

Mose: A Mobile Application for Women Street Vendors in Cape Town

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Abstract: Information and communication technologies make waves in developed and developing countries. However, lack of community involvement in the design and implementation often contributes to failure of technology projects. Our project envisioned a mobile application to enable women to form ad hoc cooperatives to sell on behalf of one another; enabling non-selling women to focus on other tasks. Through the lenses of the Sustainable Livelihoods Framework and the Technology Acceptance Model, we engaged with women vendors to learn of their lived experiences. Results showed they were hesitant to form groups with other women due to a lack of trust. The interaction and feedback from participants yielded incremental co-design and development of several iterations of a mobile prototype; resulting in a final modification to allow for standalone users, whilst also accommodating groups; with groups benefiting by lowering travelling costs by allowing group members to rotate days going to the market when trust materialises.

Keywords: Sustainable Development Goals, Information and Communication Technology for Development, Sustainable Livelihoods Framework, Technology Acceptance Model.

1. Introduction

From generation to generation women have been the subject of emotional, physical, psychological and many other forms of abuse. This trait is more prominent in African homes and especially poor African homes [1]. Despite women's contribution to society, they are still seen as inferior and the gender gap is large, especially in poor areas [1]. The evident gender discrimination and male dominance sometimes lead women into believing that they are powerless and results in them depending on a man to be the sole provider or decider of women's fate [1]. For example, in West Bengal where no woman had ever been a leader, 86% of parents wanted their daughters to become whatever their in-laws wanted, or to become a housewife [1].

Women's empowerment becomes very crucial, as it can improve women's self-worth and reduce the gender gap. In some African countries, males are the sole leaders on culture, religion, and politics [2]; and this violates basic human rights such as inclusion and non-discrimination [3]. Gender equality and women empowerment comprise one of the Sustainable Development Goals (SDGs) [4]; to promote equality and also bring another aspect of development [1], and the benefits can be carried over to the next generation [5].

Another factor that portrays inequality is the way men and women are expected to use their time [1]. Time is a scarce resource for women and studies have shown that in poor families males have more leisure time than women [6]. A study found that after electrification in South Africa, there was a 9.5 % increase in women's employment and no improvement in males. This was due to women's time being freed [1].

Statistics in Quisumbing *et al.* (1996) show that women in sub-Saharan Africa are responsible for 70% to 80% of food production, despite having little land and resources [7]. To develop and empower women, there must be constant favour towards them [1]. Since

women are less educated than men, they resort to trading as they cannot successfully compete with males in the formal job market [8]. The gender and poverty gaps are worse for those who are economically and (or) socially marginalised; especially those at the intersection of gender, race or ethnicity and class issues [9].

A study at the University of Zimbabwe that aimed to understand female students' learning experiences, in the context of their access to computer labs, found that the female-male ratio usage between October 2005 and March 2006 had a low of 7 females as compared to 8,293 males in November 2005 and a high of 19 females to 360 males in January 2006 [10]. Some females relied on male students for help, and some males resorted to pushing their way to computers, due to computer shortages [10]. The cost of devices has also greatly contributed to low uptake to the internet in African countries like South Africa, Rwanda, and Lesotho. Another contributor is a lack of awareness and(or) skills in ICT and its benefits [11].

These issues lead us to consider how to leverage Information and Communication Technology (ICT) to bridge the gender gap in a developing region in a way that addresses some of these concerns.

2. Objectives

Our project investigates women street hawkers/vendors and proposes an ICT mobile application for them that can be used to improve their everyday life as women street vendors. The project aims to leverage ICT for social development with women, specifically street vendors by developing an Android mobile application that would be used by these women to take stock and inventory for street vending. The objectives are to:

- Create a version 0 prototype and use it to inform and illustrate the vision of what the application is supposed to do and look like, to the participants;
- Collect feedback, concerns, questions, preferences, and suggestions from participants;
- Implement the suggestions and feedback in a new prototype; and
- Repeat the process, until an appropriate application is developed.

3. Related Work

A street vendor is someone who provides/sells goods to the public without a building/store or a solid structure from which to sell [8]. There are two types of street vendors, stationary and mobile. The first being those that have a space in the street (public/private) that they occupy and the latter being those that move from place to place pushing their carts or carrying their baskets (to get more profit and variety of clients). Each can sell different commodities ranging from food (dominated by women), craft, hardware, fruits and others [12]. There is little to no regulation and protection in the informal space [8] [12], which leads to some authority figures and gangsters taking advantage, and demanding a monthly payment of the space occupied by vendors [8]. A study on street vendors in Asia found two main reasons why income of women vendors was lower than that of men in India [8]: 1) most women came from poor families that were poorer than those of male vendors; therefore the capital invested in their business was less; and 2) women had other responsibilities at home, requiring them to leave the market earlier than male vendors [8]. Women were also even harassed in cities like Kolkata, for being in the street/sitting on the pavement [8].

In some African homes, trading is viewed as an extension to a women's domestic and reproductive role [12]. In South Africa, vendors can earn between R600 to R800 per month [12]. A case study on six African countries, Zimbabwe and South Africa included, found that street vending is becoming a source of income for urban dwellers and increasing

rapidly but despite the increase, local and government authorities are not taking count/records of street vending's contributions towards the economy [12].

There are still many countries where street vending is viewed as an underground activity and considered illegal [13]. Many are arrested or their products are taken by law enforcers [8],[12]. There is nothing that they can do considering that they are poor, uneducated and unemployed [13]. Permits and formalized vending can help improve the confidence, respect, and lives of street vendors [13]. This is where associations come into play and make a huge impact, in South Africa, there are different unions; some that help women in buying in bulk, storage and training; and other unions that help with the negotiations, e.g., Self Employed Women's Union (SEWU) negotiated with Durban's central council [12],[14], to improve water supplies, toilets, and child care facilities for women. It is quite an achievement considering that vendors from some countries have not reached such levels of negotiations [12].

The gender gap in everything is huge, and this includes the gap of women in ICTs too. In Guinea and Djibouti, less than 10% of Internet users are women and in India it is less than 25%. Women also use technology less than men [15] and are regarded as 'Technophobes' [16]. They also tend to have negative attitudes towards computers [16] [17], less knowledge, fewer skills, less experience and lack of training in ICTs [16][10] and computers in general as compared to males who enjoy spending time using computers [16]. In a study done in Flanders, Belgium, data collected from 1058 participants showed that 72.6% of women considered themselves behind when it came to technology, compared to 61.0% of men [16]. In an e-Health study in Bangladesh, using the unified theory of acceptance and use of technology model (UTAUT) with gender as a moderator, it was discovered that males were influenced by perceived usefulness to use technology whereas women were influenced by perceived ease of use [17], which is the extent to which a person believes that the technology will increase their job performance [18].

A patent for an architectural design for physical inventory application software was published in 2007 [19]. In the application, multiple process components interact with each other through an interface. The process components include an Accounting process component, for recording business transactions, Physical inventory that uses counting operations to count inventory and a process that confirms inventory changes [19].

4. Methodology

4.1 Theoretical and Conceptual Frameworks

Many theories examine and define the 'D' in ICT4D yet it is still very hard to conceptualize it, as the 'D' means different things to different people, and also depends on where it is being applied e.g. agriculture, health, etc. There are often arguments about what the 'D' in the ICT4D means [21]. Avgerou states that development depends on the context and it can be measured using different metrics, qualitative and (or) quantitative [22]; whereas Kleine used the Sustainable Livelihoods Framework (SLF), which states that poverty is not only an outcome of lack of material resources but involves interconnected factors like physical weakness, vulnerability, and powerlessness [23]. The women targeted in the project were vulnerable mainly because of their social status. By using the SLF, we can analyse and understand the factors that affect women vendors' livelihoods and their relationships. The framework was used to plan the development of the new activity (Mose Application).

Figure 1 shows how the SLF was used in the context of women street vendors in Cape Town.

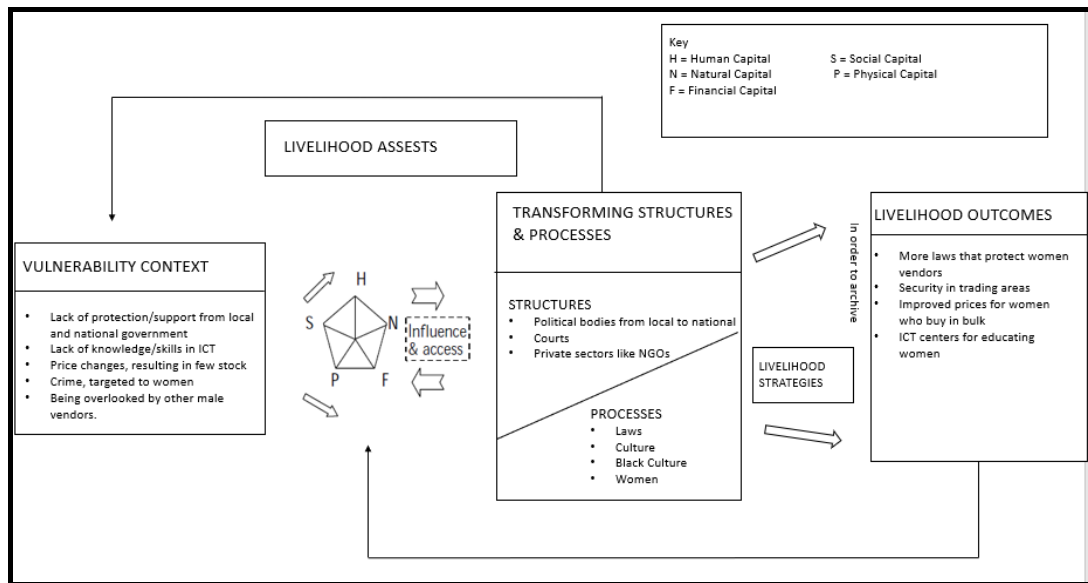


Figure 1: Sustainable Livelihoods depicted in the context of women vendors, adapted from [24].

The Technology Acceptance Model (TAM) was used to structure questionnaires in the face-to-face meetings, on how users came to accept and use technology. It proposes that different factors influence a user's decision into adopting and using technology [18]. The model was used to structure questionnaires in such a way that allowed us to understand the external variables that were influencing the participant's perceived usefulness (PU), the extent to which a person believes that using a particular system would increase their job performance; perceived ease-of-use (PEOU) which is the extent to which a person believes that using a particular system would require no effort (easy) and their overall attitude towards using the system (in this case the Mose Application) [18].

4.2 Research Ethics

The minimum ethics guideline was utilised as a checklist during the period of the research and interaction with participants [25]. There was full disclosure of the researcher's intentions and how participants could help in the research and a consent form was provided for each participant to sign (these were translated into English, Afrikaans, and isiXhosa). This all helped in building respectable relationships with participants and it also kept the researcher in line.

Some risks could not be predicted, however, e.g., the researcher tried to minimize some by meeting and interacting with participants at a safe place during the day. From the viewpoint of amplification theory [26], there was a possibility that the application could cause disruptions in households whereby husbands would want to monitor incoming money from the market, as the application will log the total amounts obtained after-sales. The application could amplify the controlling nature, insecurity and the "what I say goes" mentality in other men. This was one of the identified bad unintended consequences, that can occur, but not to ignore other possible consequences too [26].

4.3 Questionnaire Design and Data Collection

A structured questionnaire was used to obtain information/data that is important in understanding the participants' background, views on ICTs, co-operatives and other information relevant to the research. The questionnaire was divided into three parts: Part A contained demographics, e.g. age, marital status, education, phone usage frequency and levels of knowledge of ICTs; Part B contained questions regarding different aspects of being a street vendor, community and daily navigations to and from the market; and Part C contained questions that helped the researcher in understanding the participants PU, PEOU

and attitudes towards using the application (this was after showing participants prototype v0). Information on how participants wanted the app to look like and any additions were gathered.

Questions were read out loud and clear to participants, and responses were either written down or recorded (per participant's consent). The feedback was then used to develop prototype v1. The interaction with participants was face-to-face with the first meeting being 30 minutes but the meeting time was reduced to 15 minutes in all the following meetings as less time was required for the interviews. Selective sampling was used to identify participants due to traveling costs. The researcher resorted to selecting participants based on the areas that could easily be travelled to without spending a lot of money, e.g. vendors at nearby train stations, and vendors located at a central place like Cape Town's taxi rank and (or) train station.

After women had voiced their discomfort in using the app as a group, the following meeting had questionnaires that were structured using TAM with a specific interest in women's PU and PEOU, of Mose application having an option for single users as compared to the group usage. The development of v2 prototype was a result of the feedback received from women being uncomfortable with other women handling their products and their money.

In the meeting that concluded the interviews, the researcher presented a coded version of the Mose application to the women so that they could get a feel of it on their respective phones. The researcher showed them how to use the mobile app, some women admitted to not being able to use the app but given time (a day or three) they would be able to, considering that they understood the language used on the app.

5. Results

A total of seven participants were interviewed, with their ages ranging from 32 to 49 years. Two out of seven had 1 child while others had two or more children. There was an average of 6 days a week that each woman went to the market. Two women (one being a divorced, single mother) were the only sole providers of their household, on a street vending income of R2,000 - R5,000 per month, whereas the other women had husbands that acted as primary providers and also earned R2,000 - R5,000. Out of the seven participants, 3 women had more knowledge on how to use ICTs besides the majority usage, which consisted of WhatsApp, calls, text, and Facebook. The average time spent by each woman on her phone was 3 hours. Five of the seven participants were hesitant to try the co-operative application (Mose Application), due to a lack of trust in other people handling their products and counting on them to return their profit. After a step-by-step demonstration of the app and explaining how it handles data non-repudiation, they were willing to try it provided that they were taught how to use the application and guaranteed that it would not use their mobile data. Another woman was hesitant to use the app mainly because of the prominent criminal activities found in her place of trading, as she could easily be robbed of her mobile device.

For v2 prototype, women responded positively to the app having an option of one user or group. The previous hesitation of coming together with other women became less, however, the women's PEOU was low as they thought it would take them 1-3 days to learn how to use the app on their own.

For v3, the coded version of the app was installed on each woman's mobile device. They were amazed to see what was once theory come to life in an application that they could use with their own hands. The researcher had to demonstrate how to use the app more than once e.g. login, logging products, capturing product images and adding a product to the sold list first before they were comfortable using the app on their own.

5.1 Prototype design

The researcher knew that to create an appropriate application a close relationship with the participants was imperative and it should be of low cost with appropriate user interfaces [18]. Figure 2 below shows how the app evolved, from prototype v0 (drawn prototype) to v3 (coded prototype), with the screen depicting how to add a product and capturing the product image.

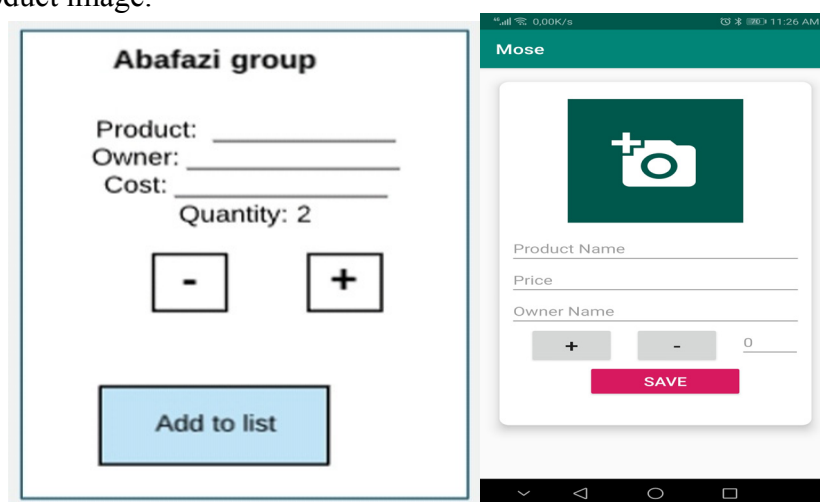


Figure 2: Side by side images of prototype v0 (left) and prototype v3 (right).

6. Resulting Design

Toyama [26] noted that most projects fail because they are not designed using the right context. You must account for poor infrastructure, have a close relationship with participants, and an application should meet local needs [26]. With this in mind, a close relationship with participants was put into place, co-designing the application (through questionnaires) and appropriating the languages used in Cape Town (isiXhosa, English, and Afrikaans, for those that only know their mother tongue.) [26]. The application is run offline, with a local database. Women can easily install the app on their mobile phones.

Allowing the database to be local and one member to remove or add items in the database removes some of the hurdles that come with databases, like locks and race conditions [27].

Knowing that technology amplifies human forces, security/constraints (login and register) options were added on the app reducing the risk of someone getting their hands on private financials. Also, a page that captures deletes and updates (data non-repudiation) was added to the application and this reduces the risk of group members tempering with another member's products and profits.

The app was designed in such a way that data sharing between users is possible via Bluetooth or WhatsApp in the form of Excel or pdf. Rodden *et al.* (1992) show that sharing information in cooperative applications is essential as this brings about the common goal of the co-op [28].

Other design factors included aesthetics (colours, fonts, and perceivability of icons), help sections, which the researcher co-designed with participants and hearing their preferences. Android Studio with Java and SQLite was used to code the app, since all participants have Android phones and to cater for different Android versions, minimal animations were used, as some participants have low Android versions (lowest was Android version 4.4).

The fragments and interface remained the same from v1 to v3, the fragment for "My Totals" is dedicated to a user who prefers to use the app alone, and the fragment "Total Amounts" contains amounts that belong to all group members. With the final prototype

users had the option/choice of using the app however they see fit or are comfortable with (single or in a group).

7. Conclusion and Future Work

The success of the project relied on the involvement of participants from the beginning. Co-designing and developing the application with participants yielded favourable outcomes, as the participants learned how to use the app during the co-design process, influenced the creation of something they could use and the researcher assessed their PU and PEOU in early stages. After interacting with seven participants, it showed that they mainly used Facebook, WhatsApp, text, and calls on their devices with the average woman spending an average of 3 hours per day on their phone. The idea of an ad-hoc co-operative was received negatively, as women had trust issues with someone handing their products and also had concerns in relation to trusting them to bring back the profit on sales. As a result, a choice of using the app as a single user was proposed and additional security features were implemented (data non-repudiation). As a result their attitudes changed slightly and they became open to using the app. Perhaps one day the women may move toward using the ad-hoc group features that would indeed free some of their time to work on other chores or interests besides physically going to market.

Reflecting on the iterative co-design process, we note that by starting with a pre-conceived notion that groupware would be a solution, we became aware of our desire to ‘push’, no matter how gently, our view upon these women to empower them and help them improve their ICT skills. We learned that our intent, no matter how good or well-informed, should not be the reason for researchers to push a preconceived agenda on women, as this can interfere with them adopting the ICT mobile app into their everyday lives. Many underlying factors contribute to women not wanting to use ICTs and (or) the Mose Application, and these include valid reasons that include, yet are not limited to lack of knowledge, skills, security fears and being targeted by criminals. These should be viewed as asset-thinking for carrying out co-design (as opposed to deficit-thinking) and can be uncovered by genuinely trying to understand participants using genuine co-design that respects women’s lived experiences. Culture also plays a big role in how technology is adopted and used; therefore, it could be highly beneficial to use culture as a moderator in the model [29].

Implementing such a project requires a vast amount of patience, resources/workshops to educate and inform the targeted women on the benefits of ICTs in their daily marketing lives. The limitation of the method applied is the small sample size and short time allocated to complete the project. The female participants (n=7) are not and cannot be viewed as a statistical representation of all women vendors in our area. We also completed this project over a span of only four months. We feel that if we had more time, and involved more women, we could see some variation in our results and improve the Mose application. What would be most beneficial is to see and iterate Mose in action, and learn from actual usage and more feedback of new lived experiences, this time with the app, could lead to the trust necessary to realise our original goal of ad-hoc groups of women vendors; or to let the goal's needle be moved by the women, grouped or not. If grouped, then women can partake in other tasks e.g. going back to school, find other means to earn money and (or) relax. Societal benefits are also expected, as more women will be introduced and will partake in the ICT space, our society will grow and improve (knowledge, skills, reduced digital gap) as we are as strong as our weakest person/group.

References

- [1] E. Duflo, “Women Empowerment and Economic Development,” *Journal of Economic literature*, vol. 50, No. 4, pp. 1051–79, 2012.

- [2] Oduyoye, Mercy A., and Musimbi RA Kanyoro, eds. "The will to arise: Women, tradition, and the church in Africa" *Wipf and Stock Publishers*, 2005.
- [3] G. Theory and R. T. Hare-mustin, "The Meaning of Difference: Gender theory, postmodernism and psychology", *American psychologist*, vol. 43, no. 6, pp. 455–464, 1988.
- [4] General Assembly, "Sustainable Development Goals," Transforming our world: the 2030., 2015
- [5] K. Michael, "Women and development in Africa: How gender works", Second Edition, Lynne Rienner Publishers, 2004.
- [6] M. Buvinić and M. Buvinic, "Women in Poverty: A New Global Underclass," *Foreign Policy*, no. 108, pp. 38, 2006.
- [7] A. R. Quisumbing, L. R. Brown, H. S. Feldstein, L. Haddad, and C. Peña, "Women: The Key to Food Security," *Food Nutrition Bulletin.*, vol. 17, no. 1, pp. 1–2, 1996.
- [8] K.S.Bhowmik "Street Vendors in Asia : A Review," *Economic and political weekly* , vol. 40, no. 22, pp. 2256–2264, 2019. <https://www.jstor.org/stable/4416705>
- [9] After Access: The State of ICT in South Africa: <https://researchictafrica.net/2018/09/10/state-of-ict-in-south-africa/>
- [10] A.Nakafeero,et al, "African women and ICTS: Investigating technology,gender and empowerment.", Zed Books Ltd., 2013.
- [11] After Access, Africa Comparative Report: <https://researchictafrica.net/2019/05/16/after-access-africa-comparative-report/>
- [12] V.W.Mitullah, "Street vending in African cities: A synthesis of emperical finding from Kenya, Cote d'Ivoire, Ghana, Zimbabwe, Uganda and South Africa", '05 *World Development Report*, 2005.
- [13] V. Falla and A. Maria, "Legal Empowerment of Informal Workers Formalizing Street Vending as a Tool for Poverty Reduction Vargas Falla, Ana Maria," *In K.Dahlstrand Edition.*, 2016.
- [14] C. Skinner and I. Valodia, "Local Government Support for Women in the Informal Economy in Durban , South Africa," *International Journal of Politics, Culture and Society* vol. 16, no. 3, 2003.
- [15] J.N.Hafkin and S.Huyer, "Women and Gender in ICT Statistics and Indicators for development," *Information Technologies & International Development*, vol. 4, no. 2, pp. 25–41, 2008.
- [16] A.Broos, "Gender and Information and Communication Technologies (ICT) Anxiety: Male Self-Assurance and Female Hesitation," *CyberPsychology & Behaviour* vol. 8, no. 1, pp.21-31, 2005.
- [17] M.Hoque, B.Y.Rakibul and S.Golam, "Investigating factors influencing the adoption of e-Health in developing countries : A patient's perspective," *Informatics for Health and Social Care*, vol. 42, no. 1, May, 2018.
- [18] F. D. Davis, "A technology acceptance model for empirically testing new end-user information systems: theory and results," *Doctoral dissertation, Massachusetts Institute of Technology*, 1985.
- [19] S. Alfandary, J. Hirth, W. Wilmes, J. Freund, S. Kaetker, G. Moosmann, and P. Latocha "Architectural design for physical inventory application software." *U.S. Patent Application* No. 11/322, 973, filed July 26, 2007.
- [20] I. M. Thies, "User Interface Design for Low-literate and Novice Users : Past , Present and Future." *Foundations and Trends in Human-Computer Interaction* vol. 8, no. 1, pp.1-72, 2015.
- [21] A. Dearden and W. D. Tucker, "Moving ICTD Research Beyond Bungee Jumping: Practical Case Studies and Recommendations", *IEEE Technology and Society Magazine*, vol. 35, no. 3, pp. 36-43, 2016.
- [22] C. Avgerou, "Discourses on ICT and Development," *Information and Technologies & International Development.* vol. 6, no. 3, pp. 1–18, 2010.
- [23] D. Klein, "ICT4WHAT? — Using the choice framework to operationalise the capability approach to development.", *Journal of International Development*, vol. 22, no. 5, pp. 674-692
- [24] R. Duncombe, "Using the Livelihoods Framework to Analyze ICT Applications for Poverty Reduction through Microenterprise," *Information and Technologies & International Development.*, vol. 3, no. 3, pp. 81–100, 2007.
- [25] A. Dearden and D. Kleine, "Minimum ethical standards for ICTD/ICT4D research," Sheffield, UK: C3RI, Sheffield Hallam University / SIID University of Sheffield. 2018. <https://ictdethics.wordpress.com/>
- [26] K. Toyama, "Technology as amplifier in international development," *Proceedings of the 2011 iConference.ACM*, pp. 75–82, 2011.
- [27] U. Varshney and R. Vetter, "Mobile commerce: Framework, applications and networking support," *Mobile networks and Applications*, vol. 7, no. 3, pp. 185–198, 2002.
- [28] T.Rodden, J.A. Marinani and G. Blair "Supporting Cooperative Applications," *Computer Supported Cooperative Work (CSCW)*, pp. 41–67, 1992.
- [29] L.Irani, J. Vertesi , P. Dourish, K. Philip and R.E. Grinter "Postcolonial computing" *In Proceedings of the 28th international conference on Human factors in computing systems -CHI 2010*, pp. 1311, New York, USA: ACM Press, 2010.