applications can be an effective way of empowering women entrepreneurs against the sociocultural constraints that impede their business. This is evidenced by impact reports of past mobile application projects in Sub-Saharan Africa. Table 3 summarises some of these projects for informal workers.

Table 3. Identified mobile applications and project descriptions

<table>
<thead>
<tr>
<th>Project</th>
<th>Description of Project</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esoko</td>
<td>Esoko was introduced in 2006 in Ghana and 2012 in Zimbabwe. mAgric platform for tracing and sharing market intelligence. It connected farmers to markets with prices and bargains from customers. Esoko now is active in 16 countries.</td>
<td>David-West, 2010; Ifeoma &amp; Mathitwa, 2015</td>
</tr>
<tr>
<td>Sauti ya Wakulima (The voice of farmers)</td>
<td>A collaborative knowledge base created by farmers in Tanzania in 2011 to disseminate information on climate, pests and plant diseases and how to cope with these problems.</td>
<td>Tisselli, 2015; Tisselli, Schlaepfer-Miller, &amp; Hilbeck, 2013</td>
</tr>
<tr>
<td>M-shamba (Mobile farm)</td>
<td>A cooperative platform in Kenya that offers information to farmers on production, harvesting, marketing and climate through mobile phones.</td>
<td>M-Shamba, 2015</td>
</tr>
<tr>
<td>M-kilimo (Mobile agriculture)</td>
<td>Established in Kenya in 2009, this provides agricultural information, advice. It employs mobile phones to respond to inquiries from registered farmers. To date 30,000 unique users have subscribed M-Kilimo.</td>
<td>Brugger, 2011</td>
</tr>
<tr>
<td>DrumNet</td>
<td>Has delivered a set of services to rural small holders’ farmers to increase farm productivity and access market information through mobile phones since 2003, organised by Pride Africa.</td>
<td>Rashid &amp; Elder, 2009</td>
</tr>
</tbody>
</table>
2.3 WOMEN EMPOWERMENT IN THE CONTEXT OF ICT4D

Women empowerment has been considered one of the topmost development goals, while instantaneously being underscored as an important tool to achieve poverty reduction and other development outcomes in the developing economies (Hoan, Chib, & Mahalingham, 2016). Nevertheless, the conduits to attain the goal are less obvious since the meaning and measurement of empowerment has remained unclear due to socio-cultural setting. Scholars and practitioners have followed some conventional patterns in countless conceptualizations of women’s empowerment. Kabeer (1999), defined women empowerment as a process whereby those who have been deprived of the capacity of making strategic selections in life end up acquiring such a capacity. It entails the enhancement of people’s ability to make deliberate life choices in settings in which this was formerly denied to them. The capacity to use such choices entails three dimensions: resources, agency, and achievements. These can be used to define an indicator and thus validating it as a measure of women empowerment (see Kabeer, 1999). Also, Cornwall (2016), defined empowerment as the procedure of improving the capacity of individuals or groups (women entrepreneurs) to make choices and change those choices into anticipated actions and outcomes. The main focus to this process is actions that create individual and collective proclaims and enhance the effectiveness and impartiality of the institutional structure which govern the use of these proclaims. Moreover, women empowerment means restoring a sense of their own worth and strengthening their capacity to resolve their own difficulties (Buskens & Webb, 2013). Thus, it imperative to underscore that, the ability to change one’s life condition depends on immediate institutional structures that permit one to do so.

The objective of empowering women is to provide equal economic, political, social and legal opportunities for their development and that of the nation at large. Women empowerment contributes to the growth of a country through wealth creation, enhancement in per capital income, creation of occupational opportunities and social contributions such as balanced regional development, enhancement in living standards and innovation (Rathee & Yadav, 2017). Furthermore, empowerment enables women to create consciousness of their rights and obligations, self-confidence, to have control over their lives both at home and outside home, and to develop the ability make changes in the community (Sohail, 2014). Therefore, we see that empowerment plays a role as catalyst to the development in the society by enabling women to participate in developmental issues on equal footing as men, such as doing business. Thus, empowerment is about power relationship which is based on a preposition that one group of people can and indeed should somehow empower others.

The concept of women empowerment and the extent to which ICT can be deployed as an empowering tool (e.g., for accessing market-related information) is the subject of interest in this study. The concept of empowerment in the perspective of
Information and Communication Technology for Development (ICT4D) involves people developing capabilities by changing the power structures that constrain them to act successfully within the prevailing system and structures of power (Unwin, 2017). ICT4D denotes to the opportunities of ICT as an agent of development (Sutinen & Tedre, 2010). Also, ICT4D has been defined as a complex socio-technical activity in which the social and technical negotiate and evolve together to address ill-structured and wicked problems (Smith & Turpin, 2017). Furthermore, ICT4D is concerning how people make use of the available information and technological assets to develop their own capabilities, improve their livelihood, and enhancing the economic status of the rural sector as well (see also, Ojo, 2016). Thus, ICT4D bridges the digital divide and enrich economic development by guaranteeing equitable access to up-to-date information technologies.

The potential role of ICTs in empowering the disadvantaged group (women entrepreneurs) in the developing economies has been discussed, nevertheless, comparatively little is known about how, when and why empowerment occurs (Abubakar, Dasuki, & Quaye, 2017). There are number of conducts in which ICTs can empower women entrepreneurs, such as enabling business activity on their part. ICTs can empower women entrepreneurs by fostering new opportunities of starting and growing businesses by reaching out to the clients, becoming more efficient and building their businesses more than they were able to do previously (United Nations Conference on Trade and Development, 2014). ICT is a solution for the development of poor African society through enhancing competences for human development when applied with forethought, clear objectives, understanding the challenges that exist in the context of women entrepreneurs and promote the use of ICT for the disadvantaged group (Islam & Grönlund, 2011). Furthermore, ICT is among the tools of addressing the biggest challenges facing developing economies including poverty, gender inequality, hunger, ignorance, tyranny, climate change and more (Heeks, 2018). Likewise, ICT can improve the quality of life for every African, economic integration of the regions, and improving trade and other linkage within the global community (see also, Ojo 2016). In addition, the use of ICTs by women entrepreneurs helps to empower them by reducing traveling expenses and time to the market, it reduce physical risks such as theft, and increase outcomes of those necessary journey, as well as reduce tiredness as they interact with through virtual platform (Sife, Kiondo, & Macha, 2010). The wide spread of internet connectivity in developing economies and mobile telephone close to ubiquitous, far more people now have access to a mobile phones than have access to piped water (Mitullah, Samson, Wambua, & Balongo, 2016), and thus, it provides a great chances for women, who should be an integral part of and important actors in the information community (Smith, 2015). In achieving the goals of ICT4D projects, it is imperative to place more emphasis on the local realities such as power structure and indigenous source of knowledge which can be greatly enhanced by ICTs. The contribution of ICTs to economic development of the marginalised
community is apprehensive with the issues to do with the access that people have to information and enable to change their lives and livelihoods (Unwin, 2009).

Additionally, ICTs has contributed in elimination of cultural contraints which impedes women from doing business because of unequal distribution of responsibilities in the household caused by patriarchal ideology (Ihugba & Njoku, 2014). However, in achieving the goal of empowerment through the use of ICTs, in the developing economies is hampered by the numerous barriers that prevent women from accessing ICTs. ICTs are considered as being socially constructed and thus impact men and women differently since it is not gender neutral (Hafkin & Huyer, 2007). It is imperative to take into deliberation that women have different needs, capabilities and skills than men. Participation of the end-users in the design of ICT4D projects in the developing economies could be a tool to adress these bariers. In addition, ICT4D projects fails because technology may simply have no positive socio- economic impact on its targeted community. This occurs when the challenges to development are expensive to overcome, for instance, the end-users are characterised by high illiteracy and lack of technical staff to solve technical problems when they emerge (Chipidza & Leidner, 2017). Furthermore, sustainability aspects of ICT4D projects have not taken into consideration, which leads to weak long term effect (Unwin, 2009). This has been attributed by the introduction of ICTs solutions without acknowledging the needs and requirements of the end-users.

This study advocates feminist and institutional theory in understanding the nature of the challenges that curtail business development. Even though there are several theories in the field of entrepreneurship, this study advocates these two theories. Feminist theories were deemed important to use in this study because they locate the ideological roots of key concepts in empowerment and feminist thinking about improving women’s business performance through mobile technology. Also, as a lens of feminist standpoints can be used to develop and compare diverse views points on women experiences in the society (Crawford & Unger, 2004). Likewise, institutional theory is considered imperative in this study as it provides an established framework for the explanation of how social norms and behaviours affect women entrepreneurs’ business performance in the developing economies. In addition, it illustrates how socio-cultural encounters from the viewpoint of regulatory, normative and cognitive structures could affect business development of women entrepreneurs (Amine & Staub, 2009). The contributions of these theories in understanding gender perspective and business development are described in this section.
2.2.1 Feminist theories

Feminist arguments are determinedly subject to popular remarks, suspicion, and rejection, as they challenge the power of the masculine which is harboured within and is articulated by a fundamentally gendered socio-economic ordering (McRobbie, 2009). This study adopted feminist and institutional theories in understanding the nature of the challenges impeding business development among women entrepreneurs, the need of empowering them through mobile technology and its implications. Feminist theory has several variations whereby each can be thought as a different lens through which to view the experiences of women and like different lenses, each is useful for concentrating on particular phenomena (Crawford & Unger, 2004). Feminist theories were deemed appropriate for this study because they illustrate on how to women can be empowered from different dimensions. Feminists believe that ideas about the nature of gender disparity in the community stem from patriarchal beliefs, and they utilise that understanding to improve the lives of women. According to Jennings & Brush, (2013), stereotypes and subjective perceptual variables influence our beliefs about the entrepreneurial propensity of women and provide justification for considerable variance in entrepreneurial activity among genders. Similarly, in the women’s entrepreneurship domain, feminist theories are important as they help to understand gender differences caused by patriarchal ideology. They also help to understand how marginalised groups can be empowered from different perspectives, such as technology. Feminist theories contribute to our understanding of women entrepreneurship by identifying four main aspects: (i) entrepreneurship as a gender marvel, (ii) entrepreneurship as rooted in the family, (iii) entrepreneurship as a result of requisite and opportunity, and (iv) entrepreneurship as a pursuit of a goal beyond economic gain (Jennings & Brush, 2013).

Feminist theories focus on the description of gender differences in entrepreneurship so as to comprehend the likelihoods and choices of entrepreneurs in developing economies (Vossenberg, 2013). Our work was guided by two feminist theories in understanding women’s engagement in entrepreneurial activities: liberal feminism, and social feminist theory.

2.2.1.1 Liberal feminism

The proposition of liberal feminism has been the exclusion of obvious lawful and institutional against the involvement of female entrepreneurs in the community equal to that of their male counterparts’ entrepreneurs. Liberal feminism considers that, given equal environments and opportunities men and women will behave similarly (Crawford & Unger, 2004). Liberal feminism is derived from the liberal political viewpoint in the enlightenment period, and centers on the central ideas of autonomy, universal rights, equality of citizenship, and democracy. Therefore,
eradication of obstacles against women’s involvement, particularly in education and employment is a solution to women’s lack of business achievement. The elimination of institutional and legal obstacles would allow men and women as individuals unrestricted access to opportunities, moving forward based on their potentials, abilities and readiness to work to achieve equitable entrepreneurial outcomes (Butler, 2003). The work on women entrepreneurs’ business is consistently organised according to a feminist framework that is viewed from feminist perspective (Butler, 2003). The treatment of liberal feminism is conventional in terms of well-known feminist theory. Assuming that women’s and men’s ways of knowing and managing things in the world are similar, the task of feminist research and guidelines is to allow women’s estates to become similar to those of men via the elimination of general discriminatory practice against women. Liberal feminists can be credited with wellbeing, education, and health restructurings that have promoted the lives of women. In this light, women should have similar rights as men, such as equality in education, business as well as employment opportunities (Enyew & Mihrete, 2018). Thus, liberal feminism tends to disparage gender disparity in the community and support gender fairness.

However, liberal feminism have been criticised that, its individualist assumptions make it difficult to see the ways in which underlying social structures and values disadvantage women entrepreneurs. It is argued that, even if women are not dependent upon individual men, they are still dependent upon a patriarchal state. Liberal feminism cannot overcome the dominant belief that women and men are intrinsically diverse, but to a degree, it succeeds in showing that, although women are different from men they are not inferior (see also, Enyew & Mihrete, 2018).

2.2.1.2 Social feminist theory

Social feminist theory embraces the proposition that there are dissimilarities between male and female experiences due to deliberate socialisation methods from earliest moments of life resulting in different ways of seeing the world (Fischer, Reuber, & Dyke, 1993). Culture determines how women interpret their gender responsibility regarding being entrepreneurs in a given community, and less participation does not indicate that women are mediocre as compared to men, but rather that there are difference perceived by the society. Marlow & McAdam, (2013) pointed out that, there is a deeply embedded sense that men and women are fundamentally different, which produces and sustains a hierarchical ordering which raises the masculine and subordinate the feminine. Thus, gender differences, unequal access to resources, imbalances in education opportunity, and inequality in economic power relationships are socially created. There is variations in the way women in Africa context understand gender and gender struggles is due to differences in regional, political and religion. Hence, these phenomena vary across
cultures in the developing economies. Social feminism in Africa aim at adjusting culture as it disturbs women in different societies. This understanding paves the way to different intervention strategies of empowering women entrepreneurs, based on socially constructed roles between women and men. Thus, in African context empowerment of women entrepreneurs can be attained by employing different strategies in a holistic approach to undermine causes of woman’s subordination. Tanzania in particular, several initiatives have been introduced to undermine reasons of women’s demotion. For instance, Tanzania Gender Networking Programme (TGNP) was introduced to strengthen the building of a transformative feminist movement in Tanzania (Kitunga & Mbilinyi, 2009). The TNGP has been at the forefront in the struggle for gender equality, social justice, equity, and women’s empowerment in Tanzania.

2.2.2 Institutional theory

Institutional theory portrays sociocultural encounters from the viewpoint of regulatory, normative, and cognitive structures (Amine & Staub, 2009). Though such structures offer stability and make sense out of societal behaviour, they also might present hurdles to business development of women entrepreneurs. Women entrepreneurs can therefore be inhibited in ways that are perpetuated by institutions in the business setting, though their efforts may be influenced both negatively and positively. The cognitive institutional pillar comprises of scripts, schemas, and taken-for-granted elements that influence individuals in a sociocultural setting. In addition cognitive and social knowledge are socially shared (Scott, 2001). Also, normative pillars represent actions that individual ought to take, standards of behaviour and commercial conventions of various professions, occupations and organizational fields (Bruton, Ahlstrom, & Li, 2010). Finally, regulatory pillars consist of laws, regulations, rules, policies, and their enforcement in promoting a certain type of behaviour and restrict others (Veciana & Urbano, 2008). Thus, institutional theory provides a framework for explaining inequalities embedded in regulatory, normative, and cognitive pillars that influence business performance of women entrepreneur. On this basis, it can offer viable strategies through technology to empower women in business to achieve acceptable solutions.

Mobile technology can be used to empower women entrepreneurs by strengthening their ability of engaging in business despite obstacles embedded in society, as recognized by feminist and institutional perspectives, enabling the handling of family matter alongside business activities. Figure 2 summarises some of the sociocultural challenges grounded in institutional structures and feminist perspectives, and transversal strategies.
Figure 2. Socio-cultural challenges and transversal strategies of women entrepreneurs in Iringa region, Tanzania (redrawn from Paper I).
2.4 SUMMARY

This chapter presented the review of literature on women empowerment and mobile technology. The chapter described the concepts of women entrepreneurship development, mobile application in Africa context, empowerment in the context of ICT4D, and theories (feminist and institutional) employed in understanding the nature of the challenges that curtails business development owned by women entrepreneurs in the developing economies. Mobile technologies are an important tool for empowering women entrepreneurs, since it gives them new opportunities of starting and growing business by interacting with the clients more easily through virtual platform. Also, mobile technology empower women entrepreneurs by consolidating their ability of tempting in business activities notwithstanding obstacles embedded in the social structures.
3 RESEARCH DESIGN

The aim of this chapter is to describe the research design applied in developing the mobile application for women entrepreneurs. First, though it needs to be emphasised that, there are several research frameworks that this study could have used (see, Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007 and Hevner & Chatterjee, 2010), this dissertation adapted the design science research framework put forward by Johannesson and Perjons (2014) in designing and developing a mobile marketing application to facilitate women entrepreneurs’ access to market information. The DSR framework was used to understand the problem and to identify suitable solutions through co-creation and co-design with the end-users. The co-created solution in this manner should therefore be more meaningful to the end-users, boosting their sense of ownership and social acceptance.

3.1 DESIGN SCIENCE RESEARCH FRAMEWORK

Design Science Research (DSR) is an orderly way of developing solutions to real-world problems evolving from actual life setting and circumstances (see, Johannesson & Perjons, 2014). It produces or investigates original artefacts (Hevner, 2007, Johannesson & Perjons, 2014). Furthermore, DSR involves the creation of knowledge through the design of innovative artefacts (things or processes) and the study of artefact’s usage and/or performance with reflection and generalisation. Thus, according to March and Storey, (2008), DSR is about problem solving. The purpose of DSR is not only to produce artefacts but also to respond to inquiries about them and their surroundings (Johannesson & Perjons, 2014). Grounded in thoughtful contemplation of the problem, DSR can be used to create and appraise artefacts that facilitate renovation of situation through altering their situations to the desired state. DSR is oriented toward providing, if not optimal, satisfactory solutions to problems (see, Lacerda, Antunes, & Dresch, 2015). Solutions generated by DSR should be, however, general enough that other scholars and experts in other circumstances can use them to further knowledge creation.

According to Johannesson and Perjons (2014) DSR “includes five core activities that range from problem inquiry and requirements definition, through design and development, and lastly, to demonstration and evaluation” p76. In each stage, research strategies are used to conduct different activities and add to the knowledge base in the field of study. There are several design science research frameworks as summarised by scholars (see for example, Peffers, Tuunanen, Rothenberger, & Chatterjee (2007), Hevner & Chatterjee (2010). This study adapted the DSR framework of Johannesson and Perjons (2014), including elements of co-creation and co-design to arrive at a suitable technical solution that facilitates access to market information. The adapted framework is based on the following reasons:
(i) it comprises related activities in each stage, indicating inputs needed and the expected output,
(ii) the framework clarifies the research strategies (overall plan for conducting a research study) and methods in each DSR activity,
(iii) it offers guidelines on how to relate research to the prevailing knowledge base, and
(iv) the framework offers illustrations and examples for each process in sequence.

### 3.2 STAGES OF THE DSR FRAMEWORK

DSR can be a hefty undertaking, involving many people for an extended period of time (Johannesson and Perjons, 2014). Researchers can gain from DSR approaches that helps to organise their activities and guarantee that the effort is the worth of the outcomes. This study followed the five stages of DSR framework: problem inquiry, definition of user requirements, design and development, demonstration, and evaluation of the artefact. Detailed below are the tactics and approaches used in each stage.

#### 3.2.1 Explicate the problem

The first activity in a DSR framework is to explain a challenge being addressed (Johannesson & Perjons, 2014). This stage involves exploring the main problem, positioning it within the practice in which it transpires, articulating it precisely, and stimulating its relevance to the community. It also involves dividing the problem into sub-problems before the analysis. In this study, the problem explicated was the challenge of accessing market information by women entrepreneurs in the food sector in Tanzania.

#### 3.2.2 Outline the artefact and define requirements

This activity encompasses outlining a way of overcoming the identified challenges in the form of an artefact. In this study rigorous investigations were carried out to recognise user requirements so that they could be amalgamated into the designed application to facilitate access to market information through interactions with end-users. The aim was to recognize important information users might offer easily via the application. In our case, product information and product display were identified for artefact functionality, creation, and setting.
3.2.3 Artefact design and development

This stage involves designing and developing the artefact, to address the identified challenge and carrying out the well-defined requests identified in the previous activity. The crafting of the artefact involves both determining its functionality and constructing the artefact (Johannesson & Perjons, 2014). Different design techniques can be used in the process, such as brainstorming, participative modelling, walk through, and pair design. This is to say that the instruments introduced here are illustrate just one way of supporting design work. In this study, a prototype was drawn to assist in the design of a user-interface grounded on user-centred understanding. The mobile marketing application system was implemented successful, and in accordance with the users’ requirements for retrieving potential market-related information and expanding their business networks in Iringa.

3.2.4 Artefact demonstration

At this stage, the developed artefact is demonstrated in an actual life scenario, to determine the feasibility or to test the concept (De Villiers & Harpur, 2013). Demonstration is intended to show whether the artefact can solve certain facets of the challenge in one descriptive or real-life circumstance. In addition, demonstration intends to present hints of the artefact to the users in a colourful and confident manner. In this study, the mobile application was demonstrated and used in real-life setting, as women entrepreneurs and their customers had first-hand experience with the developed artefact.

3.2.5 Artefact evaluation

The fifth activity according to the DSR framework is to evaluate the artefact. This activity aims at determining whether the artefact satisfies the user requirements and how it addresses the explained problem. According to scholars, Venable, Pries-Heje, & Baskerville, (2016), the appraisal or evaluation of the artefact is the important aspect in DSR, since it provides feedback as to the extent to which the mobile marketing application was performed as projected to access market information, guaranteeing the rigor of the research.

In this project, formative evaluation was conducted to gather responses to improve the artefact. Moreover, summative appraisal was conducted to appraise the overall outcome of the artefact. The research methods for evaluation of the artefact included face-to-face unstructured and semi-structured interview, direct observation, and group discussions. The guidelines for evaluation of the artefact focused on every requirement identified and how well the artefact fulfilled the requirements
and the explicated problem. The outcomes of the appraisal of the mobile applications are presented in the subsequent section.

### 3.3 ARTEFACT DEVELOPMENT WITH DSR, CO-CREATION AND CO-DESIGN

The repetition and incremental development principle of DSR required that at least one cycle be conducted during the development of a mobile marketing application. Nevertheless, in this study, slighter iterations between the stages of DSR cycle happened through co-creation and co-designing in order to revise the identified problem in accordance to the defined requirements. The iterations produced new insights on the needs of the end-users and update the relevance of the research. The DSR design cycle of mobile application was addressed by research questions 1, and 2, which focused on recognising encounters confronted by women entrepreneurs and how a mobile phone application could help them to access market information. Further, this was addressed by research question 3 that addressed the user requirements in a technological innovation tailored to simplify their access to business information. Research question 4 focused on knowing whether the mobile application system had offered a solution to the problem of accessing market information. Figure 3 presents DSR activities in the development of the mobile application.

![Design science research framework modified from Johannesson and Perjons (2014)](image)

Figure 3. Design science research framework modified from Johannesson and Perjons (2014)
This study employed co-creation and co-designing strategies in the implementation of a technological solution within a DSR framework. Co-creation and co-design is a user-centric approach whereby the researcher considers users first and recognises them as the initial point of know-how and creation of value over the course of development and implementation of the artefact. Co-creation and co-design as unified methodology was employed to contextualise the solution with the users’ needs. It involved forging collaboration between the researchers of this study and end-users in questions framing, research design and implementation (see, Goodyear-Smith, Jackson, & Greenhalgh, 2015).

Specifically, the research employed a co-creation and co-designing strategy because:

(i) it is based on value and focuses on the relationships and allocation of responsibilities among designers, researchers, and end-users during the processes, hence improving interactions in co-creation and co-design,

(ii) the incorporation of co-creation and co-design in DSR approach to ICT4D is imperative, as it allows end-user involvement in the process of making a solution, which might affect a more justifiable feeling of possession and greater approval of the produced artefact,

(iii) the procedure of co-creation, and co-designing tends to produce unforeseen advantage – the study outcomes alter the inherent expectations of researchers after gaining new insight from the participants during the DSR process, and

(iv) it is a unified methodology (Steen, Manschot, & De Koning, 2011). Grobler & De Villiers, (2017), point out that, the effectiveness and usefulness to community users should be validated through participatory approaches as this allows community members to shape solutions that they value.

However, the co-creation and co-designing strategy employed in this study, encountered some difficulties during the implementation of the mobile technology. The main challenge were related to the smartphones used by the participants lost battery fast particularly after allowing mobile data usage to access the application data which are hosted in the cloud. Another challenge was lack of knowledge of using the mobile application. The usage of mobile technology application needs training prior real-life usage, especially for those who are not very acquainted with smartphones usage.

Thus, an innovative contribution of this study is the extension and strengthening of DSR with co-creation and co-design strategies within the ICTD4 realm. Similarly, the design tailored the technological solution to the desires of beneficiaries, which created a sense of ownership. This was vital as it highlights the end-users’ involvement in the process of solution making.
3.4 RESEARCH PARADIGMS

The study was based on philosophical assumptions and beliefs of interpretivism and pragmatism (Creswell, 2014). It began with interpretivist worldviews to understand the environment of women entrepreneurs (problem explication), define the requirements, and design and develop the artefact. Interpretivism holds that the social world is created by people who bring about social actions and give senses to them (Johannesson & Perjons, 2014). Societal authenticity is intangible and fluid than physical authenticity as it relies on peoples’ preconceptions, and prejudices. The researcher’s intention in using an interpretivist philosophy was to understand how institutional structures, which are socially constructed, affected women entrepreneurs and how to address the problem through mobile technology applications. The objective of interpretivism is to enable society to reflect upon actions, and upon how the social order is formed and what the objectives of their actions are.

In line with interpretivism, participants of this study had the opportunity to reveal socio-cultural challenges that curtailed their equal involvement in business. The researchers employed ethnographic strategies to arrive at a participatory understanding of social phenomena. Interpretivism is a suitable philosophy for this study because it aims at improving a situation, which is contextualised to real-world challenges, and understands that to resolve the problem at hand is more important than the method used (Goldkuhl, 2012).

Moreover, this study also employed pragmatist philosophy. This is concerned with action, transformation and the interaction between knowledge and action (Goldkuhl, 2012). Pragmatism is an appropriate paradigm for action research and design science research. This was, thus, also appropriate for this study, which intended to intervene in the sociocultural challenges facing women entrepreneurs by developing an artefact of enhancing their access to market information and hence improve their livelihoods.

3.5 RESEARCH ETHICS

The ethical issues related to a research project and societal consequences were considered at all stages of the design of the mobile marketing application. Here, research integrity refers to the researchers’ obligations regarding the concerns of his study (Iivari, 2007). According to Johannesson and Perjons (2014) the overarching standard for study ethics is that, the ends do not justify the means in the search of knowledge. Moreover, as Iivari (2010) points out, DSR brings about “an ethical change” in research since it does not only describes the world but also it shapes it through the generation of new knowledge and the creation of innovative artefacts as solutions to real problems. Therefore, the value of the research must be made as “explicit as possible” (ibid. p17).
In this light, the present study adhered to the principles for research ethics as follows. First, the researcher made sure not to disclose any personal information provided by the participants during the project cycle. All information was treated as confidential and was only used for research purposes during this study. Second, all study participants were provided with sufficient information about the objectives and benefits of the study for the targeted community. Third, the researcher complied with “the law of the land” by providing leaders of each given locality with an introduction letter from the research institution (University of Eastern Finland) that explained the purpose of the study and its social impact. Fourth, the researcher observed principles of the digital divide, intellectual property and individual rights (see Johannesson & Perjons, 2014).

3.6 SUMMARY

This chapter presented the methods applied in this study. It presented the DSR approach as a framework that guided our understanding of the hurdles that women entrepreneurs face with a view of mitigate them through ICT solutions, since DSR is a holistic research approach leading to problem solving by means of artefacts. The deployed DSR method comprised co-creation and co-design elements of carrying out each stage of DSR: explicating the problem, outlining an artefact solution, defining requirements, designing and developing the artefact, demonstrating the artefact, and evaluating it. The method as defined here, may appear highly chronological, however the DSR project was conducted through an iterative, incremental approach in other words moving back and forth through all of the stages of DSR. Thus, the actions should not be perceived as temporally ordered, but instead as reasonably connected over input-output interactions such that each activity can obtain input and yield output for any other activity (Johannesson & Perjons, 2014).
4 THE DEVELOPED ARTEFACT

In the context of Africa, there are several solutions in facilitating access to market information among informal workers (see Table 4). Nevertheless, Sub-Saharan Africa still faces several hurdles in the implementation of mobile marketing applications especially those targeted to the marginalised groups such as women entrepreneurs.

Although many women entrepreneurs own mobile phones devices in Sub-Saharan Africa, they do not use them for business purpose, but rather for social interaction with friends and relatives (Mpogole, Usanga, & Tedre, 2008; Donner, 2006). This underscored the need for a mobile marketing framework of accessing market information (see Kiba-Janiak, 2014; Kapinga, Suero Montero, & Mbise, 2016; Lacerda, Antunes, & Dresch, 2015). Any technology solution would need to contextualise women’s needs when accessing market information to allow them to do so at their own pace while still attending to social obligations. This chapter presents the stages of development of one such mobile marketing application solution to empower women entrepreneurs in accessing and sharing market information regarding their produce.

4.1 PROBLEM EXPLICATION

As noted previously, although many women possess cellular phone devices, they do not often use them for conducting business (Kapinga et al., 2016). Consequently, they miss the opportunity of using the gadgets to improve their business performance. In this light, the researchers assumed academic responsibility of designing a mobile marketing system to support a blended marketing strategy instead of depending solely on ordinary ways of marketing, which include walking carrying the goods seeking for potential buyers. In addition, a mobile application could mitigate inequality in terms of distribution of tasks whereby, women are accountable both for taking care of the families and are for processing food (Kapinga & Suero Montero, 2017; Gichuki, Mulu-Mutuku, & Kinuthia, 2014). Moreover, it could mitigate the sociocultural challenges embedded in normative, cognitive, and regulatory pillars that prohibit women from engaging fully in business activities for the betterment of their livelihoods. It could also overcome the challenge women face of lacking knowledge about promoting goods in the marketplace that causes difficulties in attracting customers (Kapinga A. F., Suero Montero, Mwandosya, & Mbise, 2018). Thus, these issues were the motivation behind the identification of appropriate technologies which could be integrated into women’s business activities and address the challenges which are the source of poor business performance among women.

Following DSR, the researchers formulated initial problem, positioned it, rationalised its importance and investigated its underlying causes (Johannesson & Per-
This was enriched through co-creation by giving the target group (rural Tanzanian women entrepreneurs) a space of voicing their concerns, problems and hopes of a better future. We explored opinions of women entrepreneurs through interviews, questionnaires, and exploratory focus group workshops to ascertain the extent to which technology could be employed to enable them obtain potential market information and highlight any challenges of its use.

The majority of women entrepreneurs participating in the study established that their entrepreneurship faces several obstacles that curtailed their daily business performance. This was focused on in paper one (PI), which looked at the direct association between sociocultural factors (SCF) such as meddling, absence of support from husbands and poor monetary performance (FP) of women in SME (small and medium enterprises) in Tanzania (Kapinga & Suero Montero, 2017; Majenga & Mashenene, 2014; Maziku, Majenga, & Mashenene, 2014). Qualitative research methods were employed to explore such challenges women experienced in doing business in Iringa, Tanzania. Paper (PII) investigated the usefulness of mobile phones for entrepreneurs in retrieving market information. Paper (PIV) explored the contributions of incubators (Hub) for business development by women by identifying any additional challenges that could be addressed through technology.

4.2 THE REQUIREMENTS DEFINITION

A requirements definition is an artefact property that is considered as required by women entrepreneurs in practice and that is to be used to guide the design and development of the mobile application solution (Johannesson & Perjons, 2014). The aim of requirement identification was to build a system that could facilitate access to market information by displaying product’s ingredients, specification, and usefulness of the products to end-users. Requirement definition was important because stakeholders may have different views on the requirements, and some of these might even be incompatible, making them impossible to satisfy at the same time (Kapinga, Suero Montero & Mbise, 2016). Requirement definition comprised of two activities, “outlining artefact”, and “eliciting requirements” (Johannesson & Perjons, 2014). According to Johannesson and Perjons, (2014) outlining the artefact starts by selecting which type of artefact should be designed to solve the defined problem. Eliciting requirements includes looking at the features of the problem, the sketched solution, the technological opportunities, previous recognised solutions, and interests and thoughts of the stakeholders.

In order to identify the requirements definition for the technological solution of this study, the encounters that affect women entrepreneurs while conducting their business were investigated and analysed by employing a co-creation approach among the researchers, developer and end-users (women entrepreneurs). Since access to market information was identified as one of the pressing challenges, the
participants agreed that a technological solution could assist them to address this problem.

According to Mramba, et al. (2015), a tailor-made mobile technology application could improve informal recordkeeping system of street vendors', assist in identifying potential customers and boost products advertisement and information sharing. Furthermore, a suitable mobile technology application could also simplify communication between women entrepreneurs and customers where the latter could be informed about availability and quantities of their produce, qualities, and usefulness of the products for human health. Moreover, a mobile technology application could help to recognise the prevailing market prices of goods by getting feedback from the customers on the market trends and by viewing prices offered by competitors.

During this stage of the DSR, co-creation focus group workshops and interviews were used to elicit user requirements (Bryman, 2012). The workshops provided the participants with the prompts of the possibilities that mobile technology is able to afford. Stakeholders were asked to imagine an ideal tool that could help them overcome the problems of accessing market information and describe which features were incorporated in such a tool. During the workshops, participants discussed and brainstormed imaginative and creative requirements in partnership with the researcher.

As a result of these activities, the end-users imagined a tool that could display the price of the product alongside a picture showing how the product looked like. In their views, this could attract customers into purchasing the produce. Sellers and customers contacts were also identified as a requirement that should be incorporated into the system to foster business communication outside the platform. Furthermore, in their views the ideal tool is the one which could foster the receipt and delivery of orders as well as provide customers feedback on the product in question.

The participants also suggested the use of Swahili language in the ideal tool to accommodate the needs of the majority of end-users. They argued that because Swahili is a native language which is used widely in East Africa and parts of central and Southern Africa, a Swahili language-based mobile application is thus of paramount importance for scalability and sustainability for all women entrepreneurs in Tanzanian and in the neighbouring countries of East Africa community. Therefore, the language that is effective in empowering marginalised groups of women in the business domain should be used. Furthermore, the participants suggested including a voice-based interface for recording oral descriptions of the product in order to cater for the needs of illiterate customers. A Voice-based interface is of paramount importance in enabling customers who cannot read and write to know the verbal descriptions of the product in terms of ingredient, usefulness, and price and thereafter to make sound decision on whether to order the products or not. The summary of the requirements that were acknowledged by the researchers, women en-
trepreneurs and customers during the elucidation stage (Paper III) are shown in Table 4.

Table 4. The user requirements and functions description

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Functions Description</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product information</td>
<td>This is focused on the product ingredients, weight, usefulness of the goods to buyers’ health and sellers’ contact.</td>
<td>Non-functional</td>
</tr>
<tr>
<td>Product display</td>
<td>This includes product price and picture that indicates how the product looks</td>
<td>Non-functional</td>
</tr>
<tr>
<td>Market-related communication</td>
<td>A mechanism for receiving orders from buyers, engagements for delivery, and feedback channel to receive customers’ satisfaction.</td>
<td>Functional</td>
</tr>
</tbody>
</table>

In general, requirements fell into the categories of functional and non-functional requirements. Functional requirements were concerned with the functions, structure, and environment (Johannesson & Perjons, 2014). Functional requirements refer to the functions of the artefact (proposed solution) that address women entrepreneurs’ needs to access market information. Non-functional requirements were those that are not functional but were relevant to mobile application usage, such as product information and product display information. Figure 4 displays one of the sessions of user requirements exploration during the training on how to use application in order to ascertain whether there were new requirements for further improvement.
In general, it was deemed essential to design and implement a mobile application that helps women who are overburdened with many responsibilities in Tanzania, especially in the rural areas. The application could help such women to engage in business on an equal position with their male counterparts. The mobile application which is tailored for women in food processing chain could increase their engagement in business activities, thereby improve their livelihoods. To my understanding, before this, there was no mobile application that contextualised the needs of women in Tanzania when accessing market information. Further, the increased usage of the mobile phone has made this a potential avenue for empowering the underprivileged groups such as women entrepreneurs in Tanzania.

4.3 MOBILE APPLICATION DESIGN AND DEVELOPMENT

In DSR, an artefact should fulfil user requirements preceding with the design itself. Designing the ideal technology should be focused on functionality and its structure. The design and development of the artefact was conducted in Iringa, Tanzania in collaboration with women entrepreneurs. The activity involved generating ideas through brainstorming (exploratory group discussion), sketching and building the application (application development), and justifying the design decisions. The outcome of these activities was an Android smartphone-based application that could allow users to access, share market information and enlarge their business coverage. In so doing, they are empowered in doing business and improving the wellbeing of their families.
4.3.1 System architecture design

Kapinga et al. (2017) explained how the elicited requirements definition for an ideal technological solution was co-created by women entrepreneurs and customers. The authors also show how involving women entrepreneurs in the design of the technological solution (mobile application) through co-design, the researcher managed to provide the drawing of a prototype user interface based on a user-centred experience (and taking into account the defined requirements). The participants were able to brainstorm and comment on the interface sketch and/or propose improvements or different arrangements of elements to the interface. Furthermore, visual diagrams were used to present and sketch the system and database architectures via Unified Modelling Language (UML). UML defines the data structure of mobile applications via an assortment of the best algorithms for processing data flow (Kapinga et al., 2017). This way, it was ensured that the system architecture was designed based on the end-user’s requirements. For instance, through the application, different users could join the internet cloud facilities through their mobile phones to form a cloud community for exchanging information and sharing data. The mobile application database hosted in the cloud was made and designed using MySQL workbench (Kapinga et al., 2017).

The mobile application solution was, thus, designed with a front-end user interface, a middleware processing language, and back-end service. This is whereby: (a) the user interface (front-end) is created using XML supported by Java programming language; (b) processing language (middleware), forms the central functionality of the entire application and uses Java as the programming language for processing data from user interface to the storage (MySQL); and (c) back-end services, using PHP as cloud server execution language for communication between data taken to and from the database with the support of JSON and structured querying language (SQL) for data handling (Kapinga et al., 2017). SQL for managing data is used to insert, delete, update, and hold goods to the database through the mobile marketing application interface (front-end). Figure 5 represents a data flow diagram displaying the actors and their roles in the mobile marketing application.
4.3.2 Mobile technology implementation

During the implementation of the mobile technology, participants were probed regarding the functions they use in their smartphones, and how they download different applications, in order to get a general view of their familiarity with the functionalities of smartphones. The mobile marketing application was then implemented taking into consideration the knowledge that the end-users had. Once implemented, it was installed onto smartphones belonging to women entrepreneurs. The new application did not interfere with the existing applications they already had. During the implementation of the application, a screenshot was presented to the end-users. The goal was to present clearly the “look and feel” of the user interface design and to determine how to begin using the mobile application (Figure 6). This activity was carried out in partnership between the project’s software engineer, researchers, and end-users. Co-creation and co-designing strategies were employed to foster feedback from the users for further improvements of the artefact. The description of the user interface, shown in Figure 5, indicates the functions of the mobile application:

a) Welcome screen (Skrini ya kukaribisha) is the first image users see launching the mobile application. This gives a hint to the users that the application is loading. After this screen, the user gets to the products description screen to view different products.

b) Registration screen (Skrini ya kujisajili). This is a screen for new users (women entrepreneurs) to register in the application by clicking an icon at the bot-
tom of the screen. After clicking on the icon, users are taken to a registration form where they fill out all personal information, such as name, cellular phone number, and PIN.

\textbf{c) Log in screen (Skrini ya kuingia ndani).} This is meant for administrators (women entrepreneurs already registered) to upload new products after signing into the application with a phone numbers or an email addresses, and a PIN.

\textbf{d) Product description screen (Skrini ya maelezo ya bidhaa).} This presents detailed information about the product such as its price and where about of its availability. Similarly, it presents the usefulness of the product for human health. Those who cannot read can click on a sound icon to listen to an oral description. In addition, it enables a customer to order the respective products from producers by clicking on the icon “Weka oda” below the product image. As soon as the customer orders the product, the information is relayed to the producer of product in question.

\textbf{e) Products Orders screen (Skrini ya kuweka oda).} This screen enables current customers to place orders by filling out order forms and submitting them to respective producers. This function enables customers to sort products by name or by producer. Sorting products by name retrieves a list of all producers with the same products on the screen. Sorting by producer retrieves a list of same products from different producers on the screen. After this stage, communication between sellers and buyers about the physical delivery of products and payment modalities is done through their cellular phones.

\textbf{f) New product posting screen (Skrini ya kuchapisha bidhaa mpya).} This is a screen where women entrepreneurs fill out information about their products, including name of the products, a brief description, price, product category, and place where it is available. In addition, it enables them to upload photos of the product either directly from cameras or from a gallery. Furthermore, it allows them to record an oral description of the product in question through the icon “Bonyeza kurekodi sauti “. In my view, the sound recording function is what makes this mobile application exceptional and effective in empowering women entrepreneurs. It enables them to advertise what they are selling to customers and affect transactions. The recording feature emancipates even customers who cannot read and write.
Thus, the explicated problem and requirements definition were employed during the design and development stages of the solution for Tanzanian users (women). This was achieved through co-creation and co-design with women entrepreneurs and stakeholders.

4.4 DEMONSTRATION OF THE MOBILE APPLICATION

This section provides answers to the question which is required in the demonstration stage of a DSR project: how can the developed artefact be used to solve the explained problem in a given case? (See, Johannesson & Perjons, 2014).
As a proof-of-concept and a confirmation that the solution is adequate to solve the perceived challenge of accessing and sharing market information, the solution was presented to the end-users. The demonstration process which was carried out in Iringa, Tanzania showed that the developed application could, in fact adequately tackle the problem in a real-life setting of women entrepreneurs. We present the details of the demonstration stage in the subsequent subsections.

4.4.1 Training workshop

The first activity during training workshop was to gather the participants and install the mobile application onto their mobile devices to ascertain compatibility. Ten participants (five women entrepreneurs and five customers) with smartphones and experience using it (one to five years) participated in the four-hour training workshop. The core activities during the workshop are shown in Table 5.

Table 5. List of activities during the training workshop

<table>
<thead>
<tr>
<th>Activity</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downloading the mobile application (from Google App store)</td>
<td>all</td>
</tr>
<tr>
<td>Learning to open the phone device and browse to find the application icon</td>
<td>all</td>
</tr>
<tr>
<td>Switching the application on and off on their phones</td>
<td>all</td>
</tr>
<tr>
<td>Getting familiar with various icons and their functions</td>
<td>all</td>
</tr>
<tr>
<td>Posting products (picture upload and description writing), voice recording and orders viewing</td>
<td>women</td>
</tr>
</tbody>
</table>

During the training workshop, all participants were given time to use the application in their mobile devices, (see Figures 7a and 7b). After the workshop, participants were given two days for preliminary field-testing of the application to ascertain its functionality and the intuitiveness of its front-end design.
4.4.2 In-the-wild field-testing

After the two-day preliminary testing, all participants were given three weeks for “in wild” field testing in real-life setting in order to ascertain the usability and functionality of the application. The researcher received feedback on a weekly basis.
from the participants about the outcomes of the application testing. The research which was carried out during the field-testing part of the work employed a case study research strategy, since this is suitable in real-life scenarios (Johannesson & Perjons, 2014). In this respect, the researcher aimed at determining whether the mobile marketing application enabled users to access market information and improve business.

The report from the participants revealed that the mobile application functioned well on their smartphones. They could post products, record descriptions, upload photos, view products, and post orders. In addition, the application enabled them to send links to friends through social communication media, such as, WhatsApp and Facebook. In this manner, more people (e.g., potential customers) could download the application and connect with the providers (i.e., women entrepreneurs) through their mobile devices. As a result, the women entrepreneurs could expand their business networks with the potential of improving their business performance.

In addition, the mobile application served as marketing platform, where customers can assess the differences of products in terms of ingredients, price, and health benefits before deciding to order them. Customers had access to a wider variety of products through the application platform than they had without the tool. Moreover, women entrepreneurs received feedback from customers on how to improve the packaging of their products in order to get better reputation and to gain competitive advantage in the market.

In responding the question how can the developed artefact be used to address the problem at hand? (Johannesson & Perjons, 2014), the users who tested the solution seem to have been satisfied in the manner that it enabled them to access market information and to receive orders from customers. The solution also enabled them to advertise their products through the application platform, which they could further share with potential customers through phones call and social communication. Hence, the co-created technical solution satisfactorily tackles the explicated problem that impeded access to market information.

### 4.5 EVALUATION OF MOBILE APPLICATION

The evaluation of the artefact, an important component of DSR, examines the extent to which the designed and implemented solution can solve the defined problem and the extent to which it fulfils the defined needs (Johannesson & Perjons, 2014, Venable, Pries-Heje & Baskerville, 2016). As shown in Figure 8, the main goal in evaluating an artefact is to identify its utility, functionality, opportunities for improvement, usability, performance, comparison with others artefact, consistency, efficacy, completeness, simplicity, and generality (Prat, Comyn-Wattiau & Akoka, 2014, June; Venable, Pries-Heje & Baskerville, 2016). The appraisal of an artefact is grounded on
three aspects. These include: (i) usefulness of the artefact, which emphasises the usability and helpfulness of the introduced mobile application, (ii) comparison of the existing related projects for informal workers (women entrepreneurs), (iii) the Sustainable Livelihood Framework (Department for International Development, 1999), to weigh its contributions to the livelihoods of the end-users through enhanced business performance. The goals and principles advanced by Johannesson and Perjons (2014) guided the evaluation of this DSR project and the co-created artefact. Moreover, the evaluation adapted approaches from the viewpoint of Venable, Pries-Heje and Baskerville (2012).

Figure 8. Goals of evaluating an artefact in relation with the aspects of Usefulness, Comparison with related projects and the sustainable livelihood framework (SLF)

4.5.1 Usefulness of the designed artefact

The appraisal of an artefact’s usefulness must respond to how well it solves the explicated problem and fulfils the defined requirements (Johannesson & Perjons, 2014). Several approaches can be used for appraising a developed artefact. For instance, one may need to choose between “ex-ante and ex-post evaluation” (Venable, Pries-Heje, & Baskerville, A comprehensive framework for evaluation in design science research, 2012, P.430). Ex-ante evaluation is evaluation of an “uninstantiated artefact”, that is, evaluation before the artefact is created, for instance evaluating a model or a design. Hence, for an ex ante evaluation building an instantiation of the artefact is not needed. In contrast, an ex-post evaluation is the appraisal of an instantiated artefact that requires the artefact to be employed. (Venable, Pries-Heje & Baskerville, 2012).
Another dimension of an evaluation strategy is found when clearly identifying the evaluative nature of the activities carried out as “naturalistic evaluation” and/or as “artificial evaluation”. In naturalistic evaluation an artefact is evaluated in real-setting, exploring the performance of the technology solution in a real environment (see, Sun & Kantor, 2006). A naturalistic evaluation is always empirical and tends towards interpretivism but may be positivist and or critical (also see Sun & Kantor, 2006). In addition, according to Venable, Pries-Heje, and Baskerville (2016) “naturalistic evaluation approaches comprises of case studies, field studies, field experiments, surveys, ethnography, and action research”. According to Johannesson and Perjons (2014), naturalistic evaluations have high external validity because they are carried out in a real setting, including the complications of human practice, and their results can be generalised or transferred to comparable situation. Nevertheless, naturalistic evaluations are riddled with misinterpretations and are affected by cofounded variables which are not possible to control, making it perhaps difficult to replicate. On the other hand, an artificial evaluation involves a reductionist abstraction from the natural setting and it is generally carried out in the supervised environments (e.g., a laboratory). Artificial evaluations, however, fail to adhere to one or more of the three proposed realities, having instead unreal users, an unreal system or an unreal problem to evaluate. Nevertheless, artificial evaluations possess strong scientific reliability making its results easier to replicate. (Venable, Pries-Heje & Baskerville, 2016).

Table 6 lists the characteristics of different approaches to DSR evaluation present in this work. In this thesis, the evaluation of the artefact adapted a naturalistic evaluation strategy because of the involvement of multiple participants. Ex-post evaluation was also appropriate because it was important to understand how the co-created artefact tackled the problem as a suitable solution.

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Ex-ante</th>
<th>Ex-post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naturalistic</td>
<td>-Exploratory focus</td>
<td>-Case study</td>
</tr>
<tr>
<td></td>
<td>group discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Interview</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Co-creation strategy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Co-design strategy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Prototyping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Ethnography</td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 6. DSR evaluation method selection framework used in this thesis (adapted from Venable, et al, 2012).
Fulfilling the defined requirements

The developed mobile marketing application (artefact) fulfilled the defined requirements. Women entrepreneurs interacted through the mobile application, and this made a difference in their business.

Nevertheless, it is imperative to note that the developed artefact might not solve the explicated problem in its entirety because the challenges of accessing market information are multifaceted. For instance, many women entrepreneurs in Tanzania do not own smartphones. As a result, they use ordinary phones (USSD-capable “regular” mobile phones). In addition, the cost of airtime is higher in Tanzania compared to other East Africa Countries (see (Mpogole, et al. 2008; Misaki, Apiola, Gaiani & Tedre, 2018). However, Kapinga, Suero Montero, and Mbise (2019), demonstrated that, the cost of acquiring smartphones and airtime are falling quickly because of advances in technology and the flourishing of telecommunication, with numerous service providers in Tanzania. Thus, it is projected that smart mobile devices will be commonplace in the coming years.

A strategy employed by women entrepreneurs participating in the field-testing was to use the application at a certain time of the day only (e.g., in the evening) to revise new orders or upload/update products’ information. In this way, they could attend their other obligations (e.g., housekeeping) and maintain their presence in the market, as well. Although the project was carried out with a relatively small sample1, it still laid a foundation for further innovation to contextualise the empowerment of women entrepreneurs who may be marginalised because of embedded institutional structures that hinder their engaging in business activities.

Utility

The mobile marketing application was tested with a group of ten women entrepreneurs and customers. They were asked to use the application for a certain period and then give feedback on how useful the application was for its intended purpose. As a result, several useful benefits were found. For instance, it was reported that the application helped the users save money and time, linked sellers with potential customers, reduced cost of travelling to market places, and assisted enlarging the sellers’ market network by sharing with more people the application link over other social media app such as WhatsApp. On the other hand, several challenges were also reported. There were mainly related to the application costs due to the need of buying airtime, as it requires internet access. Nevertheless, according to the users’ feedback, the benefits of the mobile marketing application outweighed the challenges encountered during the testing period.

---

Usability

The mobile marketing application was evaluated to determine its usability by the end-users. The usability of an artefact is generally assessed by its effectiveness, efficiency, satisfaction, learnability, memorability, errors, and cognitive load (Harrison, Flood, & Duce, 2013). In this study, the usability of the mobile marketing application was mainly focused on its effectiveness and learnability as well as the end-user’s satisfaction as these aspects were found highly relevant. With regards to effectiveness, the end-users (women entrepreneurs) were able to achieve the goal of accessing market information by displaying their products in the online platform and responding to their customers’ needs through the application. This was manifested by the selection of produce that the women entrepreneurs uploaded via the mobile application while on the other hand, customers viewed and make order to the products of their choice (Kapinga, Suero Montero, & Mbise, 2019). With regards to the learnability attribute of usability, the participants reported that “using the app was easy to learn, in terms of installing and managing it”. The participants also reported that “the application was easy to use since it is developed in native Swahili language”. Furthermore, with regards to satisfaction, the end-users showed a positive assertiveness towards the use of the mobile marketing application and they considered it as potential in fostering their business performance and improve their livelihoods. Additionally, the application facilitates the expansion of their market size by fostering easy connection to key potential clients that made order of products more frequently.

Table 7. Usefulness of the designed artefact: strength and shortfalls.

<table>
<thead>
<tr>
<th>Usefulness</th>
<th>Strength</th>
<th>Shortfalls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defined requirements, Utility, usability</td>
<td>• Reduce costs of traveling to the market</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Save money and time-linking with potential customers</td>
<td>• High cost of purchasing airtime</td>
</tr>
<tr>
<td></td>
<td>• Enlarge market size</td>
<td>• It does work on mobile phones which does not support android application</td>
</tr>
<tr>
<td></td>
<td>• Developed in a native Swahili language</td>
<td>• Unreliable internet access</td>
</tr>
<tr>
<td></td>
<td>• Installation and managing it is easy</td>
<td>• It requires prior training to use the app</td>
</tr>
</tbody>
</table>

4.5.2 Comparison with existing related projects

It is imperative to relate the appraised artefacts with similar artefacts in a similar context (Johannesson & Perjons, 2014 p. 142). Therefore, the mobile marketing application was appraised on its own as well as in comparison with the existing relat-
ed projects focusing on performance, completeness, consistency, accuracy, improvement opportunities, and other relevant quality attributes (see Table 7).

With regards to the application performance from the software perspective, the following aspects are highlighted:

- The system response time (the time the app takes to process a request, e.g., loading information about a product), varied depending on the mobile device’s bandwidth and signal reception and ranged from 0.4 to 3 seconds to retrieve information for the users.

- The system responsiveness (the time the app takes to acknowledge a request), was good as the interface is XML-based, supported by Java-based back-end services which allowed a smooth response to the user’s handling without freezing their mobile device.

- The power consumption of the application is roughly 4 percent of the battery per hour when the application is active.

- The system simplicity is attested by the implementation of intuitive icons and the use of native Swahili language, and short interaction paths, which ease the learning curve, making the application easy to familiarise with, requiring minimal training. This also contributes to the perceived fast responsiveness of the system.

Linked to the performance aspects, the mobile marketing application was evaluated by the users as suitable in facilitating access to market information and the expansion of the user’s business and networks. The mobile application allowed women entrepreneurs to reach potential customers directly without traveling physically to the market place, and thereby minimising unnecessary travel costs and balancing the costs of running the application.

With regards to the application completeness a special consideration was given to illiterate users by incorporating a sound icon, which allowed producers (i.e., women entrepreneurs) to record their products’ description and buyers to listen to it and thus make decision of buying the product or not. In developing economies, many women cannot read and write, because of lacking the opportunity of attending school as children, mainly due to patriarchal ideologies embedded in the community (Jayakumar & Kannan, 2014). Thus, to my knowledge, the inclusion of a sound icon that also serves the neglected group which is deprived of basic education in the community makes the application exceptional in the entrepreneurship domain. Furthermore, a peculiarity of the present artefact is the use of Swahili as the medium of communication as opposed to other artefacts which use foreign language within the Swahili speaking Nations (East Africa and part of central Africa). This also makes this application more socially acceptable since all users are fluent in the language.

With regards to the improvement opportunities of the current designed mobile application, there is a need of expanding the technology innovation to cover a wider areas of business realm in the developing economies. The addition of more inter-
active user interface is an area of improvement since it could be customised to different users. This objective of expanding the technology innovation could be attained by incorporating the designed technology into activities of different stakeholders, for instance, universities, technology hubs and companies.

When trying to compare this project with other related projects in the same field, the researcher discovered that several mobile applications had been designed for agricultural extension services, farming information, training and agricultural information, record keeping, marketing and business networks expansion in Sub-Saharan Africa. It is worth mentioning that many of the projects however did not focus on women entrepreneurs in food processing industry. Also, many of the projects did not report on the employment of a DSR approach, which is user-centred in nature. That is, the end-users are not reported to be involved in the elicitation of requirements during the development of such projects. Thus, the present project is exceptional in that it considers the voices of women entrepreneurs in developing this technological solution. A co-creation and co-design strategy is highly recommended when developing ICT interventions to achieve joint value creation opportunities and higher acceptance within the community in developing economies (Neuhofer, 2016; Goodyear-Smith, Jackson & Greenhalgh, 2015). Nevertheless, for the purpose of comparison, this study compared with another study on the co-designed and co-created mobile marketing application of M-kilimo (mAgriculture) based in Kenya. The cited study also aims at providing high quality information service to smallholder farmers on market price information, agriculture-specific weather forecasts, plant and animal diseases and agricultural tips and efficient farming practices2. In contrast to the co-created mobile application described in this thesis, the M-kilimo app faces a challenge of language mismatch especially when targeting rural population: the messages sent in local languages could help to reach wider range of customers since many of them are not fluent in English or Swahili (official language). Table 8 compares the characteristics between the co-created application and M-kilimo.

---

Table 8. Comparison between the co-created mobile marketing application described in this thesis and M-Kilimo (mAgriculture) application.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Co-created mobile marketing Application</th>
<th>M-Kilimo (mAgriculture)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
<td>-Fosters access to potential customers without physical traveling &lt;br&gt;-The system response time with respect to splash screen is 5 seconds</td>
<td>Allows users to call the Farmer Helpline any time</td>
</tr>
<tr>
<td>Simplicity</td>
<td>The application is friendly to the end-users since it uses Swahili language, easy interactions and intuitive icons</td>
<td>The application is not friendly to local languages speakers, since there are not fluent neither Swahili nor English (official languages).</td>
</tr>
<tr>
<td>Completeness</td>
<td>A sound icon was added to aid description of products for illiterate users</td>
<td>Needs to incorporate local language into the application</td>
</tr>
<tr>
<td>Consistency</td>
<td>Queries to the system database are executed correctly (e.g., when users request information about a product).</td>
<td>Queries are executed correctly (e.g., when users request information about market prices of their commodities)</td>
</tr>
<tr>
<td>Improvement opportunities</td>
<td>-Wide expansion of technology innovation in business realm &lt;br&gt;-More interactive user interface</td>
<td>-Incorporation of local languages to reach wider audience (i.e. by the use of standard symbols for common language)</td>
</tr>
</tbody>
</table>

4.5.3 Mobile marketing application and sustainable livelihoods

This study also evaluated the outcome of the designed mobile marketing application in the context of empowerment and sustainable livelihoods of the end-users. The root of the challenge was that notwithstanding the increase in cellular phone usage in Tanzania, and its profits, the details regarding the extent of the impact of the mobile phones in the empowerment of women entrepreneurs in doing business and in improving livelihood are not yet clearly understood. Consequently, this study adapted the “Sustainable Livelihood Framework” (Figure 9), to evaluate the outcome of the designed mobile marketing application in empowering and improving livelihoods of women entrepreneurs in vulnerable environments. The frame-
work served as an important reminder and a worksheet for key empowerment issues.

Figure 9. Sustainable Livelihood Framework (redrawn from Moser and Norton 2001).

The framework shows that women operate in a context with limited access to livelihood resources. According to the Department for International Development, (1999) the assets gain their meanings and values through the dominant social, institutional and organisational environment, transforming structures and processes. Furthermore, the context conclusively impacts the livelihood plans, open to people in search of a self-defined beneficial livelihood. This framework provides an analytical structure for facilitating a broad and systematic understanding of how the designed mobile application contributes to the empowerment of women entrepreneurs through enhancing business performance as a foundation of their sustainable livelihood. It should further be noted that the framework does not lay down explicitly what constitute empowerment, which is context specific and therefore needs to be investigated on a case-by-case basis (Moser and Norton 2001).

The results revealed that the situated mobile application changed the vulnerable environment by fostering the enhancement of business performance, which in turn, supports the improvement of livelihoods. Using the assets that the women entrepreneurs already possess, the technical solution enabled them identify potential customers, increase sales, increase income, increase well-being, expand business networks, add value to their products and reduce vulnerability in business environment, all of which place women on equal footing with their male counterparts.
Thus, the influence of the designed artefact has empowered women entrepreneurs against the normative, cognitive, and regulatory barriers as shown in Figure 10.

Figure 10. Contribution of designed artefact towards empowerment of women entrepreneurs based on the SLF

The study also evaluated the outcomes of the designed mobile marketing application based on generality and efficacy attributes. Generality refers to how broad the goals of an artefact are. Consequently, if the artefact addresses broader goals the artefact is more general. (Prat, Comyn-Wattiau, & Akoka, 2014). The evaluation aimed at stimulating insight from the participants about the impacts of the designed solution to the sustainable livelihoods of the end-users. Ten people-five entrepreneurs and five customers-participated during the co-creation and co-design of the evaluation stage. The evaluation was limited to ten participants, since many women entrepreneurs and customers owned traditional phones that did not support internet application. However, the outcome of the evaluation can be generalised to other type of entrepreneurs in the developing economies and in the research findings. With regards to efficacy, that means the degree to which the designed mobile marketing application produce the desired effect (i.e. achieve its goals) (see Venable et al. 2012), the evaluation was conducted with end-users (women entrepreneurs and customers) to determine how well the evaluated artefact achieves its goals. The mobile application was found “superlative” since it enabled women entrepreneurs to link with potential customers and to enlarge their market size.

4.6 SUMMARY

This chapter focuses on the design science research (DSR) design and development cycle of a mobile marketing application (technical solution artefact), having DSR
strengthened with elements of participatory design (co-creation and co-design). The chapter described the stages of the DSR project that were used to accomplish the artefact’s development cycle. The DSR approach stages comprised problem explanation, requirement definition, artefact design and development, artefact demonstration and artefact evaluation. These stages were interactive, cyclic in nature, and incremental in the sense that the researcher keep on improving the artefact in every stage based on the outcomes of previous stages, and according to the needs raised by the end-users
5 DISCUSSION OF THE RESULTS

5.1 INTERPRETATION OF RESULTS

The chapter presents discussion of the main results in Paper I - V. This study sought to design and develop a mobile marketing application aimed at women entrepreneurs in the food processing industry in the Tanzanian entrepreneurship domain. The study aimed at empowering women entrepreneurs in improving business performance through the use of mobile devices. To realise this goal, the pragmatic design science research (DSR) research method, was adopted. DSR comprises five stages: problem explication; requirements definition; design and development; demonstration; and evaluation of the artefact.

As explained in sections 2.3.1 and 2.3.2, feminists and institutional theories informed the study. These theories advocate for seeing the origins of disparity in the community as based in patriarchal beliefs and institutional structures. The theories work towards improving equality and entrepreneurship development. Furthermore, feminist theory in particular, helps to understand the socially embedded challenges faced by many women. Based on the identified encounters confronted by women entrepreneurs, technological solution was put forward to create an enabling environment for conducting business without conflicting with societal beliefs, such as the society’s patriarchal ideology. In this regard, the aim of the study was not to challenge societal ideologies in a swift and clear-cut way, but to provide the target group (women entrepreneurs) with a means of thriving and prospering within the business environment they live. The researcher believes that this plants the seeds for fundamental changes in society as the target group is empowered to function in better conditions.

In this study, women entrepreneurs interacted asynchronously with customers through a mobile marketing application to secure market information. In addition, since the aim was to empower women doing business anywhere anytime, it was imperative to select feminist and institutional theories that underscore the poor business environment and come up with a better solution in the digital era. In this vein, women entrepreneurs participated fully in doing business on a level equal to that of their male counterparts assisted by a virtual platform.

With regards to the research questions, the study investigated and identified the participants’ motivation to engage in business, the societal challenges hindering them from engaging in business on equal footing as males, and strategies of rectifying the situation in the Tanzanian context in Paper I (PI). The results showed that, women entrepreneurs were inspired to involve in business activities to improve their livelihood as well as to have a source of self-employment. Regarding sociocultural challenges, the findings showed that business is conducted in an unfavourable environment, in which there are inequalities in community responsibilities, unequal access to education opportunities, patriarchal dogma, low standards of goods, in-
sufficient funds for investing in business and unreliability in locales for selling processed products. Many women entrepreneurs in developing countries have insufficient skills to develop a creative business, to market products outside neighbourhood, and to keep record, business premises, and loan level suited to their business needs (Mori, 2014). The women entrepreneurs are a marginalised group because of unfavourable business environment (Adams, Johansson de Silva, & Razmara, 2013). In the search for transversal strategies of tackling these challenges, my analysis revealed that the women would form economic groups, establish entrepreneurship clubs, create village development committee, attend business incubations and trainings that could be accepted easily by the end-users. Thus, improvement of business performance among women entrepreneurs is important in the creating employment, improving income, and alleviating poverty in the developing economies. Furthermore, the study aimed at exploring the effectiveness of the transversal strategies (business incubation and training) in improving women entrepreneurs’ business performance in Paper IV (PIV). The study explored the role of business and technology incubators, in addressing the unique challenges faced by women entrepreneurs. The results showed that women are confronted with numerous difficulties in conducting their business, despite the roles played by incubators. A great number of incubators’ beneficiaries face difficulties in accessing financing, business spaces, market, and business skills.

The study adopted mixed methods research design to answer research questions in Paper II (PII) as shown in the introduction section. The questions presented in the introduction dedicated on (i) assessing the role of mobile phones; (ii) identifying the impact of mobile phone usage; and (iii) identifying the challenges of using mobile phone for accessing market information. Regarding the use of mobile phones, the findings showed that the existing usage of mobile phones did not enable many women to attain market information (e.g., the price of goods, the demand for their goods and possible buyers). Mobile phones were mainly used for maintaining social relationship. As a result, their impact in alleviating poverty and transforming business was minimal.

With regard to the challenges of mobile phone usage, the findings showed that poor cellular networks, user dishonesty, recharging mobile phone batteries, absence of knowledge regarding the use of mobile phones for business, and the high cost of airtime hindered the effective use of mobile phones. As a result, sensitisation campaign to women entrepreneurs about the importance of the mobile application in improving entrepreneurial activities is needed. In addition, it was recommended that the government should regulate charges of operating phones so as to cut down the cost of airtime and bandwidth. This is because mobile technology has the potential of improving business by reducing search costs, time to the market, providing up-to-date information, and improving business networks.

Third, the researcher addressed the women entrepreneurs’ and their customers’ defined requirements in designing and developing a mobile solution for accessing
market information. The questions presented in the introduction focused on identifying: (i) the necessary information to include in the mobile application; and (ii) the kind of technology implementation needed to simplify access to market information. These questions were the focus of **Paper III (PIII)**. The finding revealed that the participants recommended the inclusion of information regarding the product - components, usefulness of goods, weight, and stock of product and displaying product - price, photos, and contacts of actors in the system. In addition, participants suggested that sound icon be included for describing the products for illiterate users. Furthermore, they recommended the inclusion of market-related communication to enable women to obtain requests from potential buyers, deliver products, and receive products requests from customers. With regards to the type of technology that could simplify the availability of business information for users, a system architecture was designed using MySQL workbench hosted in the cloud. The mobile marketing application is composed of a front-end, a middleware processing language, and back-end services, functioning collectively to run business, increase the market presence, and share updates. Furthermore, the application used native Swahili language as a medium of communication to create acceptance by users and to allow it to spread to a large geographical areas within Tanzania and in the neighbouring East Africa countries.

The women entrepreneurs and customers were involved (co-creation and co-design) in all stages of DSR process, from the problem explication to the evaluation of the developed mobile application. User involvement is important in ICT4D projects because it creates a sense of ownership of the artefact, enhances understanding of the system, improves acceptance, and allows for the incorporation of features of interest (Damodaran, 1996). Proper participation of women during design and development cycle contributed to the successful implementation of the ICT4D project. The project put forward a participatory design strategy, whereby end-users were recognised as the initial point of the know-how during all the DSR stages (Neuhofer, 2016) in order to avoid the failure of most ICT4D projects, which emanates from the imposition of such projects on users (Udo & Ifinedo, 2012).

Fourth, the study demonstrated and evaluated the developed solution in an actual scenario to explore whether the explicated problem had been addressed in **Paper V (PV)**. The study attempted to answer questions such as: how can we implement a solution that could simplify access to market information? How can we examine the mobile application by women entrepreneurs and customers in the actual scenario? Does the application fulfil the requirements of users, and can it address the intended problem? To address these questions, the mobile application was downloaded onto the phones of participating users to expose them to the application. In addition, the mobile application was demonstrated to women entrepreneurs and their customers, first by conducting a four-hour workshop training to familiarise them with the use of smartphones and the important icons in the application. Second, by a preliminary, two-day field followed by in the wild field-testing
for the period of three weeks. The evaluation confirmed that the mobile application fulfilled user requirements and tackled effectively the target problem of accessing market information. The benefits conferred by the mobile application included: saving time and money, linking sellers with potential customers, reducing travelling costs, enlarging market networks, increasing customer satisfaction and advertising food products. ICT4D projects in the developing economies have helped informal workers to improve business performance. They have facilitated efficient information flow, networking with important stakeholders, and record keeping. Nevertheless, the limiting factors for the application included the high price of airtime, possession of phones without internet access, and the absence of awareness regarding the usefulness of mobile applications in business. Technological solutions that are easy to use and cost-effective, such as the one presented here, are highly needed in the Sub-Saharan Africa to empower women who are underprivileged in the community by addressing the constraints in the entrepreneurship domain.

5.2 RESEARCH CONTRIBUTION

This thesis presents the prototype of a mobile application that contextualised the needs of women entrepreneurs in the food processing sector from rural Tanzania in accessing market information. The mobile marketing application enables women entrepreneurs to connect with buyers in the course of making a sound business choice with regard to when, where and what to trade. The mobile application contributes to paving the way towards technological solutions and innovation for empowering women in business realm. This technical solution was developed within a design science research (DSR) framework. DSR is useful for creating innovative artefacts which are essential for opening new opportunities for human undertaking and for answering questions about their environment using research strategies (Johannesson & Perjons, 2014). As Gregor and Hevner, (2013) argued, DSR projects have the potential of making different types and levels of research contributions relying on their initial points in terms of problem and solution maturities. On the forms of DSR contribution, Gregor and Hevner (2013, p.345) present a simple 2 by 2 matrix space comprising 4 quadrants portraying the maturity of solution artefacts against the maturity of the problem content as shown in Figure 11.
The current thesis falls under the **improvement quadrant** of developing new solutions for known problems. The study contributes to the usage of mobile application to improve the business performance of women entrepreneurs by addressing the challenges they face in accessing market information. The study has contributed to transforming the usage of mobile phones from a social reciprocity tool to a business communication gadget. In addition, the work presented here has elements from the **invention quadrant** because it presents a strengthened DSR through the incorporation of essentials of the co-creation and co-design as a unified methodology to be deployed within the ICT4D realm. In this vein, the involvement of end-users from the time of problem formulation through all the stages in the project cycle yielded a meaningful and acceptable solution.

This study has opened an avenue for technological innovation of utilising mobile devices for solving community problem in the business domain: such as record keeping, and business training. In addition, it shows how women entrepreneurs identify potential customers, gets feedback on customers’ satisfaction, display product, and extend business networks.

Furthermore, study has contributed to strengthen the DSR methodology in ICT4D projects by obtaining the value of co-creation and co-design for sustainable innovation. It advocates that the consideration of the end-user’s knowledge, experience and environmental setting from the stage of problem explication is ideal in bringing about a meaningful solution.
5.3 LIMITATIONS OF THE STUDY

One of the limitations of this research was that the study covered too small segment of the population for comparison purposes. This limitation was caused by inadequacy of research funds. Indeed, challenges facing women entrepreneurs might differ significantly in different contexts—although women entrepreneurs operate in similar business environment.

Another limitations of this study was not contextualised to other challenge facing women entrepreneurs other than addressing the challenge of accessing market information through mobile technology. However, other challenges were more important but less amenable to use mobile technology, for instance, access to capital, and availability of packaging material.

Moreover, while the designed mobile application is intended for Android smartphone, many women entrepreneurs do not own such phones, then it will actually increase inequalities rather than empowering the poorest and most marginalised women.

The smartphones used by the participants of the study lost battery quickly particularly after allowing mobile data usage for the application. This kind of phone is not suitable to the areas where there is no reliable power supply sources, since it requires to be recharged more repeatedly. Thus, availability of reliable power supply sources is paramount important for the mobile application to function effectively.

Furthermore, many women entrepreneurs did not have the basic skills needed to use mobile phones, and thus could not fully benefit from the application. Training is necessary to women entrepreneurs in order to familiarise themselves with mobile applications icons and their functionalities for easy use in interacting with customers. Therefore, expansion and wide-intake of the application to many users requires a preliminary training to impart the basic skills, through a cascade or peer training modality within their entrepreneurship/economic clubs in rural areas.

In addition, the evaluation of the artefact only involved only a small sample size and followed a strictly qualitative approach. This implies that there is room for applying rigorous quantitative appraisal to improve the usefulness of the solution—to determine the cost-benefits analysis of the application.
6 CONCLUSIONS

Women can contribute greatly to the growth of economies in developing countries through various business activities. However, they face several challenges in these matters. In this regard, we have developed a mobile marketing application to allow women entrepreneurs in food processing industry with access to smartphone to improve their business performance in Tanzania. The research formulated four questions which were answered using the DSR approach of developing a mobile application. The study recommends for the integration of mobile technology into business activities.

6.1 ANSWERS TO THE RESEARCH QUESTIONS

Research question 1: What are the sociocultural challenges facing women entrepreneurs in business activities in Iringa, Tanzania?

In answering this question, exploratory focus group discussion, direct observation, and in-depth interviews were used to collect information. The results of this study were presented in Paper I and Paper IV. The results showed that women entrepreneurs operated in an environment, which is characterised by unequal distribution of responsibilities, patriarchal ideology, inadequate capital, low quality of goods and unstable market. These challenges hinder women entrepreneurs from realising higher profits and expanding their business networks. There is an increase of phone usage in sub-Saharan countries, which means an opportunity of addressing the societal challenges.

Research question 2: What are the roles of mobile phones in supporting women entrepreneurs’ access to market-related information in the Iringa, Tanzania?

In answering this question, an exploratory study was conducted in Iringa, Tanzania with women entrepreneurs. A mixed-method design was used to acquire detailed information regarding the participants of the study qualitatively. There was also quantitative information on whether phones were useful in obtaining market information, outcomes of using phones and the challenges of using mobile phones when trying to access information about the market. An investigation was the main focus of Paper II. The results showed that the use of mobile phones does not spontaneously support women entrepreneurs to find market information. The mobile phones are used in upholding social messages and not for business purposes. Likewise, there was no reliable platform linked to market information. Therefore, the traditional walking style for hawking goods still predominates in the study area (Iringa). Similarly, the costs of airtime and poor cellular network constrained
the usage of mobile phones. Nevertheless, the use of phones might help women to access timely market information about prices, possible buyers, and demand for products.

**Research question 3:** What are the necessary business-related information and technological innovations that could simplify access to market information?

In answering this question, the study employed the DSR method, which focuses on the design of artefacts to solve the problem by exploring the necessary business-related information that comprises the application. The results which are presented in Paper III, showed the important information that required to be incorporated into the mobile app so as to facilitate interactions between producers and potential buyers of the processed products is as follows. *Product information* was the first, which entails ingredients, worth of goods, weight, and stock of product. The second is *product display*, which encompasses price, photo, seller, and client personal contacts. Another is *market-related communication* for receiving orders and feedback from customers. In addition, *voice icons* for recording brief informative descriptions of the products were included in the mobile system. User requirements regarding the best technology execution were suggested by end-users. The process of designing the user interface was assisted by the drawn up prototype. The system architecture was designed based on the end-users’ requirements, to connect users to the internet through their mobile phones for exchanging information and sharing data.

**Research question 4:** How does the mobile application empower women entrepreneurs to access market information?

In answering this question, the study employed DSR to develop an artefact that was dedicated to addressing the identified problem. The study employed focus group discussion, structured interview, direct observation, and co-design workshops in collecting data. In the implementation stage, the mobile application was verified in the field to ascertain the extent to which it has fulfilled the necessities of users and addressed the identified problem. The results of these aspects of the study were presented in Paper V. The results showed that the mobile application could significantly facilitate access to market information by fostering and facilitating the interaction between them and their customers. Additionally, the mobile application was reported to save time and costs of travelling to markets, reduced tiredness of travelling to market, permitted easy access of data from all devices that link to internet, connected them to customers, and help them to escalate their market scope through sharing the application within the network.
6.2 FUTURE RESEARCH

The research offers a cornerstone for future study on empowering a marginalised group in the developing economies using technological solutions, which are contextualised to their specific needs. This is important in this study because many challenges women entrepreneurs confront in Tanzania, such as inadequate capital and poor packaging knowledge, are embedded in sociocultural practices. In the future could consider undertaking general studies on women entrepreneurs in Tanzania and globally for comparative purposes.

Future research is needed because the demonstration stage of this study was relatively short (three weeks of in-the-wild field-testing) and involved only a small sample (volunteers with smartphones). Demonstrating the application with a large sample and for longer time could ascertain its usefulness in different contexts.

In addition, good packaging of food products is a requirement in international markets. As a result, poor packaging is amongst the causes of business failure in the competitive market economy. Since packaging issues was another problem identified by the participants, future research could therefore focus on co-creating innovative technological solutions for improving packaging.

Future studies could customise the artefact to the needs of women users in various activities, such as to the clothes vending. The mobile application solution could be enhanced with new features to cater for the needs of such end-users and enable them to receive the same benefits.

In addition, future studies could customise scalability of the application to a wider users by incorporating different actors in business realm, for instance, government agency such as Small Industrial Development Organization (SIDO), University Hub, and business incubators for the sustainability and wider outreach of the mobile application.

Finally, technological solutions that emanate from grassroots movements bring meaningful creations and solutions to the targeted users; build brand awareness, commitments and collective innovative interactions. Therefore, strengthening DSR through integration of co-creation and co-design strategies in recognising the end-users as starting point of experience and partners in the development of an artefact from problem explication stage to the evaluation stage is highly recommended. Further adaptations and deployments of this idea represent a very interesting research theme.
7 BIBLIOGRAPHY


Marlow, S. T.; & McAdam, M. (2013). Gender and entrepreneurship: Advancing debate and challenging myths; exploring the mystery of the under-


https://www.researchgate.net/publication/237250795_To_Claim_Our_Rights_Livelihood_Security_Human_Rights_and_Sustainable_Development


Exploring the socio-cultural challenges of food processing women entrepreneurs in IRINGA, TANZANIA and strategies used to tackle them

Alsen Florian Kapinga and Calkin Suero Montero

Abstract

Women entrepreneurs have significant contributions to the economies of sub-Saharan Africa. However, women in this region are facing a shocking array of challenges in their business environment. This paper examines the challenges facing women entrepreneurs in the food processing industry in Iringa, Tanzania. The study employs interviews and focus group discussions in collecting data and utilizes content analysis for interpreting findings. The findings indicate that these women entrepreneurs face problems of lack of access to markets, unequal social responsibility and lack of enough capital. Our findings also show that women entrepreneurs in the food processing business of the region employ an array of transversal strategies in order to tackle and mitigate the socio-cultural challenges, including the creation of economic groups and entrepreneurship clubs. Our work sheds light on the issues that women entrepreneurs in the food processing industry struggle with in Iringa. Furthermore, we present the general and transversal strategies that they use in order to mitigate the problem and finally put forward the use of mobile technology as a transversal tool.

Keywords: Women entrepreneurs, Sub-Saharan Africa, Institutional theory, Feminist theory

Background

Women entrepreneurs account for a substantial majority of small-scale entrepreneurs in Sub-Saharan Africa (SSA) (Belwal et al. 2012). Entrepreneurship has increasingly attracted the governments’ and policy making institution’s attention in recent years. According to Jamali (2009), the attention has been drawn in light of concrete evidence of the importance of new business creation for economic growth and development. Women entrepreneurs’ businesses are best described as micro or small-scale enterprises ((Belwal et al. 2012; Siddiqui 2012). Through their enterprises, women entrepreneurs empower themselves and contribute to the development of the society at large. Even if the majority of women who operate enterprises have less than three employees, based on the nature of the enterprises, women have the potential to raise their business’ employment and create job opportunities for many unemployed people (Wasihun and Paul 2010). Hence, it is
important to devote attention to issues that constrain women entrepreneurs from carrying out their business.

Despite the fact that women entrepreneurs contribute to economic growth, several issues have been identified to affect the advance of business for women entrepreneurs in SSA, including market access, initial capital, unequal distribution of responsibility, and skills in business (Rutashobya and Nchimbi 1999; Magesa et al. 2013). Furthermore, literature indicates that women entrepreneurs face more socio-cultural challenges compared to their male counterparts (Gichuki et al. 2014; Brush et al. 2009). In this context, socio-cultural challenges are issues related to cultural expectations (e.g., values, attitudes, gender roles, etc.) and societal structures (e.g., family, reference groups or networks, status in society, etc.) that affect the development of women entrepreneurs.

In the developing economies, women confront barriers to success due to negative social attitudes arising from intensely rooted, prejudiced cultural values, attitudes, practices, and traditions of male-controlled cultures (Woldie and Adersua 2004). In SSA, the socio-cultural challenges that affect women during the development of their businesses are embedded in patriarchal ideology that undervalues women’s efforts and ability to excel in their enterprises (Magesa et al. 2013). According to Singh and Belwal (2008), women face challenges in securing finances for establishing and running SMEs and entrepreneurial and management competence. They also lack exposure and encounter challenges in finding suitable markets and distribution networks. In addition, women have limited opportunities for promotion and participation. The male-controlled family arrangements demonstrate the power given to the father and the elder sons. Women do not have power to influence decisions that favor their wellbeing, hence lack of power balance between males and females. Given the unfavorable socio-cultural setting for women in most SSA, social empowerment of women requires transformation in terms of division of labor, as well as a change in the prevalent ideologies about the roles and responsibilities of women and men (Munyu and Mureithi 2008).

Although women entrepreneurs have been recognized as an important agent of economic development in SSA (Woldie and Adersua 2004) the socio-cultural conditions that restrict women from developing their business in the rural areas of Tanzania are yet to be explored. Agriculture has been identified as a key provider of employment and livelihood in the rural areas of the country and a priority area for strategic intervention, under the Tanzania Development Vision (TDV) 2025 and other government policies (ASSP 2014). According to the Tanzania Ministry of Agriculture and Food Security Annual Report, the agriculture sector in Tanzania contributes 28.9% of the national GDP and provides 75% of the total country labor force as per 2015 (The United Republic of Tanzania, URT 2015). Furthermore, the agriculture sector is reported to be linked with non-farming activities, through an association with agro-processing of farmed products, and women constitute the main source of labor force of the agriculture sector (Mmasa 2013).

Several studies have investigated the socio-cultural challenges facing women entrepreneurs in Tanzania. For example, Majenga and Mashenene (2015) revealed that there is a direct relationship between socio-cultural factors (SCF), such as interference and lack of support from husbands, and poor financial performance (FP) of women small and medium enterprises in Tanzania (see also Maziku et al. 2014). However, the study by Majenga and Mashenene focused mainly on women entrepreneurs from the urban
area of Dodoma, with a small proportion of entrepreneurs from Chamwino rural area. Our study is different from those of Majenga and Mashenene (2015) and Maziku et al. (2014) because we focus on challenges facing women entrepreneurs in the food processing industry in the rural area of Iringa, a prime agriculture area of Tanzania. Since women are the main labor force in the agriculture sector, the socio-cultural issues related to the women entrepreneurs need to be explored as they have a significant impact on the national economic growth. Furthermore, our work goes beyond the identification of the socio-cultural issues, to also present and discuss the general transversal strategies that women entrepreneurs of the region employ to mitigate the problems they face. Therefore, in the context Tanzania as a case study, we use institutional and feminist theories to explore the socio-cultural conditions that tend to curtail women entrepreneurs’ success in the food processing chain. Therefore, the main objective of this study is to explore the socio-cultural challenges facing women entrepreneurs in Iringa southern highland region of Tanzania and strategies used to overcome them. The research questions included the following:

- What are the motivating factors for women to engage in entrepreneurial activities in the food processing business in Iringa?
- What are the socio-cultural challenges that affect the business activities of women entrepreneurs in the food processing industry of Iringa?
- How can these challenges be mitigated or addressed in order to promote sustainable growth of the region and the empowerment of women in the society?

This study is particularly important as it adds literature to the existing body of knowledge about the fundamental influence of institutional and feminist perspectives in improving women entrepreneurial activities in emerging SSA economies. The study also advocates the use of easily accessible mobile technology as a transversal tool for empowerment.

**Theoretical perspectives**

**The concept of entrepreneurship**

According to Kuratkio (2011), entrepreneurship is defined as a “dynamic process of vision, change, and creation that requires an application of energy and passion towards the creation and implementation of new ideas and creative solution”. The essential ingredients of entrepreneurship include the willingness to take calculated risks in terms of time equity, ability to formulate an effective team, creative skills to marshal needed resources, fundamental skills of building a solid business plan and the vision to recognize the opportunity. Entrepreneurship is also seen as a field of business that seeks to understand how opportunities to create something new (e.g. new product or services, new production process or raw materials, new way of organizing technologies) arise and are discovered or created by specific persons, who then use various means to exploit or develop them, thus producing a wide range of effects (Baron 2013). In the same light, entrepreneurship is viewed as the act of mobilizing or employing and organizing the other factors of production while assuming the associated rewards and risks.
Olomi 2009). In addition, entrepreneurship can also be perceived as the process of creating something new with a value by devoting the necessary time and effort, assuming the accompanying financial, psychic and social risks and receiving rewards of monetary and personal satisfaction and independence (Hisrich and Peters 2002).

In view of this, entrepreneurs may be defined as individuals who bring about an improvement, both for other individuals and for the society as a whole (Gorji and Rahimian 2011). Longenecker et al. (2003) define entrepreneurs as individuals who discover market needs and launch new firms to meet those needs. They are risk takers who provide an impetus for change, innovation and progress in economic life. Therefore, entrepreneurship implies the process of creation and bringing improvements in the community by discovering market requirements and introducing enterprise to meet the demands. Economic growth and productivity improvements lie in the entrepreneurial capacity of an economy (Audretsch et al. 2007). Entrepreneurship does indeed involve the renovation of ideas (recognize or create chances) into something new and concrete through some kind of overt action. In this study, entrepreneurship is perceived as a tool for personal economic growth and empowerment. Entrepreneurship thus contributes to job creation opportunities and higher quality of community life.

**Characteristics of women entrepreneurs**

Women entrepreneurs are women who participate in entrepreneurial activities. Women entrepreneurs create new products, processes, and services for the market consumption. Like other entrepreneurs, women entrepreneurs take the risks involved in combining resources together in a unique way so as to take advantage of an opportunity identified in their immediate environment, through the production of goods and services (Okafor and Mordi 2010). Entrepreneurial characteristics are influenced by the availability of infrastructures, training programs, and financial and family support, all of which can help to enhance the personality of entrepreneurs (Okafor and Mordi 2010).

Women entrepreneurs tend to have a number of common characteristics which include creativity and innovation, foresight, imagination, and courage (Mordi et al. 2010; Pines et al. 2010). According to Storey (1994), other entrepreneurial characteristics include previous management experience through family history, functional skills, and relevant business skills. Family members influence the ability to engage in entrepreneurial behavior (Eddleston et al. 2012). Kuratko (2011) suggests that essential features of women entrepreneurs include total commitment, determination and perseverance, drive to achieve and grow, and opportunity and goal orientation. Furthermore, entrepreneurs are characterized by self-efficacy, higher internal locus of control, the need for autonomy, need to achieve, perseverance, the ability to find and explore the opportunity, risk-taking propensity, innovation, ambiguity tolerance and vision (Deakins and Freel 2009; Singal 2009; Olomi 2009). The work of Siddiqui (2012) indicates that entrepreneurial women are capable of contributing value both to the families and to the society, given their strong desire of doing positive things. These characteristics are highly valued for the economic growth and development of emerging economies in SSA. Women entrepreneurs endowed with more of these attributes are more likely to start and succeed in business than those with less (Olomi 2009).
**Socio-cultural environment**

Wetherly and Otter (2011) describe the socio-cultural environment as an environment consisting of everything that is not contained within the economic or political systems. The socio-cultural system is made of a collection of activities and relationships through which people engage in their personal and private lives, including population features, age, ethnicity, religion, values, attitude, lifestyles, and associates. In this study, the socio-cultural environment implies elements that are embedded in the society and affect the performance of women entrepreneurs, either negatively or positively.

In Tanzania, the socio-cultural environment represents a key factor affecting entrepreneurial capabilities of women entrepreneurs (Mashenene et al. 2014). For instance, poor education and training, interference and lack of support from husbands and lack of business information have been found to be critical socio-cultural factors that affect negatively the financial performance of women small and medium enterprises in Tanzania (Majenga and Mashenene 2015). Previous research has shown several socio-cultural factors and their relationship with the business development of the women entrepreneurs (Maziku et al. 2014). In our study, a significant milestone has been achieved by exploring not only the socio-cultural issues that affect women entrepreneurs but also revealing the transversal strategies that are used for personal empowerment and problem mitigation.

**Institutional theory and women entrepreneurs**

The institutional theory focuses on the process that forms the basis for social norms and behavior. It blends together the cognitive, normative and regulatory structures that provide stability and meaning to social behavior (Scott 2001). The regulative structures of the institutional theory profile consists of laws, regulations, rules and policies which promote a certain type of behavior and restrict others (Vecian and Urbano 2008). The normative structures consists of social values, beliefs and assumptions about human nature and behavior that are shared and carried by an individual (Vecian and Urbano 2008). The cognitive aspects recognize the cognitive structure and social knowledge shared by people in a given society (Scott 2001). In their study, Amine and Staub (2009) argue that institutional theory takes a sociological view of reciprocal interactions between institutions (such as business entities) and society. An institutional theory is considered relevant in this study because it illustrates how socio-cultural challenges from the perspective of regulatory, normative and cognitive structures could affect the development of women entrepreneurs in food processing business in Tanzania. Thus, institutional theory is important in this study as it provides an established framework for the exploration of how social norms and behaviors affect women entrepreneurs’ business performance. The intensity of institutional challenges differs across societal structures, hence a need to tackle those challenges from different dimensions to achieve satisfactory solutions.

**Feminist theories and women entrepreneurs**

Feminist theories are relevant to this study because they illustrate how women are marginalized in the business environment and economic dialogue. Feminist theories advocate for the understanding of the nature of gender inequality in the society due to patriarchy ideology and using that knowledge to better women’s lives. The theories
reveal where stereotypes and subjective perceptual variables come from and enrich our understanding of how these exert a fundamental influence on women’s entrepreneurial tendency and account for much of difference in entrepreneurial activity between the sexes (Jennings and Brush 2013). Socio-cultural norms have contributed to the creation of the unique barrier for women entrepreneurs to access assets, education and gendered activity expectations among the sexes. Jennings and Brush (2013) identify four substantive contributions of feminist theories to the field of women entrepreneurship: i) entrepreneurship is a gendered phenomenon, ii) entrepreneurship is embedded in families, iii) entrepreneurial activity can result from necessity as well as an opportunity, and iv) entrepreneurs pursue goals beyond economic gain. Therefore, the adoption of a feminist approach to the field of entrepreneurship is important in order to better women’s lives. This study highlights two feminist theories which are relevant to the entrepreneurship phenomenon:-

**Liberal feminism** advocates for equal opportunity for women and assume that the removal of institutional and legal barriers will result in women founders achieving equitable entrepreneurial outcomes with male founders (Greer et al. 2003). Liberal feminism advocates that women and men are essentially the same in understanding and copying the world (Kutanis and Bayraktaroglu 2003). In addition, liberal feminism tends to ignore gender inequality in the society and focus on gender equality (Greer et al. 2003).

**Socialist feminism** advocates for equality through socialization processes that shape women to be equal but different from men in the way they view the world (Fischer et al. 1993). Culture shapes the way women view their gender role of being entrepreneurs in the society. Socialist feminism suggests that it does not mean women are inferior to men but rather different. Female experiences differ from those of males because of deliberate socialization methods from childhood life that result in fundamental different ways of viewing the world (Fischer et al. 1993). Therefore, gender differences, unequal access to resources, and unequal economic power relations are socially constructed and differ depending on the culture.

In this article, the socio-cultural challenges facing women entrepreneurs are perceived in light of feminist theories in order to broadly explore the relationship.

**Methods**

This study was conducted in Iringa region, one of the Regions of Tanzania Mainland located in the Southern Highland of Tanzania. Iringa was chosen because it is among the leading regions in agricultural production and many women entrepreneurs attempt thriving in their business there.

This study employed a qualitative research approach in order to explore the hurdles affecting women entrepreneurs’ business in Iringa. This approach has been useful for exploring and understanding the meaning that individuals or groups ascribe to social or human problems (Cresswell 2014). An ethnography research strategy was used to explore socio-cultural phenomena about women entrepreneurs. This strategy is appropriate in contexts where there is a need to gain insights, through observations, about women entrepreneurs in their business context and activities and understand the issues they face from their points of view and perspectives (Saunders et al. 2009, &
Denscombe 2013). Ethnography allows for a high level of congruence between concepts and observations as it involves prolonged participation in the social life of the group over a period of time and description of things witnessed first-hand (Denscombe 2013). Ethnography strategy has been the most powerful influence on the transformation of qualitative research into a kind of postmodern research attitude, which is opposed to the more or less codified application of specific method (Flick 2009). Participant observations that lasted for 2 months were used to collect information on food processing, challenges, and how women market their products (Flick 2009). Observations took a considerable amount of time in order to describe group of women entrepreneurs who share the similar socio-cultural challenges in doing business (Gliner et al. 2009).

A purposive sampling technique was used to reach the women who participate in entrepreneurship using the following criteria: a) working in the food processing industry in Iringa, b) having 1 year or more of entrepreneurship experience in their business. Purposive sampling enabled the researchers to choose relevant respondents in order to address the research questions of this study (see Bryman 2012). The participants were recruited through village leaders, church leaders (for the groups operating under the umbrella of the church, such as MATUMAINI group), telephone calls, and direct contacts along the streets where the women entrepreneurs were selling their products. Thirty-seven (37) participants agreed to participate in this study through this recruiting process. Purposive sampling was also used for selecting some key informants such as the regional manager of Small Industries Development Organization (SIDO), the manager for "Muungano wa Ujasiliamali Vijijini" (MUVI),1 and the head of Social Welfare Department, in Iringa Municipality. These key informants deal with women entrepreneurs’ issues from the government perspective. Furthermore, these governmental organizations were included in the study because of their positions as key stakeholders on issues pertaining to women entrepreneurs, since the institutions provide services such as training on food processing, financial record keeping, business plans preparation and loans.

Primary data for the study were collected through in-depth interviews, focus group discussions (FGDs) and observations. The researcher conducted face-to-face interviews with 14 out of the 37 women entrepreneurs who agreed to participate in the study. After obtaining the interviewees consent, the interview conversations were recoded and later on transcribed for analysis. In addition, the researchers conducted three focus group discussions with three groups of women entrepreneurs (i.e. SARA group: seven participants, MATUMAIN group: eight participants; and others: eight participants). This was done in order to explore attitudes and perceptions, feelings and ideas about business challenges. The sessions took one to one and half hours. The researchers also collected data through direct observations (as part of the general ethnography strategy) on the way participants process food products, the processing environment, the packaging of the products and machines used, and how they accessed market information for their final products. Through observations, the researchers gained insights on the challenges the participants face in undertaking their entrepreneurial activities. Specifically, the observations focused on the processing of various food products, including tomato. For instance in the tomato chain, the observations were on how entrepreneurs prepare fresh tomatoes by cutting them...
into small pieces and drying them using solar driers to maintain the original taste. Also, the observations focused on the preparations of tomato wine, specifically, how it was bottled in different sizes and distributed to the consumers. Our observation strategy involved the researchers’ participation in the lives of the women entrepreneurs under study in the field setting (Fetterman 1998).

Secondary data were collected from official reports, including reports on market challenges in Tanzania, which enabled the researchers to get insights about the governmental perspective on the issues affecting women entrepreneurs’ business. The reports showed the development of women entrepreneurship in the study area, groups of women entrepreneurs dealing with food processing, efforts made by the government to enhance access market information through exhibitions, and strategies of SIDO as a government agency in the development of entrepreneurship domain. Furthermore, review of journal articles and books served as supportive background to the findings of our study.

The collected primary data were analyzed using conventional qualitative content analysis, in which the data were organized into categories and themes (Hsieh and Shannon 2005). Content analysis is an approach to the analysis of documents and texts that seeks to quantify the contents in terms of predetermined categories and in a systematic and replicable manner (Bryman 2012). The content analysis in this study followed this pattern: (i) appropriate texts for analysis were chosen (ii) the texts were split into smaller units of analysis (iii) relevant categories of analysis were developed (iv) coding of the units of analysis was done (v) analysis of the text in terms of the units and their relationship with other units that occurs in the text was done (Denscombe 2013).

Results and discussion

Demographic characteristics

Field data show that the entrepreneurial activities are highly influenced by age. This study quantified the demographic information into percentages in order to indicate their implications on women entrepreneurs to engage in food processing activities with respect to age, education and social problems. A total of 37 women entrepreneurs aged between 20 and 55 years involved in the food processing business were interviewed. Most of the interviewed women entrepreneurs (26 or 70% of participants) started doing business in their 20s. This concurs with the observations by some scholars that women start their business as young people between 20 and 30 years of age (Okafor and Mordi 2010; Marlow and Patton 2005).

With respect to the educational level of respondents, it is important to determine the qualification women entrepreneurs hold in their various processing activities. The findings revealed that the majority (31 or 83.7%) of the interviewed women entrepreneurs had primary education as their highest level of education, while 4 (10.8%) of the women had secondary education and only 2 (5.4%) of the women had a Bachelor’s degree level of education. During the focus group discussion with SARA group, the participants affirmed that “a large number of women entrepreneurs had limited chances to pursue formal learning beyond compulsory primary education because of cultural constraints embedded in the society”.

With respect to the three (3) key informants that participated in the study, they all were 35–44 years old females and had bachelor’s degree level education with three or more years of work experience in their respective institutions.

**Motivation in business**

To address the question: *What are the motivating factors for women to engage in entrepreneurial activities in the food processing business in Iringa?* The results show that "engaging in business as a source of income" was the main motivating factor for entrepreneurship of the interviewed women during our study (Okuruf and Ama 2013). Another related aspect that was made visible during the data collection in this work was that involving themselves in business enabled women entrepreneurs to *create their own job* and "reduce dependency from family members". This goes in line with previously reported work of Jamali (2009) who also found that, the pursuit of financial independence motivated women entrepreneurs to engage in business in order to take control of their life and career. Women entrepreneurs in the FGDs with SARA group pointed out that "earning from business is used to improve their wellbeing by building modern houses, access to better diet, medical services, and pay school fees for their children and relatives". The money obtained from business enable women entrepreneurs to provide support for covering the basic needs in their household and improve life status. These findings also support the observations made by Datta and Gailey (2012) that women were motivated to engage in entrepreneurial activity because they earn income that enable them to provide good education to their children.

Furthermore, another interesting and less known aspect that motivated the interviewed women entrepreneurs to initiate their business was "to reduce wastage of farm products by drying" crops such as tomatoes, vegetables, and mushroom, hence adding value to the products through processing them into another form. Also, one of the key informants, the head of MUVI, pointed out that "the use of new technology for drying farm products using solar power also seems to attract more women entrepreneurs to engage in business". It was noted that the majority of respondent agreed that "the processing of food product added value to the price of the commodity". Simple processing such as sun-drying allowed the entrepreneurs to preserve perishable products for future consumption while retaining the original taste of the produce. In this way, the entrepreneurs boosted the value of their handled produced since dried products can be sold more expensively than their fresh counterpart, at the same time reducing the wastage of products. The promotion of using solar technology in the processing of different food products should be encouraged since in the developing countries are geographically located for optimal absorption of the sun’s rays hence there is a big potential of solar energy if it is effectively harnessed (Foroudastan and Dees 2006). The solar technologies used in drying food products are simple to use and affordable to women entrepreneurs.

**Food processing activities**

According to researchers’ observations during the field work, the processing activities are undertaken by groups or individual women entrepreneurs. Women entrepreneurs deal with more than one food product chain lines in order to diversify their activities.
and maximize profit. The food products processed include honey making, sunflower oil milling, tomato sauce and tomato wine making, tomato, mushrooms and other vegetable drying, spices, peanut butter and nutritious food including soya-beans flour.

The food processing by women entrepreneurs was noted to be “in a small scale because of poor processing tools, lack of reliable market and lack of enough capital to grow and sustain their business”. In the FGDs the respondents reported that, “these obstacles pose high hurdles in our business resulting in low production and low product quality to fulfill the needs of customers”. Improvement of processing tools, access to market, and capital seems to be a solution to increasing the quantity and quality of the products in order to meet the demand of the growing market.

Women activities and time management
It seemed that women entrepreneurs had double roles in the household, that is, as a mother and as breadwinner. The interviewed women argued that “We are responsible for handling domestic activities in order to upkeep our families”. They woke up early in the morning for cleaning, fetching water and preparing breakfast for the family members. Upon completion of all domestic activities, they continued with food processing activities until late noon when they went back home to prepare meals. During evening hours, women proceeded with business activities. Women entrepreneurs seemed to manage their time properly by dividing time for domestic and business activities. The adherence to time schedule enabled them to handle double roles of domestic and food processing activities. One of the respondents emphasized that “we have to handle all duties in order maintain our families and make our business grow”. This goes in line with previously published work on the unequal household power relations and responsibilities, falling mainly on the female due to socio-culturally defined roles (Brush et al. 2009).

Source of business fund
It was observed that women entrepreneurs acquired their initial capital for starting a business from various financial institutions. The majority of the participants obtained their capital from official financial institutions while few of them did so from individual sources. This is a new and interesting perspective related to women entrepreneurs in the food processing business as previous literature has pointed out that women SMEs from rural areas “fear to face FIs (financial institutions) for loans” (Majenga and Mashenene 2015). Servings and Credits Corporative Society (SACCOS) and local banks provided loans to women entrepreneurs upon submission of business plans and their security. During the focus group discussions, women entrepreneurs pointed out that “we get a small amount of loans as we were limited by the financial capacity to borrow more from the financial institutions”. The collateral for women who are doing business in a group was their contributions in terms of shares, while individual women entrepreneurs had to surrender some of their fixed properties like a piece of land, house or animals, although this has to be approved by the Village Executive Officer (VEO) or any other leaders authorized by the village. This is contrary to previously reported work as in the study of Kumar et al. (2013) who reported that a Grameen bank in Bangladesh had reverse conservative
banking practice by removing the need for collateral and created a banking system based on mutual trust, accountability, participation and creativity.

Another source of business fund for women entrepreneurs was personal savings or individual member’s contributions from existing business activities. During the focus group discussion (FGD) with SARA group, it was revealed that, “in the new project of butter making it was funded 100% from member’s contributions as initial capital”. The contributions made from individual members were used as capital to start another business for the group members. In the FGDs with SARA group, the study revealed that “women entrepreneurs contributed from their own sources to start processing peanut butter” which indicates that, they had limited access to official financial institutions for acquiring loans. Limited access to loans from FIs, makes women entrepreneurs to find an alternative source to finance their business projects with the aim of expanding and starting new business. There is need to reverse conservative banking practice by removing collateral and creating the system based on mutual trust between a customer and the bank.

Women entrepreneurs and training
The financial institutions provide training to women entrepreneurs on business plan writing, business record keeping, and business management before they acquire loans. However, the training does not suffice the needs for business improvement since the women lack skills in food processing. The training provided is elementary, which enables them to obtain the basic skills in business management. It was noted that, over 60% of women who participated in FGDs had attended training conducted by SACCOS at Nduli village on business plan writing and on how to repay back the loan. This training is a pre-requisite to obtaining the loan. The training was not adequate enough to address the women entrepreneurs’ needs for growth as it aimed at elementary skills in business management. Access to suitable education and training would enable women entrepreneurs to obtain necessary skills and knowledge for business improvements, hence reducing gender inequalities in education.

Socio-cultural challenges
To address the research question: What are the socio-cultural challenges that affect business activities of women entrepreneurs in the food processing industry of Iringa? It was found that women entrepreneurs face several challenges in the processing of food products which includes: poor food processing technology, lack of access to suitable education and training, access to capital, and patriarchal ideology. It has been stated that women who work in entrepreneurial activities dominated by males, face unique challenges that differ from those who work in more gender balanced dominated activities (Martin and Banaras 2013).

Drawing from the institutional theory standpoint, it is evident that the results of the data analysis through the normative, cognitive and regulatory issues that create environmental obstacles to the development of women entrepreneurs of the study. Institutional theory gives insights by shedding light on the following aspects:

i. Regulatory barriers (RB) suggest that lack of access to markets, capital, packaging material and poor food processing technology make it difficult for women
entrepreneurs to process food products in large volume, high quality and meet required international standards.

ii. Normative barriers (NB) suggest that due to unequal distribution of responsibilities in the household, women are shouldered with multiple responsibilities of taking care the family and doing business, hence it becomes difficult for them to engage fully in business activities.

iii. Cognitive barriers (CB) suggest that lack of access to suitable education and training in the childhood make it difficult for women to produce good quality products and realize competitive advantage in the free market economy.

Furthermore, in this work, feminist theories also provide insights and reflect on the analyzed data by shedding light on the following propositions:

i. From the socialist feminism perspective, changes toward equality in the education system could enable women to acquire necessary skills and engage fully in business activities on equal grounds as their male counterparts.

ii. From the liberal feminism perspective, women are disadvantaged relative to men due to overt discrimination that deprive them in accessing vital resources in business education and experience. Hence, the elimination of gender stratification, laws and cultural norms that limit women to access income, market and education that inhibits the business development of women entrepreneurs is of vital important to realize gender equality.

Figure 1 summarizes the socio-cultural challenges that this study revealed from the institutional and feminist theory perspectives within different levels of institutional structures alongside the transversal strategies that they use to tackle the issues.

Regulatory barriers

Women entrepreneurs and access to market

The market for women entrepreneurs’ products was noted to be a big problem that prohibits them from expanding their business. It was revealed that, less than 20 % of the interviewed women entrepreneurs had access to market during farmers’ exhibitions once per year, whereby over 80 % had never been exposed outside their locality, hence they had limited to none access to market information. The local market was saturated to absorb the products produced by women entrepreneurs since they produced more than what was being purchased. They had not expanded their market outside their region and country. The small sizeable market prohibited women from produce more since they are not sure whether they will find customers. Evidence from the study of Belwal et al. (2012) reveals that the unavailability of the suitable marketplace for products is an obstacle that faces women to acquire market-related skills. Furthermore, Ali and Ali (2013) are of the view that women entrepreneurs require confidence, leadership and managerial skills in access to the new market. Women need to get professional advice to start a business and find an attractive market (Belwal et al. 2012). The expansion of business networks is important to enhance the market for their products.
Furthermore, the study found that “lack of a permanent building for doing business contributes to the problem of market accessibility whereby customers fail to find them with their products”. It was noted through FGDs that the women entrepreneurs do not have a specific and permanent building structures in which to sell their products. Due to the absence of a permanent market place, women tend to move carrying few products with them, looking for customers without knowing whether they will meet them. Women entrepreneurs tend to move in those areas where there is congestion of people like bus stand, and around big shops as they could chance to sell their products. However, this does not guarantee them to meet customers.

**Women entrepreneurs and access to packaging material**

The study observed further that, the supply of affordable packaging materials poses another threat to the growth of women entrepreneurs. The majority of responded argued that “packaging materials hinder the business development”. Packaging materials were not available locally; hence they had to be imported from neighboring countries,
making their price high and not easily affordable. Furthermore, it was noted that some of the packaging materials did not meet the required standards of Tanzania Bureau of Standard (TBS) and Tanzania Food and Drug Authority (TFDA) for certification in order to compete in the international market. Hence, poor packaging materials posed a problem for marketing their product and expanding their customers’ base. For example, they stated that “when packaging honey, we re-used plastic bottle used to pack sunflower oil when we fail to get new bottles due to its price and unavailability”. This is certainly detrimental to the product’s taste and quality. A good packaging of food products is a strategy of attracting more customers to buy a product as it creates confidence to the consumers that the product is of high quality. Improvement of packaging materials would guarantee women entrepreneurs to increase their market size by selling more in wider geographical area.

Women entrepreneurs and financial institutions

Women entrepreneurs faced a challenge of availability of enough capital to invest and promote the existing business. In the two FGDs with SARA and MATUMAINI, the groups with 7 and 8 members respectively, the participants reported that “the loans obtained from SACCOS were small for investing in business”. Lack of enough capital contributed to the failure of women’s plans to improve their business. The work of Wasihun and Paul (2010) found that the major difficulty for entrepreneurs, especially for women, is access to credit because of the collateral requirement by the banks. The absence of micro-finance institutions that enable them to access finance is the major obstacle for women to start a business (Wasihun and Paul 2010). It is clear that lack of access to initial capital and financial support or under-capitalization were perceived by most of the women entrepreneurs was and still is a problem (Jamali 2009). In their study, Magesa et al. (2013) asserted that access to collateral and asset based lending is a constraint to women from accessing finance because of strong cultural norms whereby women are not entitled to the assets. Women entrepreneurs in SSA do not have property in their names to use them as collateral for obtaining loans from financial institutions and other external sources (Singal 2009). Also, women entrepreneurs are confronted with rigid eligibility criteria in accessing financial services, which included having a registered business, trading license, and business plan, hence loan application process is so bureaucratic and stressful that many applicants give up before completing the process (Okurup and Ama 2013).

Financial institutions provide an equal chance to access financial service for both male and female, but collateral becomes a constraint to women in accessing loans. This is contrary to the work of Belwal et al. (2012) where it was asserted that, in the emerging economies, banking and financial institutions differentiated between female and male for disbursement and sanctions of loans and rated women entrepreneurs inferior. In Tanzania, however, women entrepreneurs can manage to get few loans, but the interest rate is so high that it discourages them to borrow more money. For example, in Iringa region, women entrepreneurs who are in a registered group of 10–25 members may request for a loan of a maximum of four million Tanzanian shillings from SACCOS (managed by Iringa Municipal), repayable at the interest rate of 10% per year. The challenge of capital has contributed to cultural values which limit women to access the ownership of property, notwithstanding the government has passed laws which promote equality in the ownership of properties.
Women entrepreneurs and food processing technology

The technology of food processing was noted to be still poor to the extent that it did not enable women entrepreneurs to produce good quality products. For example, at Nduli Village, it was observed that there was “one old milling machine of sunflower oil” which produces a poor quality product. The use of rudimentary tools hinders them to process food products in large volume and with high quality in order to cater the market needs. All the three interviewed groups of women in the FGDs complained that “the tools we use, pushes back our efforts to empower ourselves from poverty alleviation, as we spend many hours and great effort just to produce little”. Furthermore, women lacked knowledge of food processing despite the fact that they had attended a basic training program conducted by SIDO. It was also noted that processing places pose more difficulties to produce quality products as required by the Tanzania bureau of standards (TBS) and Tanzania Food and Drug Authority (TFDA) for certification. Women entrepreneurs process food products at their own residence, risking contamination with other impurities. To process a food product it requires a well-designed space, high level of knowledge and skills so as to produce more products with high quality in order to gain a competitive advantage in the market as it required by TBS.

Women entrepreneurs and weather climatic changes

The change of weather climate affected the growth of the women entrepreneurs business. The study revealed that unreliable rainfall affected the availability of honey in Nduli village. Rainfall helps in the growth of vegetative flowers that the honey bees of the region use. Hence, the absence of enough rainfall to support the growth of vegetative flower affects the availability of honey and other products. Honey is a natural product which is harvested from the beehives, put by women entrepreneurs in forested areas. One of the respondents pointed out that “unreliable and seasonal rainfall affects the quantity of honey to satisfy the demand of customers due to its importance in Tanzanian society as food as well as medicine”. Also, it was noted that unreliable rainfall affects the growth of other crops like sunflower and tomato that are used as raw materials for processing into various farm products. The presence of reliable meteorology stations is then of paramount importance in order to forecast climatic changes and informing women entrepreneurs about the right time to undertake agricultural activities. The government should also employ the expertise of agriculture in order to disseminate information on the best agricultural practices.

Normative barriers

Women entrepreneurs and division of labor

During this study, it was observed that there was an unequal distribution of responsibilities between women and their male counterpart in the household. Women take care of children, what they eat, wear, and other upkeep necessary for them as basic needs. Women entrepreneurs involved in the study stated that “household responsibilities is one of the main barriers in business”. Women entrepreneurs were responsible for taking care of the households and at the same time engage in food processing as a means to earn income for family members. This observation is also supported by studies carried out by Amine and Staub (2009), Huyer and Sikoska (2003), Ihugba and Njoku (2014),...
and Jagero and Kushoka (2011) who observed that women’s responsibilities in the household were barriers in women’s business development. The work of Jamali (2009) also asserted that women faced disapproving remarks from their family and husband, pointing out that in society, it was probably imprudent for a husband to let his wife work, this was seen as a sign of his inability to support his family. Woman entrepreneur, furthermore, may be perceived negatively as someone dedicating more time to her job than her family. The work of Belwal et al. (2012) revealed that family responsibility, household obligations and lack of social support constrained women entrepreneurs in confronting challenges imposed by the external business environment, hence entrepreneurship is a forced choice arising out of emergent family responsibility rather than ambition. The cultural environment of Tanzania makes it more difficult for women to start and run enterprises due to the expectations of their traditional reproductive roles (ILO 2002; Jagero and Kushoka 2011). Women entrepreneurs reported salient normative constraints, stemming from the ascription of women to traditional family roles, the ascription of males to breadwinner roles, and the primacy of family life and child-care responsibilities (Jamali 2009). Therefore, women have more social constrains to the extent that hinders the growth and expansion of their business.

Women entrepreneurs and family support

Little support from their male counterparts was another challenge encountered by women entrepreneurs. Women were struggling with themselves to initiate and improve business whereby men did not put emphasis to support them. In the FGDs, one of respondents observed that “family separation caused by men to restrict their wives not to engage in business is a common practice in Iringa Region as a result it frustrates women entrepreneurs from doing business”. Our study controverts with Jamali (2009) who found that women entrepreneurs get support from relatives by providing them with the initial fund for investing in business. Our study suggests that we need more training in the society on eliminating a negative ideology towards women entrepreneurs. Women entrepreneurs need to be involved in the national development agenda as they play a vital role in the economic development of the society and nation at large. The strategy of involving women in the development agenda has to start from the grass root level (i.e. at the level of family), by supporting initiatives of women in entrepreneurship activity.

Women entrepreneurs and social attitude

The society’s perception towards women entrepreneurs was found to be dominated by patriarchy ideology, whereby ownership of business activity was entitled to men. In Africa a woman who handles money is often inferred to have gotten her funds through the sexual work (Scott et al. 2012). Women who are doing business are normally perceived to be untruthful in the household as they interact with outsider men in the course of doing business. During an in-depth interview with SIDO manager, it was stated that “the negative attitude toward women entrepreneurs discourages them from doing business effectively as many decide not to engage in business in order to maintain their marriage”. Furthermore, in the FGD with SARA group asserted that “the society perceives that in the household if wealth is owned by women entrepreneurs it implies that men have no control over their families and they would be dictated by their wives.”
Negative ideology in the families towards women entrepreneurs, tend to push back development at the household level. Joint efforts between men and women in doing business at the family level is of great important in improving wellbeing, hence elimination of negative attitude towards women entrepreneurs doing business.

**Women entrepreneurs and divided loyalty**

Lack of commitment of the group members creates a barrier to the development of their business. Women entrepreneurs tended to be loyal to their personal business an aspect which contributes to the failure of joint (group) business in terms of producing large volume and high quality products. The women entrepreneurs who work individually tend to be more committed to their business as opposed to those who works with the group. In the FGDs with SARA group, one of the respondents said, “some of the members concentrate more on their personal business rather than group business activities”. Therefore the commitment of members is an important aspect in the success of group business activity as they put efforts and resources together to produce in large volume with less time spent in processing activities.

**Cognitive barriers**

**Women entrepreneurs and educational opportunities**

The study shows that women entrepreneurs lack education since the majority (over 80 %) had completed compulsory primary education. It was noted that “most of the women entrepreneurs’ family tend to give also education to girls which enable them to engage fully in developing business during their adulthood”. Gender discrimination in the emerging economies demonstrated in socio-cultural practice in terms of access to education opportunities between boys and girls (Yusuf 2013). Amine and Staub (2009) argued that inadequate education leaves women ill-equipped to resist normative pressures from society that ask for them to conform to traditional social role’s expectations for the division of labor. Therefore, functional training is required to impart women entrepreneurs with the necessary skills and knowledge to improve their business as to realize competitive advantage in this era of free market economy. Training on financial record keeping, marketing skills and processing of products could be vital for women entrepreneurs to flourish in their businesses and compete on equal footing with a male counterpart.

These challenges are similar to many of the already reported studies. However, this study contributes on schematizing the strategies that women use to improve business development and empowering themselves in order to participate fully on equal footing with their counterpart male entrepreneurs. The transversal strategies created by women entrepreneurs play vital roles in mitigating challenges that confront them in the course of doing businesses.

**Transversal strategies**

To address the research question how can these challenges be mitigated or addressed to satisfaction in order to promote the continuing growth of the region and the empowerment of women in society?, we looked into the strategies that the women entrepreneurs of the region employ in order to tackle the socio-cultural issues that they face. This
work unveiled several transversal strategies used by women entrepreneurs in Iringa. These strategies are referred herein as transversal because they are effectively applied to a wide-range of situations and contexts. Fieldwork shows two different kinds of transversal strategies that seemed to benefit women entrepreneurs: those created for the women entrepreneurs by governmental institutions and those strategies created by the women entrepreneurs themselves. Furthermore, we consider the application of mobile technology as a transversal strategy that tackles the regulatory, normative and cognitive barriers that hinder women entrepreneurship sustainable development.

One of the transversal strategies which could be employed by the women entrepreneurs is mobile technology application which would enable women entrepreneurs to access market information and expansion of business networks (RB). This type of mobile technology application would enable women entrepreneurs to make business at their own pace while maintaining the welfare of the family and complying with societal roles and expectations of the society in Tanzania (NB). Furthermore, a contextualized application developed taking into consideration the levels of literacy of the end-users (e.g., women entrepreneurs and their customers) could provide another source of empowerment through easy accessibility and usage (CB) from the governmental initiative to the self-created ones. A description of mobile technology as a transversal strategy is also given below.

**Transversal strategies created by the government**

These strategies aim to tackle regulatory (e.g., access to capital, unequal economic power, etc.) and cognitive (e.g., inequalities in education access) barriers that hinder women entrepreneurs in the development of their business activities.

**Village development committee**

Extension of finance services to the rural community by the government through village development committee has made available the access to capital for a start-up business. The main targeted group of the development committee policies is women entrepreneurs doing entrepreneurial activities. The strategy of extending financial services close to the villagers enables women entrepreneurs to acquire loans at low-interest rate with minimal collateral conditions, although the capital is generally a very small amount, which does not suffice the needs entirely because of high demand. Nevertheless, this has been a solution for women entrepreneurs who cannot access finance from banks where interest rates are high and collateral conditions are strict. Access to loan through village development committee serves as an effective weapon to fight cultural constraints and enhance the development of entrepreneurship of the women who have been kept outside the banking orbit due to their poor income (Kumar et al. 2013). There is need to set aside more funds by the government and direct close to the villagers through development committee.

**Business incubation and training**

Business incubation (BI) provides functional training in the area of marketing, record keeping, financial management, processing and packaging of food products. Business incubators serve as learning ground for women entrepreneurs in acquiring skills
necessary to engage in business. The presence of business incubator operating under the umbrella of the Small Industrial Development Organization (SIDO), enables women entrepreneurs to acquire the necessary business skills and education that they may lack due to cultural constraints. Furthermore, incubators also offer extension services that offer women entrepreneurs advise on business management. Nevertheless, the existing incubators are urban-based, neglecting those operating their business in the rural areas. Training provided in the incubators are practical oriented which accommodate all a participants regardless the level of education.

**Transversal strategies created by the women entrepreneurs**

These strategies tackle regulatory (e.g., access to capital, food processing technology) and normative (e.g., unequal access to resources) barriers that women entrepreneurs face.

**Economic groups**

The joining of economic groups constitutes another innovative transversal strategy adopted by women where the members put their efforts together in order to enhance entrepreneurship development. Women entrepreneurs who are working jointly in economic groups guarantee themselves to acquire loans from microfinance institutions, by using the group as guarantor. In other words, in case that one of the group members default, the rest of the members can assume responsibilities for the left member’s share. Therefore, this strategy of working in economic groups is a panacea to socio-cultural constraints of getting finance for business development and finally support family well-being (e.g., paying school fees for their children, etc.). Furthermore, it enable, women entrepreneurs to tackle other challenges, for instance, food processing technology, packaging materials, access to resources, unequal economic power, inequality in education hence results into enhancing women power to participate in decision making in the household and higher organs. Therefore, working in economic groups in an innovative strategy of developing women entrepreneurship by eliminating challenges embedded in socio-cultural perspective and create a conducive environment for doing business as their counterpart male entrepreneurs.

**Entrepreneurship clubs**

Another transversal strategy that we noticed during our fieldwork was the formation of women's entrepreneurship clubs where members can discuss constraints of business development in different environmental contexts. Clubs enable to identify critical sociocultural issues and come up with a solution which ties to a given society. The extent and magnitude of the challenges facing women differ depending on the context of a given society or country where they operate their businesses. Therefore, the creation of women's entrepreneurship clubs could be applied to different environmental background, approaching the challenges facing women entrepreneurs from a different dimension in a given society in the development of entrepreneurship.

**Transversal strategy offered by technology usage**

The widespread use of mobile devices provided an opportunity to design solutions that are portable and easily adopted by the users. During our fieldwork, we noticed that all
the observed participants rely on mobile phone technology to carry out their daily communications with family and friends. However, our previous research showed that women entrepreneurs in rural area are not using mobile phone technologies to their full potential (Kapinga et al. 2016).

Mobile technology has been shown to enable women entrepreneurs to establish a link with customers at their own business premises (Munya and Mureithi 2008). Furthermore, the phones can enable women to build investment capital as a result of bulk marketing and to know the price of produce in various market places (Masuki et al. 2010). Hence, phone usage in business can serve as a strategic marketing tool to improve business performance. Moreover, mobile phone usage is important to women entrepreneurs since it can also enable them to search information, improve communication with lenders, suppliers, customers, colleagues and trainers at any time anywhere, saving time for other responsibilities (Donner and Escobari 2009). Since it has been shown that marketing strategies improve the performance of women enterprises (Ewere et al. 2015) applying mobile technology to enhance women entrepreneurs’ business ventures visibility in the market is a promising intervention.

Therefore, it is argued that using mobile phone technology as a tool to tackle regulatory barriers, particularly in the area of access to market information, provides a plausible solution. Furthermore, a mobile phone based intervention could be ideal in addressing normative barriers whereby women entrepreneurs could access better market while still participating in their social responsibilities. Cognitive barriers could also be addressed by providing the users with brief, accessible training tips on how to handle and promote their business. A mobile phone application designed for these purposes can enable the user to access market information on potential customers, prices, demand of goods and reduce traveling expenses to the market place. Moreover, the application could enable women to engage in both productive and reproductive roles while maintaining good relations in the household. Such an intervention could take advantage of the widely spread use of mobile phones in developing countries – in Tanzania the number of mobile phone subscribers has increased enormously, providing opportunities for its use in business activities.

**Conclusions and future research**

This study calls for educational and governmental programme solutions in order to bring a gender-neutral participation in business activities between the sexes. The programme should be designed to bridge the gender gap on equal access to business opportunities by addressing gendered self-efficacy and self-confidence. Also, this study calls for the need of changing society’s mindset about the social constructed roles and ownership of property that would enable women to participate on equal footing with men in business activities and to contribute to economic development from the household level to the national level at large. Therefore, understanding these constraints through institutional and feminist theories could play an important role in bringing gender equality and entrepreneurship development.

The experience gained during our field study form the groundwork for giving recommendations on meliorating the socio-cultural challenges facing women entrepreneurs and on how mobile phones could assist to tackle them. Hence, the following recommendations are put forward:
i. Education in society is of paramount importance of eliminating the negative ideology on the role of women’s participation in the economic development of the household and the nation at large. Women should participate equally in the national economic development agenda.

ii. Enforcement of free educational policy in primary and secondary schools about equality in enrollment between sexes by the government is of vital importance in empowering girls in adulthood when engaging in business activity in Tanzania. Implementation of this policy depends on the political will of government officials to enforce the policy by means of laws and regulations in creating a women friendly user environment to voice their opinions and concerns. Education to girls should be given priority in the development agenda. This would enable them to participate equally in entrepreneurship development during adulthood and influence decision making organs in favor of women and minorities.

iii. Educational development of women entrepreneurs requires the facilitation of comprehensive training in the area of production innovation, marketing strategy, business record keeping and financial management in order to improve business.

iv. The usage and application of mobile phone technology based sustainable interventions to address the challenges facing women entrepreneurs are of vital importance. The use of mobile technology would enable women to expand business networks to various stakeholder hence improvements of their business and receive necessary market information for making a sound business decisions about where to sell their products at high prices. The government and other stakeholders should educate women entrepreneurs on the importance of applying mobile technology-based services to enhance their business while handling family responsibility at their own pace.

This study has various limitations. First, it focused only on women entrepreneurs in food processing in Iringa, small sample size of the study is unescapable. The second limitation is that it dealt with only women entrepreneurs in food processing. Those working in different business chains were not included.

In spite of these limitations, this study sets a baseline for future research opportunities. This study focused on exploring the challenges facing women entrepreneurs, hence further research on comparative analysis about the challenges facing both women and men entrepreneurs in the same environmental setting in order to establish whether they face the same or not. In addition, further study may want to investigate additional variables that exert a fundamental influence on women’s business development.

In conclusion, this study strived to widen the understanding of women’s business by exploring socio-cultural challenges facing women entrepreneurs in Iringa, Tanzania. The findings of this study have shown that women entrepreneurs are motivated to engage in the business in order to improve their household income and employ themselves in the informal sector as well as to raise their family’s life standards and improve the financial position in their household. Furthermore, the field work showed that women entrepreneurs added value to their farm products by processing them and helped each other on social matters, which prompted more women to engage in business activities.

It has been revealed by this study that women entrepreneurs operated in an unfavorable socio-cultural environment which was characterized by unequal distribution of
social responsibility, inadequate education, and patriarchal ideology, poor quality of products, inadequate capital and the unreliable market for the produced goods. These problems prohibit women entrepreneurs to realize higher profits and expand business networks in other regions and outside the country. Women entrepreneurs were found more at a disadvantaged position as they faced more challenges as compared to their male counterparts since they had to also handle family responsibilities entirely while doing small businesses.

With the proliferation of mobile phone technologies in the developing countries, there is an opportunity to employ them in the business arena as a means of confronting socio-cultural challenges facing women entrepreneurs. In particular, this study puts forward an intervention to address the problem of accessing market information through a mobile phone application in order to enable women to handle family matters and conducting business activity uninterrupted. Future work will be geared towards the holistic evaluation and validation of such an intervention.

Endnote

1Union of Village Entrepreneurs, in English

Acknowledgements
We want to thank the College of Business Education (CBE) for their support of this research project. Also, we thank the journal reviewers for their strong recommendations for improving the manuscript.

Funding
This paper is part of PhD programme at the University of Eastern Finland with the collaboration of College of Business Education, Tanzania. I declare that the source of Fund is College of Business Education (CBE), Tanzania in the design, data collection and interpretation of the results. It is part of student sponsorship allowance which covers to include article writing.

Authors’ contributions
AFK is the main author of this paper (student at the University of Eastern Finland) He contributed more than the other authors of the manuscript. CSM is the main supervisor and the main guider in writing the manuscript. All authors have contributed in the preparation of the manuscript submitted to the Journal of Global Entrepreneurship Research. Both authors read and approved the final manuscript.

Authors’ information
Calkin Suero Montero (PhD), Senior Researcher at the School of Computing, University of Eastern Finland. She supervise PhD candidate at the edtech Hub based at the College of Business Education, Dar es Salaam, Tanzania. Contact phone +358,504,425,789.

Competing interests
The authors declare that they have no competing interests.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Author details
1College of Business Education (CBE), Dar es Salaam, Tanzania. 2School of Computing, University of Eastern Finland, Dar es Salaam, Tanzania.

Received: 27 March 2017 Accepted: 2 August 2017
Published online: 14 August 2017

References


Investigating Women Entrepreneurs Usage of Mobile Technology for Accessing Market Information in Iringa, Tanzania

Alsen Florian Kapinga
College of Business Education (CBE)
Dar es Salaam, Tanzania
kamingila@yahoo.com

Calkin Suero Montero
School of Computing
University of Eastern Finland
calkins@uef.fi

Esther Rosina Mbise
College of Business Education (CBE)
Dar es Salaam, Tanzania
embise@yahoo.com

Abstract—Women entrepreneurs’ usage of mobile technology such a cellphone has been increasing intensely in Sub-Saharan Africa. However there is limited knowledge on the extent and precise usage of mobile phones by women entrepreneurs for accessing market information. Hence to address this gap, the goal of this paper is to investigate the usage of mobile technology for accessing market information by women entrepreneurs in Iringa, Tanzania. The study employs a mixed research approach characterized by quantitative and qualitative methods in order to obtain a holistic view on the issues, shortcomings and advantage that the usage of mobile phone for accessing market information can represent to the women entrepreneurs of the region. Interviews were conducted using semi-structured questionnaires to collect quantitative data, while in-depth interviews were used for qualitative data collection. Convergent parallel mixed method was used as a technique for summarizing objective evaluation and interpretation of findings. Results indicate that, contrary to prior research reports, mobile phones are not used as enablers by the women entrepreneurs of our study in accessing market information that is relevant to their business. Our work puts forward a plausible solution of designing a specialized virtual platform for accessing market information and expand business networks of the target user.

Keywords—Women entrepreneurs; mobile phone usage; market information

I. INTRODUCTION

Mobile phone use has the potential to improve women entrepreneurs business by reducing search cost, increase market efficiency, promptly communicate business information and improves productivity by allowing them to better manage their supply chain [1, 2]. Mobile phone use may also enable women entrepreneurs to access reliable information about the market trend of their business. Women may access information about input and output prices, and potential buyers and sellers [1]. Mobile phone use can also uplift women entrepreneurs through expanding access to local and international market [3]. Moreover, the report of the International Centre for Research on Women (ICRW) stated that mobile phone can catalyze women economic development by promoting entrepreneurial activity, improving business practice and breaking traditional gender barrier at home and in the market place [4]. These current facts and future prospect suggest that mobile phone usage has become one of the most ubiquitous technology devices for accessing market information by women entrepreneurs. Despite the fact that mobile phone has contributed to women economic development, the precise extent to which mobile phones contribute for accessing market information in developing countries is still controversial. In most developing countries, markets are dispersed, and communications infrastructure is poor [5]. Producers and traders often have only limited information, perhaps knowing only the price in a handful of nearby villages or the nearest town, so the potential for inefficiency in the allocation of goods across markets is great [5]. However, due to the important role that mobile phones can play as entrepreneurial tool, the usage of mobile phone for accessing market information by women entrepreneurs cannot be ignored. Therefore, the goal of the study is to investigate the usage of mobile phone technology for accessing market information by women entrepreneur in Iringa, Tanzania. Iringa region has been chosen as a study area because it is among the leading producers of agricultural products in Tanzania. In particular, the study focuses on answering the following questions:

- Are mobile phones used as real enablers for accessing market information?
- What is the impact of mobile phone usage on women entrepreneurs’ business development, if any?
- What are the challenges that women entrepreneurs face when using mobile phone for accessing market information?

Centering on women entrepreneurs, this study contributes to the scanty literature available about the pragmatic role of mobile phone technology usage in accessing market information in emerging economies. This also provides a holistic view for putting forward plausible solutions.

II. THEORETICAL PERSPECTIVES

Over the past decade, mobile phone ownership has grown significantly in Sub-Saharan Africa and now covers 60 percent of the population [1]. The availability of mobile phones at affordable prices and its mobility make it an attractive and powerful tool for empowering entrepreneurs to improve their business communication. For instance, mobile phones are useful for enabling the access to market information regarding products demand. This is of relevance for making sound decisions about where to sell the products [6, 7], the products’ price [8], and quality required, the identification of potential customers and the deployment of competitive strategies that
improve business and socio-economic well-being [9]. In particular, women entrepreneurs could highly benefit from mobile phone usage since it can reduce search costs of information about input prices, output prices and potential buyers, as opposed to the traditional search mechanism like personal travel, radio, landlines, letter, newspaper and television which are more expensive [10, 2, 11]. However, in spite of the benefits that mobile phone usage can provide women entrepreneurs seems to lag behind when embracing the use of mobile phone technology for improving their business. Our work is set out to investigate the issues faced when using mobile phones for accessing market information and to identify plausible recommendations to address those issues such that, the women entrepreneurs can take full advantage of the benefits provided by the technology.

III. RESEARCH APPROACH

A mixed-method design was used to study mobile phone usage for accessing market information. Given the composite nature of the linkage between mobile phones, women entrepreneurs and market information, convergent parallel mixed method approach enabled to inquire in-depth information detailed views of participants qualitatively and score on instruments quantitatively [12]. The population in the study was sampled from women entrepreneurs from Iringa region. Women entrepreneurs are at the core of this study because even though they are key participants in agricultural activities, they seems to lag behind in accessing the market information that would enable them to get reliable business intelligence regarding where to sell their products, for instance.

The sampling design for this population was based on purposive sampling in order to increase validity, reliability and obtain the widest range of variation of responses. Women entrepreneurs with one year or more in business were included in the study. Purposive sampling design was also used to select informative participants from Small Industrial Development Organization (SIDO) and “Muungano wa Ujasiliamali Vijijini” (MUVI), since these institutions support women entrepreneurs by offering training and loans. Qualitative and quantitative data were collected and analyzed using convergent parallel mixed methods.

IV. RESULTS

The results of this study were derived from the semi-structured questionnaire and in-depth interviews using mixed methods. A total of forty three respondents volunteered to fill in the questionnaires during data collection process. The majority of the participants were 35-44 years old (38 out of 43), had completed primary education (33 out of 43), and had six or more years business experience (28 out of 43). Fig. 1 provides further details regarding the women entrepreneur participants’ demographic background.

A. Mobile Phones and Market Information

To answer research question ‘are mobile phones used as real enablers for accessing market information?’ the results indicate that all of the respondents own mobile phone although only 6 (13.9%) of the respondents had smartphones, while 37 (86 %) had simple phones that did not support internet applications. It was revealed that current mobile phone usage do not enable the majority of them in accessing market information about the demand of their products, except for those entrepreneurs who had already established links with customers. According to the respondents the main sources of market information were trade exhibitions and verbal communication among women entrepreneurs themselves, particularly for those who operated their business jointly.

Furthermore, women entrepreneurs had no direct access to information from the market about the price, needs and potential customers. The data indicate that 35 (81.3%) participants did not use their mobile phones to know the price of their products. Instead women entrepreneurs set the price of their products after considering the costs incurred during food processing. Nevertheless, 8 (18.6%) respondents were of the opinion that a mobile phone did enable them to know the price of products by communicating with their fellows in other centers.

B. Mobile Phones and Women Entrepreneurs’ Development

To address the research question ‘what is the impact of mobile phone usage on women entrepreneurs’ business development?’ the results demonstrate that few women entrepreneurs used mobile phone for developing their business: only 6 (13.9%) used mobile phones to send pictures of their products to the customers through WhatsApp application. However 37 (86%) respondents possessed mobile phone which do not support internet application. Nevertheless, we speculate that internet connectivity is not a requirement in order to use the phone as a business tool since text messages could also be used for product description and information sharing.

With respect to the traveling costs, 26 (60.4%) respondents conceded that mobile phones played an important role in reducing traveling costs to the market. Furthermore field data indicate that mobile phones enriched the income when the user was connected with a large number of customers. Having many customers implied selling more and improving their revenue. However, 38 (88.3%) respondents who relied on a local market and walked around with their products, found that mobile phones were not enablers for improving their income since they lack such connections with old and new customers.

---

Fig. 1. Participants’ demographic information

1 Union of village Entrepreneurs, in English
The study also showed a lack of vision by women entrepreneurs on the importance of mobile phone as a tool in business, and that they do not engage in business based on past experience in order to maintain a status quo is challenge which they face. During the in-depth interview the head of MUVI asserted that “women entrepreneurs lacked vision of employing mobile phone in accessing market information but a mobile phone is an important tool in a modern business environment if it is effectively utilized”.

V. DISCUSSION

The main contribution of this work is unveiling the role of mobile phones for accessing market information by women entrepreneurs. The women entrepreneurs who participated in the study included respondents from all age groups, educational levels, marital status and experience in business. We consider these demographic variable have an implication for women to engage in food processing. Our sample on age cohort of 35-44 and 45-54 dominated the population of study, since at that age women are shouldered with family responsibility and they engage in food processing as a source of income. Of the respondents in our sample 95.3% were married and they have vast experience in food processing as it shows 65.1% were involved in business for more than 6 years.

According to our findings, mobile phone does not help women entrepreneurs to access market information about the market prices, demand of the products and potential customers. Women entrepreneurs have no direct link with the market where they could get such market information except few of them who have established link with individual customers. The findings show that 88.3% of respondents asserted that mobile phone does not enable them to access market information since the price of products is being set by women entrepreneurs themselves after considering the initial costs involved in food processing. Our results are consistent with [13] study in Tanzania where the researcher found that, majority of mobile phone users are not motivated to access market information but to communicate with friends and relatives.

The study has shown that all respondents owned mobile phones and users do use mobile phones for mainly maintaining relationships and not for accessing market information and expand business. This does not mean that mobile phone could not be used for accessing market information as revealed that 11.6% of the respondents use mobile phone to access price information. We have witnessed many ways of using mobile phones for accessing market information on the price dispersion, potential customers, demand of market and compete more effectively against their competitors[14]. Our findings suggest that mobile phones do not, to a great extent contributes in accessing market information by women entrepreneurs as large number access market by physical visiting with their commodity. Our results are consistent with [13] who asserted that majority of mobile phone owners and users do not use for business purposes but mainly to support family and friends relations.

---

2 Mobile phone local application for money transfer and payments. M indicates mobile, and PESA indicates money in English
Of the respondents in our sample 64.4% believed that mobile phones would help to reduce traveling costs if there was a good link with the market, where women entrepreneurs could communicate business transactions with the customers through mobile phones. While 39.4% of the respondent argued that mobile phones do not help to reduce cost of travelling to the market, they walk with their commodity around the town seeking for potential buyers. Our work suggest that to a large scale mobile phones usage does not reduce traveling costs since most of women entrepreneurs in Iringa operate their business within their surroundings and they have not extended their business outside their region. In the study by [15] it is stated that less than 5% of mobile phones owners use phones for business purposes. Our findings contradict with the study by [16] which asserted that mobile phone usage reduce traveling costs by making business transactions through mobile phones.

Through in–depth interviews, it was revealed that mobile phones do not help women entrepreneurs to expand business networks, given the fact that, most of women entrepreneurs own mobile phones but do not use for business purpose. Mobile phones do not help to expand business networks since the entrepreneurs are narrowed to operate within the local market due to lack of exposure of external market. Furthermore our results shows that 88.3% of respondents argued that the mobile phones do not helps to expand business networks since they depend on local market to sell their processed food products.

Furthermore, it was confirmed by our field data that mobile phone usage facilitates improvement in income only for those who have been connected with several customers whereby they sell more products and in turn earn more profits. Mobile phone improves income of those women entrepreneurs by reducing traveling costs and expanding market, which in turn makes them sell more products. Although mobile phone was found to improve income for some, the study suggests that at a large scale mobile phone usage does not help to improve income of women entrepreneurs. The results show 88.3% of respondents do not use mobile phone for business purpose and hence it does not contribute to improve their income. It can be argued that mobile phones are an important tool in business activities, which contributes to improve the income of women entrepreneurs and their wellbeing only if it is effectively utilized.

Our respondents’ opinion on the challenges of mobile phone usage were unambiguous, showing that mobile phones usage brings operational problem. The study revealed that expenditure on airtime is high, around Tshs 15,000 to 60,000 and above on monthly basis. Mpogole, Usanga, & Tedre [15] asserted in their study that the pricing of a mobile call is more expensive compared to the benefits of using mobile phone, which seems to be the case for the participants of our study. The results of our work also concurs with findings of [15] which showed that the price of mobile phone use in Tanzania is more expensive than other East African countries. Even though telecommunication has bloomed in Tanzania with several mobile phone service providers available, there is still absence of well established procedures for filling complaints to the government and mobile phone subscribers on the high charges of airtime and other problems related to the mobile phone usage.

Furthermore, mobile phone usage faces the challenge of poor cell network which is not stable especially as the user moves away from town center. The failure of network restricts the effective communication between women entrepreneurs and customers. During the in–depth interviews several respondents mentioned that "network failure is a problem which affect effective communication especially in remote areas". The study by [13] amplified that mobile phones customers complain on slow and low-quality network. Our work suggests that slow and low quality network affect the usefulness of mobile phone as a business and communication tool. Presence of reliable and effective network is considered to be of paramount importance to the mobile phone users in order to support business activities.

According to our findings, the usage of mobile phone in business comes also with a lot of dishonesty between women entrepreneurs and customers. Transaction of business through mobile phone devices is plagued by delays that affect the payment through M-PESA when the business transaction is agreed. Also mobile phone is used to disseminate false information in order to defeat competitors in the market. One of the respondents lamented that “mobile phone is not good in business because your competitors display the image of your products to customers by telling them the product has low quality and not approved by government for the public use”. However, our findings suggest that mobile phone is effective in supporting business transaction in placing order, payments and display the product to the customers if it is appropriately utilized.

VI. RECOMMENDATIONS

Base on the results of our field study the following recommendations are put forward:

- Awareness and training programs are required to educate women entrepreneurs on how to make use of mobile phone for accessing market information in simple ways such as text messages. Creation of awareness to women on the usage of mobile phone in business is important for them to expand business.
- Establishing and promoting women entrepreneurs clubs in order to create networks and discuss challenges they face about accessing market information.
- Governmental support is needed to foster skills of entrepreneurship and regulate the costs of mobile phone operators in order to reduce prices of airtime and make more bandwidth available for broadband usage. Also, the support and maintenance of reliable physical infrastructure (for instance, mobile phone recharging stations) is desirable.

VII. CONCLUSIONS

Preceding research has to a certain degree maintained the argument that mobile phone usage helps to access market information, improves economic efficiency and reduce transaction costs [16, 17]. However, the findings in this study have shown that mobile phone usage does not automatically assist women entrepreneurs to obtain market information. Instead, they operate in small scale and because of the traditional nature of their business, women entrepreneurs set the price of their products after considering the costs incurred in processing
without knowledge of the market. Yet, women entrepreneurs depend on the local market which is not reliable to absorb all processed food products. Furthermore, there is no reliable platform from where to get direct access to market information, hence the traditional walk, search and find style for selling products prevails in the Iringa region.

Although all women entrepreneurs included in the study owned a mobile phone device, they used it for family matters and not for business purpose, despite the benefits that such use could bring forward. Mobile phone usage could help women entrepreneurs to get timely market information on prices; opportunities; potential customers and demands of the market. However, mobile phone usage was constrained with airtime costs which are high and prohibitive. Furthermore women entrepreneurs face challenges regarding poor cellular network accessibility and lack of knowledge on how to use their phones: some of the participants only knew how to receive and make a phone call.

Our study focused on the role of mobile phone for accessing market information and understanding the challenges that plague such a usage in the agricultural Iringa region of Tanzania. Based on the knowledge acquire here, further studies are undergoing on the design and implementation of a user-friendly mobile phone application for accessing market information adapted to the local users devices and needs, with the aim of improving the socio-economic well-being of the women entrepreneurs of the region.

REFERENCES


Mobile Technology for Women Entrepreneurs in Iringa, Tanzania: User requirements and Architectural Design

Alsen Florian Kapinga  
College of Business Education (CBE)  
Dar es Salaam, Tanzania  
kamingila@yahoo.com

Calkin Suero Montero  
School of Computing  
University of Eastern Finland  
calkin.montero@uef.fi

Esther Rosinner Mbise  
College of Business Education (CBE)  
Dar es Salaam, Tanzania  
ermbise@yahoo.com

Abstract- Mobile phone technology has increasingly been used as a tool for accessing market information in Sub-Saharan Africa. However, little has been done in the development of mobile technology applications to improve women entrepreneurs’ empowerment and entrepreneurship. This study aims to explore the women entrepreneur users’ requirements needed to develop technological innovations for accessing market related information. Our study employs a design science research (DSR) approach to identify obstacles that women entrepreneurs have when accessing market information in order to develop a suitable mobile application. Results indicate that ingredients and usefulness of products, weight, personal contact, and price information are key elements to incorporate into the technological solution. The significance of our work is highlighted in the development of technology innovations for empowering marginalized societal groups.

Keywords: Design Science Research, mobile technology, User requirements; architectural design; women entrepreneurs

I. INTRODUCTION

The rapid adoption of mobile phones and consequent development of mobile applications (mobile apps) have been changing the way entrepreneurs’ access market information [1]. Recently, mobile phones have become useful tools for obtaining market information on better prices, potential customers and the right distribution channel for the products [2]. Access to market information could represent an important asset, particularly to women entrepreneurs for making sound marketing decisions on their products [3].

Mobile phones can be used as a tool to enable women entrepreneurs to connect with potential customers and improve their income through expanded product sales. Mpogole, Usanga, and Tedre [4], and Tedesse and Bahiiigwa [5] stated that, women enterprise that invested in mobile phone services can generate high revenue and increase consumer welfare by reducing price variation in different markets. Mobile phone usage can also reduce traveling time, allowing women entrepreneurs to concentrate on other activities in their life [4]. Similarly, mobile phones facilitate business networks increase, business publicity and advertisements of products [6].

Therefore, mobile phone usage has the potential to enhance sales, improve the quality of products through customer feedback and increase business networks from afar. Despite the fact that mobile phones can facilitate the access to market information, little has been done to develop mobile technology solutions that are relevant and accessible to women entrepreneurs for this purpose. The development and impact of a mobile technology solution for accessing market information among women in Sub-Saharan Africa have not been widely studied and more so, in Tanzania, the mobile applications usage remains relatively unpopular. Most of the studies carried out in Sub-Saharan Africa focus on general access to ICT and its impact on the socio-economic well-being of women entrepreneurs [7]. However, women entrepreneurs lack sufficient access to market information about prices, competitors as well as support services and resources, information that they could leverage to be more successful [8]. Women entrepreneurs are relatively powerless in the public sphere where men are considered to be economic producers due to patriarchy ideology that gives more priority to masculine than femininity [25].

Women entrepreneurs are at the bottom in terms of education, employment and economic status hence pose hurdle in business development [26]. Hence our work focuses on co-designing a technological solution that focuses on women entrepreneurs’ needs. Currently, the majority of users use mobile phone mainly for maintaining personal relationships and family ties than for economic or business purposes [3, 4, 9]. Nevertheless, given the advantages that mobile technologies can bring forward, the development of mobile applications for accessing market information by women entrepreneurs cannot be ignored. This work presents the initial stages of a Design Science Research (DSR) study, i.e., problem definition and potential solution, that aims to assist women entrepreneurs’ business development in the Iringa region of Tanzania through the implementation and deployment of a mobile technology solution. The general objective of this study is to explore user requirements and suitable architectural design in order to develop an appropriate technological innovation for women entrepreneurs in Iringa, Tanzania.

978-1-5386-2775-4/17/$31.00 ©2017 IEEE
This technological innovation is to be deployed in the form of a mobile app to allow easy access to market information and expansion of business networks. In particular, the study focuses on answering the following research questions:

- **RQ1**: What are the key business information that needs to be included in the mobile app?
- **RQ2**: What kind of technology innovation implementation would simplify business information access to the end-users women entrepreneurs?

Our work contributes to the development of research components in technology projects of empowering women entrepreneurs. The aim is to enable them to participate in business on equal footing as male entrepreneurs. In addition, our work contributes to the scanty literature available on the role of mobile technology application to improve businesses in emerging economies.

II. BACKGROUND PERSPECTIVES

A. Development of phone usage in Tanzania

Mobile and landline phone technology in Tanzania has enjoyed remarkable growth in terms of numbers of operators and subscribers over the past few years. According to the Tanzania Communication Regulatory Authority (TCRA), there are over 39 and half million of fixed landline and mobile cellular subscribers in Tanzania as of March 2016 [13]. This represents a sharp increase of over 10 million fixed and mobile phone subscribers compared to the figures in 2012. The increase in the number of mobile phone subscribers has been attributed to the spread of network coverage throughout the country, the awareness of society about the importance of mobile phone and the affordability of purchasing a mobile handset [13]. The number of telephone operators has also increased due to the converged licensing framework and good regulatory climate in the country, which has been attracting more investors into the market. Increased number of operators has further enhanced competition resulting in improvement of the quality of services as well as reduction of tariffs of postal articles [13].

The increase in the number of mobile subscribers indicates that more Tanzanians have access to mobile phones ownership, which represents an opportunity to support business activities through this technology.

B. Market Information

A market is defined as a set of actual and potential buyers of products who share particular needs or wants that can be satisfied through an exchange relationship [10]. Women entrepreneurs rely on market information in order to make a sound decision on what to produce and where to sell it [24]. A market information system consists of people, equipment and procedures to gather, sort, analyze, evaluate and distribute needed information timely and accurate to decision makers [11]. Market information entails distribution channels, payment requirements, packaging, potential customers, quality and whole host information needed by a producer to make effective sales. Therefore, market information could enable women entrepreneurs to make a rational decision with regards to the prices, where to distribute the products, and the quality of products demanded by the potential customers. Hence, market information is of paramount importance for entrepreneurs to improve their business sales and expand market size by identifying actual and potential buyers. Not surprisingly, lack of reliable market information has been highlighted as a cause of business failure, due to deficiency of reliable business intelligence regarding where to sell their products, for instance [3].

C. Mobile phone as a business tool

Recently there has been a high incursion of mobile phones applications to different business aspects. Mobile phone provides a conduit through which transactions can take place and there is no longer a need for physical presence. Kiba-Janiak [12], asserted that mobile phones are important for both producers and customers. Mobile technology alleviates the need for physical space trading as trading exchanges take place in a virtual market space created by mobile phone networks and a layer of application software [14]. The impact of digital technology from an economic perspective is the potential to reduce physical search costs when a buyer is looking for information about new products [1, 14]. Mobile phones could also be suitable as advertisement platforms for products by incorporating interactive features into the online communication through a mobile app [14]. Moreover, mobile phone usage facilitates new contacts with business partners, suppliers, and customers [9]. Therefore, we aim at developing a suitable mobile phone application that will enables women entrepreneurs to access market information timely and at their own pace; while at the same time, providing an outlet to advertise products and increase business networks. The development of mobile applications platform would enable to empower women entrepreneurs who are disadvantaged in the society to access market information due to socio-cultural hurdles. It is expected that the mobile platform would enable to improve business of women entrepreneurs by accessing reliable market information and make sound decisions about where and what to sell. The features of products embedded into the mobile technology application may attract customers as they observe the ingredients and other important features of the products and invite friends. Promotion of commodities through mobile phone application is relatively cheaper and covers a wide range of area within a short time.

III. RESEARCH APPROACH

The study employs a DSR approach, which is a rigorous process of designing artifacts to solve problems, evaluating what was designed, or what is working, and communicating the results [15]. Sein, Henfridsson, Purao, Rossi and Lindgreen [16], defined DSR as the integration of action research and design science in a method that contributes to
the construction of artifacts where development is dependent on the interaction of the participants of the research. DSR iterates the process of diagnosing, planning, action taking, evaluating and subsequent application of the knowledge elsewhere [17]. According to [15], the goal of DSR is to solve a problem that is found in a given community. It improves the world by developing and studying the impact of technological artifacts from different perspectives [18]. Furthermore, DSR also aims to contribute both to the practical concerns of people in an immediate problem and the goals of social science by jointly collaborating with a mutually acceptable ethical framework [21]. In the context of our study, DSR approach consists of activities of making changes to women entrepreneurs’ development by transforming situations to achieve improvements in their business through the application of technology [15]. DSR projects start by creating awareness of the problem, then suggesting solutions, followed by developing the potential solutions to the problem and evaluating them. Finally conclusions are drawn and researchers define the developments that seem to produce optimal results to the problem [23].

This study presents the problem explication and plausible solutions through user requirement definition stages of DSR on the implementation of a mobile app to assist women entrepreneurs to access market information and build and expand their business network. Here we focus on problem clarifications and requirements definition in order to identify and represent opportunities and potential technological solution for the women entrepreneurs of the Iringa region in Tanzania [19]. The problem clarification involves identification of the issues experienced by women entrepreneurs when accessing market information. The requirements definition sketches possible artifacts that can address the problem.

The study uses a qualitative research design in order to explore in-depth business information that can be simplified by mobile technology application and suggests technological innovation in addressing the problem of accessing market information. The aim of collecting business information is to enable a mobile technology application developer to incorporate information according to the expectations of women entrepreneurs and their customers. The information forms the basis for the application designing and its user-friendly accessibility.

The field study was conducted in Iringa region, in the southern highland of Tanzania. Women entrepreneurs in food processing activities are at the core of this study because they lag behind in accessing market information for their business [3]. Qualitative data was collected through semi-structured interviews and exploratory focus group discussions to aid in defining the problem precisely [20]. Purposive sampling was used for selecting respondents from the target population of women entrepreneurs and customers. Primary and secondary data on women entrepreneurs’ business information that could be simplified by mobile phone application was collected and analyzed using content analysis. At this stage, a comprehensive understanding of the women entrepreneurs’ vision, requirements, and ideal design essential for a successful solution was sought.

IV. RESULTS

The results of this study were derived from semi-structured interviews and exploratory focus group discussions. Thirty-three (33) respondents volunteered to participate during the data collection process. The majority of the participants were 35-44 years old (26 out of 33), had completed primary education (28 out of 33) and had six or more years of business experience (25 out of 33). This research aimed at defining the problems that face women entrepreneurs for accessing market information, in order to suggest a technological solution. Women entrepreneurs in Iringa tend to remain in their geographical location, which limits their ability to get market information. In order to access market information in a wide area, a technological application could represent a viable solution.

A. Requirements definition

RQ1: What key business information needs to be included in a mobile app?

The research set out to identify the information requirements that should be incorporated in the designed mobile technology application for accessing market information. The objective was to identify critical information that could be presented in a simplified manner through the mobile app for the end-user women entrepreneurs and their customers. The results were as presented in the following subsections:

a) Product Information: ingredients, usefulness of products to the health of consumers, weight, and product stock amount. Concerning ingredients, the respondents stated that a product should indicate what is included during the processing and packaging stage. Usefulness of product is of paramount importance to indicate the product benefits, for instance, “garlic paste reduces high blood pressure”, etc. In addition, product weight and stock amount information enables the customer to decide whether to buy in bulk or not depending on their financial capacity. Product information highlights the features of the product in order to attract customers.

b) Product display: price, picture, seller and client personal contact. The price information shows the worth of the product, while the picture shows the outlook of the product. The seller and client personal contact serve as a communication means outside the mobile app to process the order and to deliver the product.

This information types were deemed relevant by the interviewed women entrepreneurs in order to “attract and
provide detailed information to customers about products that are available from different producers.”

We also looked into identifying the kind of market-related communication that the women entrepreneurs expected to carry out with their customers through the proposed mobile app solution. Our study found that women entrepreneurs expect to receive orders from customers and make arrangements for product delivery. Furthermore, a customer feedback channel should also be available in order to monitor the customers’ satisfaction with their products either positively or negatively in terms of price, taste, packaging and quality.

The study also identified a need to enable customers who are illiterate to access product description. Based on this, the application design also included accessible voice icons on which recorded short descriptions of the products could be uploaded. The application development took in this manner an inclusive approach in order to take aboard the needs of those who are illiterate in the market.

B. Ideal mobile application

RQ2: What kind of technology innovation implementation would simplify business information access to the end-users women entrepreneurs?

User requirements were put forward by women entrepreneurs and customers on the ‘ideal’ technology innovation implementation. A prototype was drawn to aid in designing the user interface based on a user-centered experience. Visual diagrams were used for representing and designing the system and database architectures using Unified Modeling Language (UML). UML describes data structure of mobile applications for the selection of the best algorithm for processing data flow. We explored mobile technology application ideas alongside women entrepreneurs, as well as design ideas for accessing market information. This process enabled the identification of the content that should be included into the design of the mobile application. The mobile application was designed in the native and widely used Swahili language in order to be user-friendly to a large number of end-user women entrepreneurs and customers.

V. SYSTEM ARCHITECTURE DESIGN AND IMPLEMENTATION

Based on the end-users’ requirements, the system architecture was designed such that different end-users connect to internet cloud services, with their mobile devices acting as a cloud family for information exchange and data sharing. The application, which is hosted in the cloud, is created and designed using MySQL workbench. Through the mobile application front-end, women entrepreneurs and their clients (i.e., end-users) work together to conduct business, expand the electronic market, and share news and updates. All mobile phones are connected to the database services stored in a cloud server. This allows the easy access of data from every device that is internet enabled. During the demonstration phase of the application, women entrepreneurs would have phones which are internet enabled.

The mobile application platform is formed by a front-end user-interface, a middleware processing language, and back-end services.

a) User-interface (front-end). The user interface is created by XML supported with java programing language.

b) Processing language (middleware). This forms the core functionality of the entire platform, whereby Java is used as the programming language for processing data from user interface to the storage.

c) Back-end services. PHP is used as cloud server execution language for communication between data taken to and from the database with the support of JSON and SQL for data manipulation. SQL is a structured querying language for managing databases, used to insert, delete, update and retain products to the database of the mobile technology application.

Mobile technology implementation is meant to simplify accessing business information and assist in expanding women entrepreneurs’ networks. The installation of the mobile application does not affect the existing applications of mobile phones. In the mobile application, a welcome screen is presented from which the user can log in as a customer to access the products screen and feedback channel. The products screen displays the product descriptions including producer details, price, place and sound icon. The user can log in as a producer to view orders and comments from customers, post new products and record product descriptions (Figure 2).
VI. DISCUSSION

The research set out to find what business information would be included in a mobile technology application designed to assist in accessing market information. In addition, the research sought to find what kind of technology innovation implementation would simplify business information. The results revealed that product information (ingredients of products, usefulness, and product stock amount) and product display (weight, seller personal contact, pictures of products, and prices) are the most relevant information to be included in the mobile technology solution. This information would play an important role in the customers’ decision-making about the products produced by women entrepreneurs, as to choose whether to buy or not. The technology solution is also meant to serve as a platform for advertisement and promotion, covering a wide network area. This mobile technology application has the potential to enhance the end-users’ market by attracting new customers and by improving business networks.

According to our findings, women entrepreneurs’ accessed market information when they visit exhibitions, where people from different parts of the country gather and the entrepreneurs have the opportunity to interact with them. Nevertheless, business exhibitions are organized once a year, which implies that women entrepreneurs are not adequately visible as far as their products are concerned. Our field work showed that women accessed market information mainly while walking with their products, looking for customers. Women entrepreneurs walk with their products targeting crowded areas such as the vicinity of malls and market areas where there is a high possibility to meet many people. Availability of potential customers is the main consideration when selecting trading route [22]. We speculate that by having an appropriate platform to virtual networking and product display the finding of new customers could take less time and efforts.

Furthermore, the mobile platform will also allow direct communication between women entrepreneurs and customers for arranging orders and the subsequent physical delivery of products. It is expected that this type of mobile technology application would enable women entrepreneurs to make business at their own pace while maintaining other household responsibilities, as per societal structures in Tanzania. In this way, the technology could empower women who are shouldered with multiple responsibilities in the household by improving their business while maintaining the welfare of the family.

Our findings indicate that wider spread of mobile phone usage could enable women entrepreneurs to use a mobile phone as a business tool for the promotion and advertisement of their products. 29 (87.8%) respondents conceded that mobile phone usage improves business transactions, for instance by receiving an order from customers and sending money through M-PESA 1 when ordering packaging materials. The presence of potential customers in a given market segment could alert the women entrepreneurs to produce more in order to meet the demand of the market and enable them to get reliable business intelligence regarding where to sell their products [3]. Mobile phones used as a business gadgets would facilitate business transactions hence motivate future mobile development projects in the business arena. During our preliminary deployment of the application, the participating women entrepreneurs perceived that the co-created mobile application in our study would be a solution to their business in accessing market information.

A. Challenges

Concerning the challenges that would affect the deployment and wide intake of the mobile application for accessing market information, we have identified several issues. First, the purchasing price of a mobile handset (smartphone) that supports the developed application poses an obstacle to women entrepreneurs. Nevertheless, the benefits outweigh challenges. The usage of smartphones for business is increasing, as it was revealed that 7(21.2%) of the women interviewed own smartphones with potential for business

1 Mobile Phone local application for money transfer and payments. M- indicates mobile, and PESA indicates money in English
activity and many others were highly ambitious to use internet enabled phones to support their business activities. The number of telephone operators has increased, this implies high supply of mobile handsets to the community. Second, a challenge in smartphone usage was also raised by some women entrepreneurs. In our study, the majority 2678.8% of the participants used simple phones with no internet support. Nevertheless, we speculated that women entrepreneurs potentially have the skills to learn how to operate a smartphone with our developed application, since the application has been co-designed and co-created with them as end-users. The application has a simple user interface that is easy to operate and has been designed in the native language. Finally, poor coverage of cellular networks especially when the users are away from town center represented a challenge that would affect the mobile application effectiveness. However, the increase of cellular towers by telephone operators has great potential of eliminating cellular networks coverage issues because of high competition among service providers in order to increase the number of customers.

The designed and developed mobile technology app could enable the women entrepreneurs to access market information and assist them in making a sound decision about what and where to sell at a given time. Technology innovation implementation would simplify access to business information by women entrepreneurs at their own pace without physical travel to the market and hence reduce costs for the search of market information.

B. Future work
The study has focused on initial stages of a DSR project, i.e. problem identification, user requirement definition and design and development of a technological intervention [18]. Our next steps in the study will involve a detailed demonstration, evaluation, and re-design of the intervention according to the evaluation feedback [18]. Training workshops, field testing and evaluation meetings will be done in the deployment and evaluation stages of the project. Our DSR project is an ongoing venture in which women entrepreneurs are working with software engineers and researchers on co-creation activities in Iringa, Tanzania to model on the mobile technology (smartphone) application for accessing market information. The future study will also explore the integration of bookkeeping through the proposed mobile application. In addition, it would be interesting to investigate the cultural aspect during the deployment of the technology.

VII. CONCLUSIONS
Mobile technology can play a significant role in business development if it is utilized effectively. Technology could improve business by simplifying business functions, for instance, to identify potential customers, reduce search costs, receive orders, transfer money and market the products. Our study emphasized the deployment of a DSR project to tackle real problems through a technology initiative in collaboration with societal structures to assist the business development of women entrepreneurs in Iringa, Tanzania.

Our study revealed that the high price of purchasing a smartphone, lack of experiences of using smartphones and poor cellular networks were the major challenges for women entrepreneurs in Iringa, Tanzania in accessing market information through mobile technology. However, the participants in our study perceived that the challenges could be balanced by the benefits that a mobile app solution could offer. This provided the basis of our DSR project for developing a mobile technology application for empowering women entrepreneurs. This has proved to be a pioneer study in Iringa, Tanzania that employs the design research science approach in solving challenges of accessing market information with technology application. The outcome of this project is envisaged to contribute to the development of technology in the field of entrepreneurship in particular for women who are less represented in the societal structure.

References
Exploring the contribution of business and technology incubators to women entrepreneurs’ business development in Dar es Salaam, Tanzania

Alsen Florian Kapinga 1*, Calkin Suero Montero 2, Godfrey Issac Mwandosya 1 and Esther Rosinner Mbise 1

* Correspondence: kamingila@yahoo.com
1 College of Business Education (CBE), Dar es Salaam, Tanzania
Full list of author information is available at the end of the article

Abstract

Women entrepreneurs are key players in the economic development of societies in Sub-Saharan Africa. However, research has reported that business and technology incubators offer insufficient support to their enterprises. Consequently, this paper sets out to explore and highlight the present status of the contribution of business and technology incubators to women entrepreneurs’ businesses. The study collected data through exploratory focus group discussions, in-depth interviews, and structured questionnaires. The data were analysed and interpreted using the convergent parallel method. The findings indicate that business incubators provide women’s business with training and to some extend enhance their access to market information and business networks. However, the study also finds a lack of contextualisation in the business and technology incubators’ services to the real needs of the incubatees, which eventually makes their support less impactful. In this light, the study recommends the provision of incubators’ services tailored to the real needs of women businesses. Our work puts forward recommendations to support women entrepreneurs’ business development through the contextualisation of the incubators’ services tailored to the incubatees’ real needs including appropriate training beyond business management. Further investments for establishing new incubation centres are also recommended.

Keywords: Women entrepreneurs, Development, Business incubator, Tanzania

Background information

Women entrepreneurs are increasingly becoming a catalyst in the economic development of the society in Sub-Saharan Africa (SSA) by contributing to their national socio-economic development. The women’s business activities contribute to the creation of employment opportunities and the alleviation of poverty (Ihugba & Njoku, 2014). Okuruf & Ama (2013) propound that improvement of the investment climate for entrepreneurs, specifically the growth of women’s microenterprises, have a great potential for poverty alleviation.

Despite these contributions of women entrepreneurs to economic development, women still face many socio-cultural challenges in their business activities (Kapinga & Suero Montero, 2017). According to Nchimbi (2002), women entrepreneurs are constrained by numerous social factors such as training, experience, socialization, poor
networking, discrimination, and unwillingness to take risks. Further, negative attitudes of men towards businesses owned by women pose more challenges in their business development. Women entrepreneurs also experience gender divide and continue to face a number of challenges due to patriarchal practices that situate women in a subordinate position to men (Woldie & Adersua, 2004). In developing economies, it has been reported that society often neglects and undervalues the education of girls due to patriarchal ideology, which becomes a hindrance in adulthood when they try engaging in business (Amine & Staub, 2009; Magesa et al., 2013).

Furthermore, women entrepreneurs are confronted with poor infrastructure and lack of space to support the growth of the business (Amine and Staub, 2009). The challenge of working space faced by women entrepreneurs has two aspects: lack of the prime space (city centre) and general lack of space in any area of the city (Jagero & Kushoka, 2011). Chijoriga (2003) reports that the most critical barriers to women entrepreneurs in Tanzania to start and grow enterprises include limited access to finance, training and markets, lack of appropriate working premises and unfriendly cultural environment. Moreover, women entrepreneurs face problems in accessing business skills and competency development, training, marketing and marketing services, financial service and business networking (Rutashoby & Nchimbi, 1999).

Recognizing this problem, there have been numerous initiatives to improve women entrepreneurs’ business in Tanzania. For example, the Small Industries Development Organization (SIDO) was established under the Act of Parliament No 28 of 1973 to plan, coordinate, promote and offer every form of service to SMEs (Small Industries Development Organization, 2016). On the same vein, the government of Tanzania, in collaboration with the government of Finland, introduced the Information Society and ICT Sector Development Project (TANZICT) whose objectives are to create innovation program and support for incubators in Tanzania (Tanzania Commission for Science and Technology, 2013). Presently, operational business and technology incubators include Dar es Salaam Teknohama Business Incubator (DTBi) and University of Dar es Salaam ICT Incubator (UDICT), which deals with women entrepreneurs and develops innovative ideas from students’ final year projects. In addition, Buni Hub and Kina Hub are also innovation spaces focused on pre-incubation (Cunningham & Cunningham, 2016).

The problem is, however, that the assessment of the contribution of these incubators in the development of the businesses of women entrepreneurs has received little attention. Hackett & Dilts (2004) write that the real impact of business and technology incubation is a surprisingly understudied area and hence represents a wide scope for research. In light of this acute paucity of research in the area, the precise extent to which these institutions contribute to the development of women entrepreneurs’ business is unclear.

Given the importance of women entrepreneurs to the economic growth of emerging economies, this study stands for exploring the contribution of business and technology incubators to the development of women entrepreneurs’ business. Specifically, the study focuses on answering the following questions:

RQ1: What are the roles of business and technology incubators for enhancing the performance of women entrepreneurs’ businesses in Tanzania?
RQ2: What are the unique challenges facing women entrepreneurs in participating in the incubation activities?

RQ3: How can the challenges facing women entrepreneurs be addressed?

This study contributes to the existing body of knowledge in the developing economies, particularly Tanzania, on the roles of business and technology incubators in enhancing the development of women entrepreneurs’ owned businesses. We put forward the need for contextualisation of the incubators’ services to the real necessities of the incubatees in order to make the incubators’ impact stronger. We hope that the findings of this study inform business and technology incubators as well as policy makers in emerging economies in supporting women entrepreneurs in their business activities.

Theoretical perspectives

Definition of terms
For the purpose of this paper, some key terms and concepts need to be defined at the outset. Marlow and McAdam (2015) defined the concept of the incubator as a site where business founders and those external to it, but embedded within the entrepreneurial endeavour, interact. This is a place where entrepreneurs, business advisors, and external professionals can meet and engage; thus, new firm owners and those acknowledged as experts in shaping and enhancing entrepreneurial legitimacy are positioned in proximity. According to Hackett and Dilts (2004), business incubators are defined as:

“A shared space facility that seeks to provide incubatees with a strategic, value-added intervention system of monitoring and business assistance. This system controls and links resources and employees, local universities and university community members, industry contacts and professional service providers such as lawyers, accountants, consultants, market specialists, venture capitalists, angel investors, and volunteers”.

A business and technology incubator (BTI) is defined as a service that enables businesses to evolve. It is a business development tool for growing entrepreneurial ventures by providing a platform for enterprises to build their foundation. Small Industries Development Organization (2016) defines it as service centres aiming at supporting entrepreneurs who have an innovative and creative business or industrial idea in nurturing such ideas to develop to a level of commercial business undertakings. Business incubators nurture new organizations helping them to survive and grow during the start-up period when they are most vulnerable.

Business incubation and women entrepreneurs’ development
Business incubation is very crucial to the development of women entrepreneurs’ business. Business incubators ideally provide women entrepreneurs, as well as all entrepreneurs, with work premises, technical advice, and access to information through ICT facility, financial support through loans, along with other business development services on demand in order to enable smooth start, growth, competitiveness, and sustainability of enterprises (Chijorga, 2003). Women entrepreneurs could greatly benefit
from these services as they can develop skills for marketing their products by identifying potential customers and attract them to buy their products. Business incubation also enables women entrepreneurs to identify potential customers and new markets^ where they could sell their products at high prices (Shahzad et al., 2012). Marketing information enables women entrepreneurs to make a sound decision about where and when to sell and at what price, depending on the market demand. Furthermore, business incubators are meant to provide women entrepreneurs with infrastructural facilities such as flexible, affordable working space as well as shared office services^ (Kimambo, 2005; Ndabeni, 2008). Moreover, business incubators deliver training related services to women entrepreneurs for capacity building skills. Training could enable women entrepreneurs to acquire relevant skills for production, packaging and marketing their business. Customised training programs for skills development are the most important service for the start-up and business development (Shahzad et al., 2012).

Methods
Research site and approach
This study was conducted in Dar es Salaam Region, one of the regions in the eastern part of Tanzania mainland. Dar es Salaam was chosen because it is among the regions with many incubation centres and thriving women entrepreneurs’ businesses. Given the nature of the linkage between women entrepreneurs and business incubators, convergent parallel mixed methods approach was used in order to provide different types of information, detailed views of participants qualitatively and score on instruments quantitatively, yielding results that should be the same (Creswell, 2014). It involved the collection of both qualitative (open-ended) and quantitative (closed-ended) data in response to research questions.

Study population and sampling strategy
The population of the study was women entrepreneurs dealing with food processing who had been incubated by the Small Industries Development Organization (SIDO). We purposively^ chose women entrepreneurs with one-year experience in food processing – because they could provide valuable insights into their business development. A total of fifty-two (52) participants were purposively sampled to participate in the study. Twenty-eight (28) of them joined the focus group discussions, while two (2) of them participated in the in-depth interviews. The two key informant respondents who exclusively participated in the interviews were the general manager from the head office of SIDO (countrywide) and Dar es Salaam regional manager of SIDO. These key informants deal with women entrepreneurs’ issues in incubating business from the government viewpoints. Moreover, these managers were included in the study because of their positions as key stakeholders on issues concerning women entrepreneurs, such as training on food processing, provision of working premises, business plans preparations and provision of loans. Fifty (50) out of the 52 participants also filled in questionnaire.

Data collection methods
In order to ensure validity and reliability, we used different data sources to bolster confidence that data were on the right line; hence, the research instrument would produce
the same results when used by different researchers (Denscombe, 2010). That is, primary data for the study were collected through in-depth interviews, exploratory focus group discussions (FDGs) and structured questionnaires. The researchers conducted face-to-face interviews with key informants from SIDO in order to obtain in-depth information on their perspectives regarding challenges and opportunities of the business incubators for women entrepreneurs (Kothari & Garg, 2014). In addition, researchers conducted focus group discussions with four groups of participants, each consisting of seven (7) people. This was done to explore insights, and assertiveness, feelings and ideas about the contributions of business and technology incubation as well as the participants thoughts about business challenges. The sessions lasted 60 to 90 min. Furthermore, a short and simple questionnaire was distributed to and collected from fifty (50) of the participant women entrepreneurs.

Secondary data were obtained from the assessment of the feasibility of women business incubator reports. The objective was to get insights on the role of business and technology incubations and challenges faced by the organizers of the services. In addition, the study also reviewed journal articles and books for definitions background information, gap establishment, methods, limitations and so forth.

Analysis
Content analysis was used to analyse qualitative data. Content analysis is an approach to the analysis of documents and texts that seeks to quantify the contents in terms of predetermined categories and in a systematic and replicable manner (Bryman, 2012). Hence, this was a very suitable approach to use with our data. Consonant with the approach, the data were organised into categories and themes. On the other hand, quantitative data were analysed using descriptive statistics to ensure a visual representation that is easy to interpret and understand (Denscombe, 2010).

Results
The results of this study derive from exploratory focus group discussions, structured questionnaires and in-depth face-to-face interviews with stakeholders on the contribution of business and technology incubators to the development of women entrepreneurs’ businesses.

Demographic characteristics
General characteristics of the sample in terms of age, education level, marital status and experience in the business is presented in Table 1. Fifty out of fifty-two respondents volunteered to fill in the questionnaire, twenty-eight out of fifty-two participated in focus group discussion and two key informants participated in the in-depth interview during the data collection process. The participants were 35–44 years old (24 out of 52), married (33 out of 52), had completed tertiary education (21 out of 52), and had six or more years of business experience (20 out of 52). These characteristics were important in our study as they provided information about the background of the respondents that could determine their decision to engage in business activities.
Table 1 Distribution of respondents by demographic characteristics

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>Number of participants (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>18–24</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>25–34</td>
<td>9 (17%)</td>
</tr>
<tr>
<td>35–44</td>
<td>24 (46%)</td>
</tr>
<tr>
<td>45–54</td>
<td>14 (27%)</td>
</tr>
<tr>
<td>55 and above</td>
<td>3 (6%)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>9 (17%)</td>
</tr>
<tr>
<td>Married</td>
<td>33 (63%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>5 (10%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>5 (10%)</td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
</tr>
<tr>
<td>Primary education</td>
<td>18 (35%)</td>
</tr>
<tr>
<td>Secondary education</td>
<td>13 (25%)</td>
</tr>
<tr>
<td>Tertiary education</td>
<td>21 (40%)</td>
</tr>
<tr>
<td>Business Experience</td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>14 (27%)</td>
</tr>
<tr>
<td>2–3 years</td>
<td>9 (17%)</td>
</tr>
<tr>
<td>4–5 years</td>
<td>9 (17%)</td>
</tr>
<tr>
<td>6 years and above</td>
<td>20 (39%)</td>
</tr>
</tbody>
</table>

Source: Field data (2016)

Roles of business and technology incubators

To explore research question related to the roles of business and technology incubators in developing the business performance of women entrepreneurs in Tanzania, the study presented the participants with five statements on a five-point Likert scale. The participants were asked to express their opinion by indicating their level of agreement with the statements, where 1 = strongly disagree and 5 = strongly agree. The results emanating from this enquiry are summarised in Fig. 1. A detail description of each statement is given here.

Fig. 1 The contribution of business and technology incubators to women’s entrepreneurial businesses
**Statement 1: Business incubator contributes to accessing financial institutions**

Some participants agreed that business and technology incubators linked women entrepreneurs with financial services. Nevertheless, the majority of the respondents disagreed with or were undecided about this statement (see Fig. 1). In addition, the key informants pointed out that “there is a difficulty for women entrepreneurs to access financial services from financial institutions because they lack collateral in acquisition of loans”.

**Statement 2: Business and technology incubators facilitate training**

As illustrated in Fig. 1, the majority of the respondents agreed with the statement that business incubators facilitate training for women entrepreneurs. Additionally, results from an in-depth interview with key informants showed that business and technology incubators equipped women with necessary business skills. The results reflect a general satisfaction with business and technology incubators in improving training among women entrepreneurs. However, 30% of the respondents were undecided about the statement, while, over 15% showed general discontent with the contribution of business and technology incubators to women’s business skills.

**Statement 3: Business and technology incubators provide working premises**

The results in Fig. 1 show that the majority of respondents do not consider business and technology incubators as a provider of working premises. Equally, the respondents in the in-depth interviews observed that business and technology incubators lack enough working premises to accommodate a large number of women entrepreneurs. Furthermore, during exploratory focus group discussions, one of the respondents lamented, “the premises provided by SIDO to women entrepreneurs are not enough to allow many women to incubate their business”. The responses indicate that business and technology incubators do very little in the provision of the working space to women entrepreneurs in the food processing industry.

**Statement 4: Business and technology incubators expand business networks**

As results in Fig. 1 show, over half of the respondents agreed with the statement that business and technology incubators expand their business networks. This is evidence that some stakeholders are generally satisfied with business and technology incubators’ service in the area. Nevertheless, about 30% of the respondents were unsure that this statement was true, whereas, over 15% of the respondents disagreed with it.

**Statement 5: Business and technology incubators enable access to market information**

As illustrated in Fig. 1, about half of the respondents believed that business and technology incubators enabled them to access market information. This shows that business and technology incubators play an important role in exposing women entrepreneurs to market, to some extent. However, 30% of respondents were undecided whether business and technology incubators facilitated this for them, whereas, over 10% did not believe that this service was actually provided.
Challenges faced by women entrepreneurs
To address the research question ‘what are the unique challenges facing women entrepreneurs in the business incubators?’ we analysed focus group discussions data. The analysis shows that women entrepreneurs process food products at their residences due to the lack of suitable working premises. The in-depth interviews with key informants revealed that there are only four incubation centres in Tanzania, out of which, only one is in Dar es Salaam. Even so, the incubator in Dar es Salaam only accommodates between 25 and 30 women entrepreneurs in one intake.

Furthermore, our findings also show that the lack of conducive working space disqualifies women from getting registrations from institutions such as the Tanzania Bureau of Standards and Tanzania Food and Drugs Regulatory Authority. For example, one participant in the exploratory focus group discussion sessions asserted, "we fail to get a certificate from Tanzania Bureau of Standards (TBS) and Tanzania Food and Drugs Association (TFDA) because we lack premises to conduct our business". Another added, “it is very difficult in Tanzania to get a certificate from TBS and TFDA due to long procedures in obtaining them”.

Similarly, one respondent in the in-depth interview said, “availability of working premises is a prerequisite to attaining a certificate of food standards”. Overall, women entrepreneurs lack the basic requirements for registration with appropriate authorities.

Another hurdle to women entrepreneurs businesses was found to be the lack of access to financial services. Forty percent of the respondents (40%) said that business incubators fail to open the doors to financial services suppliers. The members of focus group discussions equally reported that the majority of women entrepreneurs cannot get access to loans from financial institutions for the lack of collaterals.

Regarding business competition, the focus group participants indicated that they face strong competition from producers of similar processed food products. They are also at a disadvantage because the majority of them lack certificates of standards from institutions such as TBS and TFDA, which lock them out of open markets. We noted that failure to compete is also attributed to poor packaging materials and lack of international mark of the standard, which makes the products not attractive to customers.

With respect to marketing strategies, we found that women entrepreneurs lack marketing skills to market their products. One respondent in exploratory focus group discussions asserted, “we lack the skills and strategies of marketing our products in order to win the market”. This is a great hurdle considering that winning market involves employing promotional skills to attract customers. The study realised that the existing incubators do not provide training on marketing products.

Figure 2 summarizes the challenges faced by women entrepreneurs, transformation strategies to mitigate the challenges and the target skills needed to improve business performance.

Transformation strategies
To address the research question ‘how can these challenges be addressed in order to enhance women entrepreneurship business development?’ data analysis revealed several transversal strategies to leverage their business development in food processing.
First, we look at contextualised business incubation and training. The majority of the respondents were of the view that the provision of training to develop their business is a panacea to address cross-cutting challenges they faced in their business development. It was observed that women entrepreneurs need a wider range of skills in managing their business in order to be successful. These skills include not only business-related knowledge, such as marketing and management but beyond these, food processing and packaging, as well as mobile technology usage skills. One of the key informants argued that “provision of training is necessary in order to produce a good product and gain competitive advantage”. However, incubators should realise that training requirements differ across entrepreneurs. With this regard, incubators need to adapt their training to local contexts to make the offered skills practical to the incubatees’ needs. It was observed, for example, that incubators should not only offer business management training to Dar es Salaam women food processors but also practical skills on food processing techniques and methods implementation so that their products meet the expected standards. This contextualisation to the local business environment and situation would make the incubators’ work more relevant.

Second, fostering the creation of cooperative groups is important. The study found that creating cooperatives among women entrepreneurs is a strategy to pull up resources together in order to leverage their businesses. Women small cooperatives serve as a forum to discuss issues that constrain their business development such as the lack of capital. Further, the cooperatives offer women with soft small loans for developing their enterprises. Business incubators could thus help women entrepreneurs to create such groups to maximise their opportunities for advice and financial assistance.

Third, we highlight incubator’s extension services. Women entrepreneurs continue to get coaching in managing their business even after graduating from business incubators. The study revealed that extension services such as new techniques training should be contextualised to the graduated incubatees needs (e.g., packing style and branding of products). This could enable women entrepreneurs to update skills they actually need in food processing.

Discussion
Participants in this study included respondents from different age groups, educational levels, marital status and experience in the business. We have realised that these demographic variables have an implication for women to enrol in business incubation. From the sampled women entrepreneurs, respondents of age cohort 35–44 and 45–54 years dominated the population of the study – likely because most of the women at this age are married. As a result, they are charged with household responsibilities and sometimes act
as families’ breadwinners. During the focus group discussions, the participants affirmed that a large number of women engage in business because they are shouldered with multiple domestic responsibilities and in order to upkeep their families they participate in business as a means to earn income.

Data analysis also revealed that the participants in this study had varied levels of education. Whereas some had completed tertiary education, a large number of women entrepreneurs had limited chances to pursue formal learning beyond tertiary education because of cultural constraints embedded in society (see Kapinga and Suero Montero, 2017). The findings also revealed that a significant percentage of participants had vast experience in business with over six (6) years in the practice. Our results suggest that there is a close relationship between demographic characteristics and women entrepreneurs to engage in food processing activities.

The study also affirmed that financial services are vital to the growth of women entrepreneurs’ businesses. However, the study revealed that a number of hurdles barred women entrepreneurs from getting access to financial services. The study found out, for example, that rigid eligibility criteria in accessing financial services, which include having a registered business, trading license, and business plans make the process of acquiring finance stressful (see also Okuruf & Ama, 2013; Magesa et al., 2013). The study found that most women entrepreneurs women were not entitled to assets that could be used as collaterals because of strong cultural norms (Magesa et al., 2013; Ascher, 2012). Nevertheless, the study noted a number of initiatives by the government to ensure equal ownership of the property at the household level. All the same, the analysis suggests that more effort is still needed to enforce the initiatives and financial institutions to reduce conditions of lending in order allow more women to access financial services. Moreover, the study sees the need to reverse conservative banking practice by replacing collateral with mutual trust, accountability, participation, and creativity (see, Kumar et al., 2013).

In addition, the study established that training given by the incubators should be contextualised to the local needs of the incubatees. Our study highlights the need for a paradigm change towards the contextualisation of the incubators’ services to make them more accessible and relevant to the actual needs in the field of incubatees.

Regarding the perceived importance of business and technology in the expansion of the business network, the results indicate that the incubator has somewhat enabled women entrepreneurs to expand business networks through the interactive programmes they create. Business incubators have become prevalent gadgets for women entrepreneurs’ business promotion. The findings of are consistent with Scott et al. (2012) who indicate that expansion of business networks enable women entrepreneurs to access market information about potential customers, market prices and demand for the products. Network pushes women entrepreneurs to expand their external network, the people to whom they sell (Scott et al., 2012). Furthermore, business incubators create a network of relations with other business owners who provide support for each other and who may become customers or suppliers (Ndabeni, 2008). Expansion of business networks is of vital importance to women entrepreneurs in enhancing the market size and earn more income. However, as part of their contextualisation of service practices, incubators should understand better the needs of their incubatees in order to provide services that are of value to all.
Furthermore, the majority of participants asserted that business and technology incubators do not provide working premise since they lack enough working space to accommodate women entrepreneurs. Most women entrepreneurs perceived the lack of premises as a hindrance to their business development. This is a problem that incubation centres face; for instance in Dar es Salaam Region, SIDO provides working premises to only 25 to 30 incubatees at a time in its headquarters. This deprives women of premises to undertake their business as recommended by the authority responsible for food processing. Our results are consistent with Kyaruzi and Hales (2009) study in Senegal and Tanzania, where they show that accessing appropriate and affordable business premises was a big challenge for most entrepreneurs when setting up their businesses, hence female entrepreneurs operate their business from home and miss opportunities that open market offers. Our results are also consistent with Lose and Tengeh (2015) study in the Western Cape Province, South Africa, who established that business incubator faces challenges of space for production, funding, maintenance of the machine, as well as lack of technical and entrepreneurial skills.

Given their high demand, the incubators are constrained by their incapacity to accommodate a large number of women entrepreneurs to incubate their businesses. The availability of working premises is pre-condition for women entrepreneurs obtain certificates from Tanzania Bureau Standards (TBS) and Tanzania Food and Drugs Association (TFDA), indicating that the quality of the food produced complies with international standards. The food products approved by TBS and TFDA attract more customers increasing sale’s volume and profit. However, most of the women entrepreneurs fail to meet basic requirements to obtain certificates of standards. During the focus group discussions, several respondents mentioned that it is very difficult to obtain certificates from TBS and TFDA due to lengthy procedures. They expressed that “we have to observe a lot of conditions and most of us we are processing food products at home premises”. Our findings are in line with those of Panda (2018) who observed complications with regulations, complex requirements to register, bureaucracy, and favouritism as impediments to the development of women entrepreneurship in developing countries. As food processing demands special premises in order to avoid contaminations and maintain proper hygiene for human consumption, our study recommends that business incubators should set up new sites to accommodate a large number of clients and eliminate the lack of working premises.

Concerning access to market information, only about half of the participants attributed the services to business incubators. This implies that most women food processors do not receive the needed market information, which is a pre-requisite to compete in a strong competitive market environment and to realise profits in the presence of their counterpart producers of similar products (Kyaruzi & Hales, 2009). Consequently, we argue that the contextualisation of the incubators’ services could make a stronger difference for most of the incubatees when providing access to market information.

Limitations and future research
Our work exposed the need for tailoring the incubators’ services in order to make them relevant to the incubatees. Nevertheless, the results of the study should be interpreted with caution due to the small sample size used. That is, the respondents were all from...
SIDO incubator in Dar es Salaam. Future studies could involve more incubators in Tanzania, such as Teknohama Business Incubator (DTBi) and the University of Dar es Salaam ICT Incubator (UDICT). Likewise, similar studies can be replicated in other countries whose context are more or less similar to the context of Tanzania to test the reliability of the findings of the present study.

Conclusions
Despite the efforts made by business and technology incubators, women entrepreneurs are still facing an array of challenges that affect their business development. A large number of incubatees still have difficulty to access financial services, have limited working space, are unable to compete in the market, and have limited skills training to develop their businesses successfully. These issues hinder the business growth of the women entrepreneurs in food processing sector in Tanzania. The growth of the businesses depends on a favourable environment that enables women entrepreneurs to produce quality products and create brand loyalty from the market. Our results demonstrate that, to a large extent, the incubatees are disappointed in many of the services provided by business incubators in Tanzania due to their indefiniteness. This underscores the need for tailoring incubators’ services to the real necessities of the incubatees in order to make them impactful to the recipients. In addition, plausible strategies to curb the challenges of the incubation activities need to be enforced.

Recommendations
Based on the experience gained during the field study, the following recommendations are put forward:

- The government should set aside funds in its budget in order to introduce business and technology incubators centres in all the regions of the country. Local incubation centres could reach more women entrepreneurs with business and innovative ideas. At present, SIDO has introduced incubators in four (4) out of twenty-six (26) regions in Tanzania mainland. The implication is that the four incubators cannot suitably accommodate the demands of growing businesses.
- In a competitive business environment, investment in practical training plays a key role in business’ success. Consequently, we recommend the provision of practical and contextualised training of business skills to food processing women entrepreneurs in the areas of marketing, food-processing techniques, and packaging of their products.
- The government and other key players should create a favourable environment for women entrepreneurs to improve the quality of processed food products and facilitate the procedure of obtaining quality certificates from relevant authorities. Certificates of standards will build customers’ trust and increase market size and profitability to the respective women entrepreneurs. This is, however, not a proposal to lower standards established to protect consumers. Rather, it is a modest proposal to support women entrepreneurs to meet the existing standards.
Endnotes
1Marketing activities are very important for the success of business in the current hyper-competitive business era (Shahzad et al., 2012).
2According to Shahzad et al. (2012), secure and hassle-free workspace environment, affordable office space and prime location are most important to businesses.
3According to Bryman, (2012), and Saunders et al. (2009), purposive sampling enable researchers to choose relevant respondents in order to address the research questions of the study. Purposive sampling was also used in order to ensure that a wide cross-section of people was included in the sample and getting the best in-depth information by selecting people most likely to have experience in entrepreneurship domain (Denscombe, 2010).

Acknowledgements
We want to thank the College of Business Education (CBE) for their support of this research project. Also, we thank the Journal reviewers for their strong recommendations for improving the manuscript.

Funding
This paper is part of PhD programme at the University of Eastern Finland with the collaboration of College of Business Education, Tanzania. I declare that the source of Fund is College of Business Education (CBE), Tanzania in the design, data collection and interpretation of the results. It is part of student sponsorship allowance which covers to include article writing.

Availability of data and materials
The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Authors’ contributions
AFK is the main author of this paper (student at the University of Eastern Finland) He contributed more than the other authors of the manuscript. CSM is the main supervisor and the main guider in writing the manuscript. GIM has contributed in the preparations of the manuscript and reviewing. ERM is a supervisor, guider in writing the manuscript. All authors have contributed in the preparation of the manuscript submitted to the Journal of Global Entrepreneurship Research.

Authors’ information
Calkin Suero Montero (PhD), Senior Researcher at the School of Computing, University of Eastern Finland. She supervise PhD candidate at the edtech Hub-based at the College of Business Education, Dar es Salaam, Tanzania. Contact phone + 358(504)423,789.

Competing interests
The authors hereby declared that, we have no competing interest in both financial and non-financial.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Author details
1College of Business Education (CBE), Dar es Salaam, Tanzania. 2School of Computing, University of Eastern Finland, Joensuu, Finland.

Received: 5 March 2018 Accepted: 20 August 2018
Published online: 28 August 2018

References


Mobile marketing application for entrepreneurship development: Codesign with women entrepreneurs in Iringa, Tanzania

Alsen Florian Kapinga1 | Calkin Suero Montero2 | Esther Rosinner Mbise1

1 Department of Business Administration, College of Business Education (CBE), Dar es Salaam, Tanzania
2 School of Computing, University of Eastern Finland, Joensuu, Kuopio, Finland

Correspondence
Alsen Florian Kapinga, College of Business Education (CBE), P.Q. Box 1968, Dar es Salaam, Tanzania.
Email: kamingila@yahoo.com

Abstract
Mobile marketing apps have been progressively employed as business gadget innovations in developing economies. Research has acknowledged a number of encounters between women entrepreneurs and innovation opportunities. One identified opportunity is the application of technology to enable women entrepreneurs' access to market information with ease. This paper reports the cocreation process of a mobile application contextualized to Tanzanian women entrepreneurs to facilitate access to market information for improving their business performance and livelihood. Our study employs design science research (DSR) strategy for the cocreation and codesign of the mobile application artifact. After evaluating in the wild the mobile application, the women entrepreneurs participating in the study reported that through the codesigned mobile phone app access to market information is facilitated, and their business and the networks could be expanded. The contribution of our paper highlights the benefits of employing codesign and cocreation in combination with DSR to achieve a meaningful and contextualized virtual platform for accessing market information and for business networks expansion through direct contact with target consumers.

KEYWORDS
cooperation, codesign, design science research, entrepreneurship development, mobile marketing application, women entrepreneurs

1 INTRODUCTION

Mobile technologies usage by women entrepreneurs has dramatically increased as valuable business tools and continue to increase in developing economies (GSMA, 2017). Mobile technology services influence enterprise performance through operational, transaction, and interaction benefits (Komunte, Rwashana, & Nabukunya, 2012). Mobile phone technology as a tool can facilitate women active participation in business, access to market information, promote economic growth, and alleviate poverty (Huyer & Sikoska, 2003). In addition, mobile phone technology can also reduce on-foot search costs, improve coordination, and increase market efficiency. Furthermore, it enables to connect individuals, information, market and services (Aker & Mbiti, 2010; Jensen, 2007). Sife, Kiondo, and Macha (2010) and Kapinga, Suero Montero, and Mbise (2016) pointed out that mobile phone can help to improve rural livelihood in terms of awareness of relevant market information about the prices of goods and identification of potential customers to buy entrepreneurs' goods. These current facts and future projections indicate that the mobile technology has already become one of the most ubiquitous technology devices in human development, and that it is the most widely used devices for accessing market information in a business domain, hence, provide economic benefits to women entrepreneurs and customers (Aker & Mbiti, 2010).
Despite the fact that the mobile technology has contributed to economic development, particularly in emergent economies (Jagun, Heeks, & Whalley, 2008), the precise extent to which a mobile application has helped women entrepreneurs in accessing market information in such contexts is still debatable. That is research has pinpointed that the majority of mobile phone users are not motivated to use their mobile devices to access market information but to communicate with friends and maintain a social relationship (see, for instance, Mtenzi, Chachage, & Ngumbuke, 2008; Mpopole, Usanga, & Tedre, 2008; Kapinga et al., 2016).

Several studies have been conducted investigating the use and development of technology, for instance, mobile devices for doing business transactions (see, for example, Kapinga et al., 2016; Komunte, 2015; Komunte et al., 2012). Nevertheless, there is a very scarce number of studies in the literature that have used design science research (DSR) approach combined with participatory design (cocreation and codesign) as a unified methodology, to discuss the encounters of women entrepreneurs with technology development in general, and for solving the access to market information problem in particular. Research has established that it is important to involve the end users of a technology (ie, women entrepreneurs in our study) in the codesign and cocreation process as it enhances the social acceptance of the developed technology, better matches the end user’s needs, promotes value of cocreation for use, as well as social identity, and social awareness (Wirtz et al., 2013), we employ in our study this strategy.

Kapinga, Suero Montero, and Mbise (2017) in their work pinpointed the user requirements and architectural design of a mobile application to assist in improving the business of Tanzanian women entrepreneurs. Within that scenario, there is still a need to codesign and further cocreate the mobile technology application to leverage Tanzanian women entrepreneurs’ business performance, ensure business sustainability, and at the same time assert the acceptability of the produced application. In our present work, therefore, cocreation and codesign are concepts that express the process of jointly creating and designing a given artifact in collaboration with the end users of the artifact. Our methodology involves these two components of participatory design, with users being involved in the creation and design process from the very beginning of the project; as well as elements of user-centered design, where observations of the users’ actions while using the artifact and interviews on their perceptions are used (see Sanders & Stappers, 2008).

Our research, thus, focuses on creating a mobile technology application solution that facilitates the access to market information, contextualized to Tanzanian women entrepreneurs in the food processing chain. In order to highlight the importance of mobile devices as business tools and to accelerate the real contextualization, social acceptance, and relevance of the solution, we employ DSR in combination with participatory design and user-centered design, putting forward a cocreation and codesign strategy alongside end users. The solution aims at assisting end users when taking informed decisions about where, when and how to sell their products. This goal can be made more accurate by presenting three specific objectives as follows:

- To cocreate and codesign a mobile application (artifact) that would facilitate market information access by women entrepreneurs.
- To test the mobile application by women entrepreneurs and customers in real-life settings.
- To determine whether the mobile application (artifact) does fulfill the user requirements and can solve the targeted problem.

Our study contributes to new and practical body of knowledge showing how to give voice to a marginalized societal group (ie, women entrepreneurs in rural Tanzania) through the process of codesign and cocreation of an artifact (mobile app) within the DSR framework as a combined methodology that brings contextual solution to a real problem. This represents a new perspective in the information and communication technology for development (ICT4D) research agenda from using only human-centered design application in ICT4D (end users as test subjects) towards also using a participatory design approach (end users as partners and expert informants). That is, through codesign and cocreation, the study contextualizes the mobile application to the needs of women entrepreneurs in Tanzania who have been confronted with sociocultural challenges in doing business, and it enables them to engage in business anytime, anywhere while attending their family obligations as per their cultural context. In addition, this study contributes to a new context for integrating an interdisciplinary approach in tackling societal problems, such as the use of mobile technology in addressing business challenges. Furthermore, the study adds to the existing body of knowledge about mobile technology application in the domain of entrepreneurship and towards solving a real societal problem in the business arena, for instance, to identify potential customers and make informed decision about where and when to sell processed food products.

2 | THEORETICAL PERSPECTIVES

2.1 | Women and entrepreneurship

Entrepreneurship is a field of business that seeks to understand how opportunities to create something new arise, and who then use various means to develop them, thus producing a wide range of effects (Baron, 2013). Entrepreneurship enables to employ and organize factors of production while recognizing the associated rewards and risks. Entrepreneurship involves creating new items with a value by dedicating the indispensable time and effort, assuming the social risks and receiving rewards of monetary and personal satisfaction (Hisrich & Peters, 2002).
According to Siddiqui (2012), women entrepreneurs are capable of contributing value both to the families and to the society, given their strong desire of doing positive things. Women entrepreneurs contribute greatly to the emerging economies’ development agenda by engaging in productive activity, for instance, adding value by processing food products. Women entrepreneurs process different types of food products, including peanut butter, dried vegetable, dried tomato, mushroom, honey, sunflower oil, and other items. In the process of searching for a dependable market, women entrepreneurs tend to walk with their products looking for customers, especially in highly congested areas like bus stands, marketplace, and in public gatherings due to the small size market (Kapinga et al., 2017; Mramba, Apiola, Msami, Klomsri, & Haule, 2015). Women entrepreneurs are striving to create products by dedicating the indispensable time and resources in order to earn profits and improve their household well-being. Women in the entrepreneurship domain use the opportunities and resources available in their surroundings to process different food products with the aim of improving income to support their families.

2.2 | Mobile technology application for development

The dominant domains of technology for development embrace eLearning, mobile money, health, renewable energy and control of the natural environment, government, marketing technology in agriculture, to name a few (Cunningham & Cunningham, 2016; Heeks, 2015). However, these innovative technology applications are not known to be targeted to the informal workforce, such as women entrepreneurs in the food processing chain, and street vendors, even though informal workers form a large part of the workforce in the developing economies (Mramba, et al. 2016). Mobile technologies become a threat to middlemen who exploit the marginalized group as they link direct to the market. Presence of mobile technology disrupt the prevailing power of the middlemen over the women entrepreneurs to some extent. Mobile technologies were demonstrated and evaluated (discussing its benefits and drawbacks) and redesigned with a mobile technology app (artifact) to enable women entrepreneurs to access market information about their products without physical travel as trading exchanges take place in virtual market space created by mobile phone and a layer of the application software (Jobber, 2010). Mobile technologies also enable to communicate directly to the customers and therefore eliminate middlemen who flock to women entrepreneurs to buy products at cheap prices (Furuholt & Matotay, 2011). Middlemen in business normally exploit producers to the extent that they cannot realize profits of their business. It can be argued that mobile technologies are contributing to major transformations of living experience in the business arena in particular to identify potential customers and to lighten the channel of distribution. This was amplified by Islam and Grönlund (2010) that the middlemen may not like to see such information empowerment of women entrepreneurs. Mobile technologies become a threat to middlemen who exploit the marginalized group as they link direct to the market. Presence of mobile technology disrupt the prevailing power of the middlemen over the women entrepreneurs to some extent.

Notwithstanding, the rapid growth of mobile technology usage in sub-Saharan Africa, there are a limited number of mobile applications focusing for women entrepreneurs’ business development in food processing chain. Women entrepreneurs have significant contributions to the economies of sub-Saharan Africa and well-being of the community (Belwal, Tamiru, & Singh, 2012). Women entrepreneurs form a major part of workforces in many developing economies and are thus a noteworthy user group for future technologies (Mramba, Apiola, Kolog, & Sutinen, 2016). A contextualized mobile phone app would be a panacea to directly link women entrepreneurs with customers in their business transactions.

However, the existing mobile apps are not contextualized to the needs of women entrepreneurs in food processing chains who are confronted with sociocultural challenges, but instead, they focus on presenting general crop prices in the larger market (see, for instance, the Sokoni—Swahili word for “market” application). Furthermore, women entrepreneurs have reported to rely on mobile technologies to carry out their daily communications ties with friends and family, which represents an opportunity for the same gadget to be used for business purposes (Kapinga & Suero Montero, 2017). Considering their use of mobile phones, in our work, a mobile technology app (artifact) to enable women entrepreneurs to access market information was cocreated, demonstrated, and evaluated (discussing its benefits and drawbacks) and redesigned with a team of software engineers, researchers, and a group of end users (women entrepreneurs and customers). We present details of this extended DSR process in Section 3.

3 | Research strategy

3.1 | Design science research

The study employed a DSR strategy to produce an artifact that is focused on practical business problem solving (Hevner, March, Park, & Ram, 2004; March & Storey, 2008). The DSR is used for problem definition, objective formulation, construction, and evaluation of an artifact that would

https://apkpure.com/tanzania-sokoni/appinventor.ai_kigamboni56.TANZANIA_SOKONI
enable solve the market information access problem by changing women entrepreneurs' business performance practices and procedures (March & Smith, 1995; March & Storey, 2008). DSR seeks to reduce the gap between theory and practice but maintains the necessary amount of rigor to ensure the reliability of results (Lacerda, Antunes, & Dresch, 2015). Furthermore, DSR aims at creating solutions that are more efficient, leading to effective products, processes, services, technologies, or ideas (Gregor & Hevner, 2013). Thus, our DSR strategy was motivated by the fact that women entrepreneurs in Iringa, Tanzania, face the challenge of poor access to market information in order to make a sound decision about where and when to sell their products, which results in poor business performance. Iringa was chosen because it is among the leading regions in agricultural activities, and the results could be generalized to the rest part of developing regions because they exhibit similar characteristics, whereby women entrepreneurs in developing economies attempt thriving in their business there.

DSR can be focused on three inherent research cycles: the relevance cycle, the design cycle, and rigor cycle (see Figure 1). The relevance cycle not only contributes for identification of requirements for the research as inputs but also defines acceptable standards for the ultimate evaluation of the research results. This cycle improves the environment by the introduction of new and innovative artifacts and by the process of building these artifacts.

The design cycle aids to build the design, development, and evaluation of solutions. The design cycle is the core of any DSR project. This cycle of research activities iterates more rapidly between the construction of an artifact, its evaluation, and subsequent feedback to refine the design further. Simon (1996) describes the nature of this cycle as generating the alternatives and evaluating the alternatives against requirements until a satisfactory design is achieved.

The rigor cycle links the solution and the DSR process to the prevailing knowledge base. The rigor cycle provides past knowledge to the research project to ensure its innovation. The rigor in design science is important because it is an essential factor for research to be considered valid and reliable and can contribute to an increased knowledge base in a given area. To ensure the validity of research and expose its utility, it is essential that investigations be conducted with an appropriate amount of rigor to demonstrate that the constructed artifact is suitable for its proposed use (Lacerda et al., 2015). The validity of DSR must be established from the evaluation of the developed artifacts and must show that they satisfy the required conditions to achieve the desired and expected objective; that is, they completely accomplish their function (Pries-Heje & Baskerville, 2008).

In DSR, projects start by providing requirements for research, for instance, what is the problem to be tackled with technology, and then proceed to design, construct, and evaluate a suitable technological solution (Hevner, 2007). The framework of a DSR project defines several stages including problem explication, requirements definitions, design and development, demonstration, and evaluation (Johannesson & Perjons, 2014, pp. 75-77). Alongside, these stages are where the processes of cocreation and codesign occurs in our work (see Figure 2).

The framework in Figure 2 describes the relationships between cocreation and codesign and the stages of DSR (connected with dotted arrows) about distribution of responsibilities between researchers, designers, and end users. Furthermore, integrating into ICT4D realm, this combined methodology accentuated by end user participation as partner, and expert informant has the potential to produce unforeseen benefits by gaining new insights and perspective from the participants in DSR process (see Steen, Manschot, & De Koning, 2011).

During cocreation, participants provided their input on the ideal mobile application innovation that would address their needs. On the basis of the initial cocreation output, the end user’s requirements were collected and understood. The codesign process continued the work with the development and implementation of the artifact having the input of key end user participants throughout the stages of the DSR project to further refine and redefine the end users’ requirements and evaluate the artifact as explained in this work (participatory design). After the evaluation stage, the DSR cycle restarts with redefined users’ requirements learnt from the evaluation so that the artifact is redesigned and reimplemented.

**FIGURE 1** Design science research cycle (adapted from Hevner, 2007). KB, Knowledge Base
through cocreation and codesign with the end users. Before arriving at a final product or artifact, multiple iterations of DSR design cycle might be needed. With each iteration, the output of this design cycle influences the relevance cycle as well as the rigor cycle (Hevner, 2007). In our work, smaller iterations between the stages of the DSR cycle occurred through cocreation and codesign so that the initial problem was revised in accordance to the requirements defined through cocreation, producing new insights on the needs of the end users and updating the relevance of the research. Similarly, this influenced the design, demonstration, and evaluation of the artifact, since through codesign the end users acted as expert informants providing their perspectives and knowledge of the environment where the application would be deployed. The results of this created new knowledge on how to achieve a contextualized and meaningful solution, thus updating the knowledge base as well as the original requirements and explication of the problem.

3.2 | Sampling strategy

The population of the study was women entrepreneurs and customers in the food processing business from Iringa, Tanzania. The researchers purposefully selected a sample of 10 people (five entrepreneurs and five customers, respectively) to participate in the cocreation and codesign process of the mobile application during the demonstration and evaluation. Since the aim was to elicit insights from the participants about the cocreated solution (mobile app) usability and usefulness in order to drive the design, 10 participants (five entrepreneurs and five customers) are a suitable number according to established research in the field of usability (see Nielsen & Landauer, 1993). Additionally, many women entrepreneurs possessed only traditional mobile phones, which did not support internet application (Kapinga et al., 2016). Hence, the availability of women entrepreneurs and customers with smartphones also influenced the choice of the sample size.

Women entrepreneurs were recruited from the food processing chain, having one or more years of experience in their business. Intensity purposive sampling strategy enabled the researchers to select participants that were best providing the data required to answer the research questions and meet the objective of the study (Saunders, Lewis, & Thornhill, 2009). The participants of this study were recruited through the regional office of the Small Industries Development Organization (SIDO) in Tanzania, for those who have been attached to the office through various programs. Recruitment also took place through church leaders (for groups of women entrepreneurs operating under the administration of the church), telephone calls, and direct contact with women entrepreneurs along the street where women entrepreneurs sell their products.

Furthermore, snowball sampling was used to recruit the five customers of the processed food products. Snowball sampling is a nonprobability sampling procedure in which subsequent participants are referred by either the women entrepreneurs or other customers (Cooper & Schindler, 2006). The researchers asked the informants (women entrepreneurs) to introduce customers who buy their products in order to provide useful information on how they access products from the producers. The sample grew in size as each participant further nominated a person (or persons) who might be included in the sample (Denscombe, 2010). Therefore, snowball sampling enabled researchers to obtain access to appropriate informants (Remenyi, Williams, Money, & Swartz, 1998).

3.3 | Data collection methods

3.3.1 | Face-to-face discussions and semistructured interviews

During the codesign process, the study employed face-to-face discussions and semistructured interviews to collect data through codesign workshops and training with the participants. The women entrepreneurs and customers were involved in the codesign, training, testing, and evaluation.

\[\text{See also https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/}\]
of the mobile application. The discussions also included the outputs from the initial cocreation process regarding user requirements and application design. Face-to-face discussions and interviews enabled the researchers to obtain in-depth information and bring greater flexibility to the data collection process (Kothari & Garg, 2014), since interviews tend to bring higher responses as it establishes a rapport that helps motivate the person to answer the questions (Cozby, 2007).

During the training, we started probing the participants with questions such as what functions you use in your smartphone? How do you download different applications, for instance, WhatsApp? These questions provided us with a general view of the familiarity of the end users with the functionalities of their smartphones.

After the training, for the semistructured interviews, the discussion was based on the demonstration and in the wild evaluation of the artifact. The semistructured interviews involved the presentation of oral-verbal stimuli and replies in terms of oral-verbal responses (Kothari & Garg, 2014), involving general open-ended, flexible, and probing questions that intended to elicit views, opinions, and in-depth information from the participants. The discussion started with the question in your opinion, what are the apparent benefits of mobile application? (Creswell, 2014). Furthermore, the discussion proceeded with more open-ended questions, for instance, what are the benefits and constraints of this mobile application for you? What other items/information should be added into the application? How does the application help you interact with customers in the course of doing your business? It is imperative to note that the participants were urged to focus their discussion towards the mobile application that was being demonstrated.

Interviews are an ideal method to collect in-depth information from the respondents (key informants) by eliciting opinions and different points of view. An assumption that underlies the use of these semistructured interviews is that women entrepreneurs and customers were willing and able to provide trusting and precise answers (Cozby, 2007).

### 3.3.2 Direct observation

Furthermore, the study employed direct observation (human-centered design) to see the end users interacting with the artifact in their environments, without interfering with the natural dynamics of the artifact being demonstrated and tested (Johannesson & Perjons, 2012). This is a technique in which the researcher employs explicitly formulated rules for observation and recording the results (Bryman, 2012). The aim of direct observation was to encourage each participant in the demonstration to perform as instructed and to record further improvements of the challenges that they face. During the observation, the researchers gathered information on the learnability of the mobile app through the actual use that the participants gave to the application. Moreover, the researchers also gained insights on the usability, functionality, difficulties, and performance of the mobile technology application. Furthermore, direct observation enabled the researchers to get a firsthand experience with participants as well as record information as it occurred (Creswell, 2014).

### 3.3.3 Codesign workshops—group discussions

The researchers collected data through group discussions whereby researchers and end user participants interacted and influenced each other to generate information (Johannesson & Perjons, 2012) about the suitability and hurdles of the artifact being codesigned. It provided the researcher with a method for investigating the participants reasoning and for exploring the underlying factors that might explain why the participants hold their given opinions and insight feedback on the tested mobile technology application in the business domain (Denscombe, 2010). A codesign workshop generated abundant and diverse ideas for improvements and innovations on the mobile application demonstrated.

### 3.4 Analysis

Content analysis is an approach to the analysis of documents and texts that seeks to quantify the contents in terms of predetermined categories, themes, and in a systematic and replicable manner (Bryman, 2012). It is a well-established method of text analysis among the set of empirical methods of social exploration. In content analysis, data analysis is proceeded hand-in-hand with other parts of developing qualitative study, for instance, data collection and write-up of findings. Content analysis has the potential to describe many hidden aspects of what is being communicated through the written text. The main strength of content analysis is that it provides a means of quantifying the content of a text, and it does so by using a method that is clear and, in principle, repeatable by other researchers (Denscombe, 2010).

The collected primary data were analyzed using content analysis in which the data were organized into categories and themes. First, the data were categorized in a systematic way in order to organize it meaningfully. These categories were then gathered into broader themes that aligned with the research objectives bringing about answers to question that developed in situ from the data. Finally, the themes were grouped into description of implementation, demonstration, and evaluation of the mobile technology application. These themes are discussed in Section 5.
4 | IMPLEMENTING THE DSR PROJECT

This section presents the results of our DSR project through codesign with women entrepreneurs. The results presented here are based on the activities carried out in an iterative way within the DSR cycle, moving back and forth between all the stages of problem explication and requirements definition (relevance cycle), solution development and evaluation (design cycle), and linking the solution of DSR to the prevailing knowledge base (rigor cycle) (Hevner, 2007; Johannesson & Perjons, 2014, pp. 76‐77; see Figures 1 and 2). Initial results from the relevance cycle are presented in Kapinga et al. (2017) and are updated in this work. The results shown here follow under the themes of technical description, demonstration, and evaluation of mobile technology application design cycle.

4.1 | Technical description of the mobile technology application

The mobile technology application aimed to be an ideal technology innovation implementation for women entrepreneurs to access market information. The mobile technology application is hosted in the cloud and created and designed using MySQL workbench. A front‐end user interface, a middleware processing language, and back‐end services form the mobile application platform. During the innovation implementation, a prototype was drawn to aid in the cocreation and codesign of the user interface. Visual diagrams were used for presenting and designing the system and database architectures using Unified Modeling Language (UML). All mobile phones are linked to the database services stored in a cloud server that allows easier access of data from every device that has internet access. (see Kapinga et al., 2017). The cocreated mobile app is shown in Figure 3. The mobile technology application tries to facilitate the communication between women entrepreneurs and customers for making arrangements of orders and the subsequent physical delivery of products. A participant pointed out that “teknolojia ya mfumo huu wa simu unawezesha kupanua soko la biashara yetu kokote na wakati wowote kwa njia ya kieletroniki” (informal English translation: “the mobile technology application could facilitate to expand electronically our market and enhance our business ubiquitously”).

![Cocreated mobile app](image-url)
4.2 Demonstration of the mobile technology application

During the demonstration phase, our study focused on carrying out a training workshop to give basic skills on the use of the mobile technology application, the objectives of the preliminary field-testing, and in the wild field-testing as described in this section.

4.2.1 Training workshop

The training workshop was arranged with women entrepreneurs and customers. The 4-hour-long activity focused on the use of a smartphone for accessing market information and expanding business networks though the cocreated app. All participants (10) had a smartphone and had experience using it (1-5 years). The session started by elucidating the tenacity of gathering and showing the basics of a smartphone, for instance, switching on and finding an application. The main activities in the training workshop were as follows:

- Learning how to download the application from the google play store (all participants).
- Learning different icons and their functions in the mobile application (all participants).
- Learning how to switch the application on and off using the touch screen (all participants).
- Opening the mobile device and browsing to find the mobile application (all participants).
- Posting products, selling price, record sound, upload picture, and view order (women entrepreneurs).
- Viewing products and posting order in the application (customers).

We instructed all the participants on how to download the app; switch it on and off, open the device, and browse the app; posting products; record sound; and upload pictures of products. After the training, each participant was given the opportunity to use the application by themselves to rehearse each activity (see Figure 4).

4.2.2 Preliminary field-testing

The day after the training, the women entrepreneurs and customers used the mobile application for 2 days to practice the learned skills in their real environment setting. As part of the codesign process, they were requested to provide input on any issues regarding the functionality of the application and the intuitiveness of the front-end design. It was observed that all participants of the study were able to use the app correctly; however, issues with using the camera to take pictures of products to be uploaded to the app were identified and fixed.

4.2.3 In the wild field-testing

After 2 days of the preliminary field-testing period, women entrepreneurs and customers were given 3 weeks for testing the application in the real business field. During those 3 weeks, once per week, the researchers received feedback on the usability and functionality of the application through phone calls. The results of the in wild field-testing determined whether additional iterations of the relevancy cycle were needed. Iteration of the relevancy commenced with feedback from the environment.

![Figure 4](image)
Results showed that the app functioned well on Android phones. Smartphones enabled to download the application from google play store and install the application effectively. The application was tested to install and uninstall, it was observed that the smartphones supported the process properly. Furthermore, the mobile application enabled women entrepreneurs to access market information by interacting directly with customers. Women entrepreneurs posted various products into the application, while customers viewed and placed order to the products of their preferences. It was also noted that spreading the word about the application through WhatsApp by sending the link of the app to friends and known customers enabled more people to download and install the application.

In regard to the extent that the mobile application is easy or difficult to use for accessing market information, the participants of the study asserted that the application was easy to use since it is customized in our native Swahili language, and the participants of the study had experience using a smartphone; hence, the interface was found user-friendly. Also, it was observed that posting products, recording descriptions, and uploading pictures of the product were easy and managed by end users themselves. The participants provided feedback about suitability and functionality of the artifact during demonstration and evaluation activities. It was noted that the artifact worked as expected, facilitating the interaction between women entrepreneurs and customers through posting products and placing orders, respectively.

After the period of demonstration and evaluation of the artifact, one participant of the study stated that “… mfumo huu wa simu uko vizuri na hautaijai maboresha zaidsi” (informal English translation: “the mobile application system functioned effectively to the extent that no further improvements are needed”).

### 4.3 Evaluation of mobile technology application usage

The cocreated mobile technology application for women entrepreneurs to access market information was our focus of evaluation. This activity involved comparing the objectives of the solution to the actual observed results from use of the artifact during the field-testing. Implementation of the evaluation of the mobile app was conducted by making a phone interview to the participants once per week during the in the wild testing period and by codesign group discussions at the end of the testing period. Evaluating whether the mobile app functioned as it was expected to access market information, all participants in the study agreed that the mobile application performed well, allowing access to market information by fostering the interaction between women entrepreneurs and customers. During the codesign group discussion, one women entrepreneur argued that “mfumo umetaisaidia kwatambua wateja maalumu kwa kuweka oda mara mara” (informal English translation: “the mobile application enabled us to identify key customers that made order of products more frequently”). Furthermore, another respondent expressed her satisfaction with using the app “… mfumo huu umekubalika vizuri sana kwani ni rahisi na unatumia lugha yetu ya Kiswahili” (informal English translation: “the mobile application is accepted positively by end-users due to its friendly use and customized in native Swahili language”). Another participant said “… mfumo huu ni bora kwa kukuza biashara yangu, kitu cha muhimu ni kutoa elimu kwa watu wengi ili kuonzea uwigo wa soko langu” (informal English translation: “the app is ideal to expand my business and what is needed is to create consciousness to the large population in order to increase my market size”).

#### 4.3.1 Observed benefits of the mobile technology application

In regard to the benefits that the mobile application brought forward during cocreation and codesign, the women entrepreneurs pointed out that the usage of mobile application saved our money and traveling time to the marketplace by selling products through the virtual platform. Hence, the mobile application was found ideal since it allows the easy access of data from every device that is internet enabled. The mobile application enabled women entrepreneurs to link directly to potential customers and make business without physical traveling, minimizing also business costs. Furthermore, it was observed that the end users could enlarge their market size by sharing with more people the application link through other social media apps such as WhatsApp. One interviewee when asked why she like using the app, responded “… mfumo huu wa simu unasaidia kutangaza biashara yangu” (informal English translation: “the mobile app helps in advertising my business”).

Thus, the mobile app served as a marketing platform since customers view details of different products including ingredients, prices, and product usefulness posted by different producers before they decide to place an order. Moreover, the mobile technology application is suitable and accessible to all customers, including those partially or completely illiterate since it has been cocreated and codesigned taking this issue into account. To facilitate the interaction and use of the application by illiterate customers, a functionality for the women entrepreneurs to record sound to describe their products has been integrated. The users can access the recording functionality by clicking on an intuitive “sound” icon in the interface to record and save the description of their products in terms of usefulness to human health, ingredients, price, and how to communicate for delivery. Presence of the sound icon to the best of our knowledge makes the mobile application unique in the entrepreneurship domain since it has considered an important aspect of accessibility for those who cannot read and write, empowering them to use the interface in the same level and advantages as all other customers.

Likewise, the mobile technology application could empower women entrepreneurs who are shouldered with multiple responsibilities in their household by allowing them to do business at their own pace while handling societal responsibilities determined by societal structure in Tanzania context (Kapinga et al., 2017).
The application, which is hosted in the cloud, enables the collection of data from all users, and these data serve users with suggestions on where to sell (potential customers), what to sell, at what price, and when to sell. Thus, through the mobile application front-end, women entrepreneurs and their clients work together doing business online, enlarge electronic market by linking to new potential customers exposed to the brand at a time, and upload a new product into the application platform. Therefore, our mobile technology application, as reported by the participants, enabled women entrepreneurs to access market information ubiquitously and expand business network coverage to more customers.

4.3.2 Observed challenges of using the mobile technology application

During the codesign activities after the in the wild testing period of the mobile application, one participant of the study expressed also her dissatisfaction with using the app as follows: "... mfumo huu unakabiliwa na changamoto nyingi kama vile, gharama kubwa ya kununua vocha na kuchaji beti" (informal English translation: "the mobile application faces challenges of high price of airtime and battery charges").

During the wild testing period, the findings of the study show that the smartphones used by the participants lost battery fast especially after enabling mobile data usage to access the application data, which are hosted in the cloud. Therefore, this type of phone is not ideal for women entrepreneurs who have no reliable power supply sources as they require to be recharged more frequently. Furthermore, participants reported that the price of airtime (bandwidth) for internet is very expensive for a daily operation of the mobile application. The high price of airtime hinders many women entrepreneurs to keep the application functioning continuously and consequently sometimes this causes ineffective use of the artifact for business transactions. However, the costs of airtime due the presence of the number telephone operators are dropping constantly.

Likewise, during the in the wild testing period, the findings of the study revealed that the usage of the mobile technology application requires training prior real-life usage, especially for those who are not very familiar with smartphone operations. Training is of vital importance to women entrepreneurs to familiarize themselves with the different mobile technology app icons and their functionalities, in order to make it an effective gadget in accessing market information. Training could be costly to many (eg, acquiring an internet capable mobile phone), and so this challenge could hinder a large segment of women entrepreneurs in the food processing chain to use the mobile application in the business domain. Nevertheless, the decreasing costs of mobile devices and services combined with a suitable manual with detailed information regarding the use and functionalities of the app, in written and recorded voice formats, could alleviate this problem.

The lack of awareness about the importance of mobile phone in doing business and expand networks could also limit the usage of the application in the business domain for many women entrepreneurs. The participants of the study amplified that an awareness campaign on the use and benefit of mobile devices beyond maintaining social relations and communicate with relatives into ICT4D realm is imperative. These results and observations suggest that the wide intake of the mobile application might take longer time to cover a large segment of women entrepreneurs. It is expected, however, that many of these challenges will be resolved soon as the country develops quickly and the telecommunications bloomed rapidly with several mobile phone service providers.

5 DISCUSSION OF RESULTS

The research set out to implement a codesigned and cocreated mobile application in real-life setting for solving a targeted problem of accessing market information. Our research adapted DSR approach as holistic method of problem solving through an artifact, involving the end users in cocreation and codesign. The activities in DSR iterated between the relevance cycle of problem definition and requirements, the design cycle of construction of the artifact, its evaluation and subsequent feedback to refine the design further, and the rigor cycle of contributing to the knowledge based of the problem solution. The study contributes in understanding how to empower women entrepreneurs through extending the usage of mobile phones from social communication ties into ICT4D realm for the purpose of enhancing access to market information. Furthermore, our study has contributed to the knowledge base to academic audience as well as to the environment (practitioner audience). Additionally, the implementation of DSR in our study results also in inputs to the knowledge base through the incorporation of elements of participatory design into the DSR processes. Table 1 summarizes DSR knowledge contribution our study.

<table>
<thead>
<tr>
<th>Contribution Type</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design science knowledge</td>
<td>Nascent design framework and design principles extending DSR with elements of participatory design Situated implementation of artifact Combined methodology of DSR and cocreation and codesign (participatory design) Implementation of mobile marketing application</td>
</tr>
</tbody>
</table>

Abbreviation: DSR, design science research.
In the following, this section presents a discussion based on the themes of our study findings: (a) implementation of mobile application, (b) the DSR process and testing of the mobile application—demonstration, and (c) evaluation of mobile technology application. Furthermore, the section presents the lessons learnt from applying DSR extended with cocreation and codesign that contextualized the involvement of end users in the creation of a meaningful solution. Finally, future work and recommendations are presented.

5.1 Implementation of mobile app—description of the artifact

The research implemented a mobile app (artifact) to facilitate market information access by women entrepreneurs. The results revealed that the cocreated mobile technology app contextualized to Tanzanian women entrepreneurs in the informal sector facilitates the access to market information and their interaction with customer. In addition, by sharing the link of the mobile technology application with more people through WhatsApp, the women entrepreneurs expanded their market size by enlarging their customer base. A distinctive feature of the mobile application is the consideration to codesign and cocreate strategies that accommodate the needs of an illiterate group of the end users. This was achieved by incorporating a recording capability (represented by a sound icon) that allows to describe the products details in the native language, including how to use the product, the selling price, the product’s ingredients, and the benefit of the product for human health. This is a feature that is not present in other DSR efforts for creating mobile technology solutions for informal workers even when the illiterate group is large (see, for instance, Mramba, Tulilahti, & Apiola, 2016).

In respect to the feedback received from the end users involved in the evaluation activities, the participants in the focus group discussion asserted that “mfumo umetuwezesha kupata taarifa za soko za kwa urahisi zaidi” (informal English translation: “the mobile marketing app facilitated our access to market information more easily”). The codesigned mobile technology application enabled empowerment of women entrepreneurs by utilizing the gadget for accessing market information. The evaluation of the artifact in the wild field (3 weeks) by a selected group of women entrepreneurs and customers acknowledged that the mobile application is a real enabler to accessing market information and enhance our business network expansion; however, the price of airtime raised as the main obstacle for successful implementation.

5.2 Demonstration and testing of the mobile application

The demonstration of the artifact aimed at determining whether the artifact was developed according to the end user’s requirements and expectations. In our work, one of the purposes of the demonstration was to communicate ideas behind the artifact to the participants in their environment thereby proving the artifact feasibility. Requirements were determined so that there was a transformation of the problem into demands on the proposed artifact (Kapinga et al., 2017). The requirements primarily address the function and construction of the artifacts but also relationships to its environment. Functional requirements based on the problem addressed the needs and wants of the end users of our mobile marketing application. The main functional requirement for our application was to enable women entrepreneurs to enter information that allow customers to make decision of buying products or not. Functional requirements are very often specific to the situation at hand. Requirements pertaining to construction on the other hand, are often generic, for instance, that the system should be available on different platforms and be easy to adapt to changes.

During the training session (4 hours), the participants learned about different icons in a smartphone and their functions, how to download and install the cocreated mobile application and the functionalities of it. The training workshop was successfully conducted because of the presence of prerequisite skills and experiences of participants in using smartphone for social communication. Moreover, participants of the study agreed that the training workshop was easy to understand since they knew some of the applications in their phones, and how to download them, for instance. After the training, women entrepreneurs and customers were given 2 days to practice the usage of mobile application in real-life scenarios, while researchers and software engineers monitored the process. During this phase, participants managed to interact through the application by uploading products and placing orders. As a result of this preliminary testing, issues with an irresponsive camera icon for capturing the image of products to be uploaded to the application were corrected on the spot. After the preliminary testing, the end users tested the application in the wild for 3 weeks, providing constant feedback to researchers and developers on the usability and functionality of the app. Therefore, an artifact must be rigorously and thoroughly tested before released into field-testing along with relevancy cycle and rigor cycle hence calls for multiple iterations of the design cycle in DSR.

5.3 Evaluation of mobile technology application

The evaluation of the DSR project set out to determine whether the mobile app did fulfill the user requirements and could solve the explicated problem (Johannesson & Perjons, 2014, p. 137). The mobile app has fulfilled the defined requirements and solves the explicated problem of accessing market information and expanding business networks from the perspective of the end users. The mobile app can solve our problem of accessing market information because is contextualized to the needs of end users and customized in their native Swahili language.

The outcome of this project was a first working prototype for accessing market information application. The suggestions for improvement of usability laid a strong foundation for further development of the application. DSR resulted in deeper understanding benefits of cocreation and
codesign process in the form of unique experience that contextualized Tanzanian cultural aspects. Prior the implementation of this project, little was known, for instance, on the willingness of women entrepreneurs to participate in a codesign project, or on unknown issues that may hinder their participation, for instance, lack of awareness of the importance of mobile application in business domain or enrich the implementation of the project.

Nevertheless, several issues do restrict the wide intake and use of the designed artifact for women entrepreneurs’ business development. Many of Tanzanian women entrepreneurs do not have smartphones as per 2018, but they have Unstructured Supplementary Service Data (USSD)-capable “regular” mobile phones which does not support to download and install the application. Developing applications for USSD, a platform largely available to informal traders such as many women entrepreneurs, however, would restrict in improving business development since it is limited to text messages and voice calls and does not display pictures of a product as to attract customers in making sound decisions whether to buy or not (as does the codesigned marketing platform). Furthermore, the price of airtime (bandwidth) may restrict the effective use of the application for accessing market information. It was emphasized by one participant of the study that “matumizi ya kununua vocha ni makubwa hapa nchini” (informal English translation: “price/expenditure on airtime is high in our country”).

The results of our work also concur with the findings of Mpogole et al. (2008), which showed that the price of mobile phone use in Tanzania is more expensive than other East African countries. It is expensive in Tanzania and other Eastern Africa countries to manage mobile phone in terms of purchasing airtime (Kapinga et al., 2016), high cost of data bundles (Waithaka & Mnkandla, 2017). However, the costs of mobile phones and airtime are dropping rapidly because of the advances of technology and the blooming of telecommunication with several mobile phone service providers, and so it is expected that the smartphone will be commonplace in the very near future.

Smartphones have been changing the way that entrepreneurs access market information about better prices, potential customers, and the right distribution channel for the products (Aker & Mbiti, 2010; Mpogole et al., 2008). We expect that the implementation of the mobile app for women entrepreneurs for accessing market information and expanding business networks, which has been designed and evaluated rigorously through DSR, will result in significant enhancement of their business in the near future (see Figure 5 for a summary of the benefits and challenges of the demonstrated mobile application in our work). Furthermore, the mobile app was reported to provide added value to women entrepreneurs by increasing accessibility to customers anytime, anywhere. The application was also reported to increase product visibility whereby the application is used as a promotion platform, hence reaching more customers.

5.4 | Lessons learnt from cocreation and codesign

In many mobile application design projects, cocreation is seen as critical to success and a range of benefits are attributed to it. Cocreation has been defined as any act of collective creativity that is shared by two or more participants, whereas codesign is that collective creativity applied throughout the design process (Sanders & Stappers, 2008). Cocreation confers to a higher quality of system requirements, a higher system quality, a better fit between the system and users’ needs, and improving users’ loyalty (Steen et al., 2011). During cocreation in our work, women entrepreneurs and customers were involved in the design process and their experience and expertise as partners was central. Cocreation and codesign were then touted in all stages along the development and implementation process of the artifact, having the women entrepreneurs participating in the problem explication, the refinement and redefinition of requirements, as well as the evaluation the artifact (see Suero Montero & Kapinga, 2018). During cocreation in our work through the design process, women entrepreneurs were experts of their experience and played a large role in knowledge development (eg, what was important to develop and how), idea generation (eg, how to approach illiterate end users), and concept

---

3https://en.wikipedia.org/wiki/Unstructured_Supplementary_Service_Data
development (e.g., what functionalities are important to develop in the application). Participation at the moment of idea generation was very important in order to produce a contextualize solution suitable to solve the problem.

The integration of cocreation and codesign into DSR methodology facilitated the ICT4D contextualization process by highlighting the end users’ participation in the meaningful creation of a solution, which revealed a more sustainable sense of ownership and acceptance of the solution (see, for instance, Frow, Nenonen, Payne, & Storbacka, 2015).

We consider the development of mobile application is a powerful gadget of empowering women in doing business and fostering a millennium goal of sustainable development. The cocreation recognized end users as starting point partners of the joint experience, from the iterative definition of requirements, to the design and development of the artifact and to its demonstration and evaluation. Drawing from the experiences of end users with cocreation and codesign, one of the participants of the study said “kuwashirikisha watumiaji inasaidia kusambaa kwa mfumo kwenye soko haraka” (informal English translation: "involving end-users (in the development of the application) it takes shorter time (for the application to) spread to market"). Furthermore, another participant of study asserted that “kuwashirikisha watumiaji inasaidia kuwelewa mfumo vizuri na kukubalika na watumiaji” (informal English translation: "(this experience) can easily build brand awareness and acceptance by the (end-users)"). The cocreation and codesign strategy fostered end user’s commitment, innovative interactions, and adoptability of the designed artifact. Thus, in our experience, the codesign approach of cultivating idea generation from the end users as partners in development resulted into the uniqueness of the designed artifact, which is meaningfully contextualized rather than being imposed without considering the actual needs of the target group.

5.5 | Future work and recommendations

Although the developed application functions well, it is still comparatively simple and there is no rigorous quantitative evaluation that would ascertain the effectiveness of the application. Therefore, the results provide a basis for designing rigorous quantitative appraisal criteria for future projects in design science approach.

This project was executed by a comparatively small sample of women entrepreneurs and customers. Further testing is needed to include a larger sample of participants and to cover a larger geographical area. Also, to boost the benefits of the application to women entrepreneurs, integrating other stakeholders is of vital importance, for instance, business incubators, agricultural sector, industrial sector, and learning institutions that could improve women entrepreneurs’ business projections.

The study has focused on the design, demonstration, evaluation, and redesign of the artifact according to the feedback from the evaluation (Johannesson & Perjons, 2014, p. 77) through a codesign and cocreation process. Training workshop, field-testing, evaluation, and codesign meetings were carried out in the deployment and evaluation stages of the project. We advocate that the initiation of codesign and cocreation activities to build suitable ICT4D solutions and interventions should be brought into crosscutting sectors to leverage business development and empowerment of minority end users from different sectors, for instance, sector of business and technology incubators, Universities, R&D institutions, technology hubs, and business colleges.

Based on the results of the field study, the following recommendations are put forwards on meliorating challenges in developing economies using DSR:

- Wider expansion of technology innovation in business for Tanzanian women entrepreneurs to empower them from different dimensions and to enhance their livelihood.
- Implementation of DSR combined with cocreation and codesign within ICT4D, also involving different stakeholders including, for instance, technology hubs, technologists, and universities. This could be incorporated into a national development agenda for addressing real-life hurdles faced by society.
- Incorporation of cocreation and codesign process in teaching curriculum of different disciplines in higher education institutions (HEIs) to cultivate innovative skills and ideas in addressing real-life problems confronting society through the use artifacts in a given context.

6 | CONCLUSIONS

The study strived to cocreate and codesign a mobile app within a unified DSR framework and contextualized to Tanzanian women entrepreneurs to facilitate their access to market information for improving business performance and enhance livelihood. The findings of this study have shown that a mobile app could play a significant role in facilitating the access to market information and business networks expansion, if it is utilized effectively. Additionally, the mobile app was reported to have the potential to improve business by saving time and costs of traveling and searching for markets, as well as by fostering business network expansion through sharing the application with many end users.

Nevertheless, it has been noted that the high price of purchasing airtime for bandwidth, ownership of mobile phones that do not support internet, and lack of awareness of the importance of mobile application for business activities were the major challenges for women entrepreneurs in Iringa, Tanzania, to access market information through the mobile application.
REFERENCES


The ubiquitous mobile technologies use is changing how entrepreneurs interact with customers. With that background, this work seeks to facilitate women entrepreneurs’ (WEs’) empowerment within a developing patriarchal economy. A mobile marketing application to support rural WEs’ sharing of processed goods information was co-created and evaluated with them. This book presents strategies to empower this marginalised group implementing technological solutions contextualised to their specific needs.