PROCEEDINGS

2018 IFIP WG 9.4 European Regional Conference on the Social Implications of Computers in Developing Countries

Digital Innovation for Sustainable Development

Editors

Endrit Kromidha, Tim Unwin

22-24 June 2018, Tirana, Albania

Kromidha, E., Unwin, T., (eds.) Proceedings of 2018 IFIP WG 9.4 European Regional Conference on the Social Implications of Computers in Developing Countries - Digital Innovation for Sustainable Development, 22-24 June 2018, Tirana, Albania.

Independent Network Publishing
ISBN: 978-1-78926-343-5

London, United Kingdom
Tirana, Albania

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Distribution:

#IFIP94EURO18

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Conference Programme

Day 1: 22 June 2018

10:30: **Registration opens** (First floor foyer for the breaks and Blue Room for all sessions)

11:00 – 11:15: **Opening: Endrit Kromidha**, **Conference Chair**

11:15 – 13:00: **Keynote workshop: Publishing in International Journals and Paper Development Workshop**

Key Speaker and Chair: Robert Davison, IFIP WG 9.4 Chair and Professor of Information Systems at the City University of Hong Kong

Agent Provocateur: Tim Unwin, UNESCO Chair in ICT4D at Royal Holloway, University of London, Programme Co-Chair.

13:00 – 14:00: **Lunch**

14:00 – 15:45: **Paper session: Policy and ICT infrastructure for empowerment**

Chair: Kozeta Sevrani, Professor of CS and MIS, Head of the Department of Mathematics, Statistics and Applied Informatics at Faculty of Economy, University of Tirana, Albania

Abdulrashid Iliya: Mobile Phone Use for Empowerment – A Critical Realist Ethnography Study of Women with Disabilities in Nigeria

Kondwani Thangalimodzi: E-transactions and cyber security reform in Malawi: Implications for e-government

Priyanka Pandey: mHealth outcomes for community health workers – A capability perspective

15:45 – 16:15: Coffee break

16:15 – 17:45: **Paper session: Digital innovations for development**

Chair: Petter Nielsen, Associate Professor in Information Systems, University of Oslo

Boikobo Tlhobogang: Review and Analysis of ICT4D Project – A Case of Telecentres in Botswana

Magnus Li: Mediators to Advocate and Facilitate End-User Participation in Digital Innovation

Terje Sanner & Petter Nielsen: Digital Innovation and the Development Dynamics of ICT4D Projects

17:45 – 19:00: **Free time**

19:00 – 20:30: **Networking reception – Tirana International Hotel hall**

Day 2: 23 June 2018

09:00: **Registration and Opening**

09:30 – 11:00: **Keynote Panel: EU Integration and ICT Challenges in Albania and South-East Europe**

Mirlinda Karcanaj, General Director, National Agency for Information Society in Albania

Irena Malolli, Director of Infrastructure Projects, Ministry of Infrastructure and Energy

Erton Graceni, Executive Director of PROTIK – ICT Resource Centre Albania

11:00 – 11:30: **Coffee break**

11:30 – 13:00: **Paper session: Education for Development – New Approaches Tools and Models**

Chairs: Valentina Ndou, University of Salento; Mirjeta Beqiri, Gonzaga University; Blerta Dragusha, University of Shkoder

Agim Kasaj: Students behaviour intention and continuous use of Moodle in Albania

Valentina Ndou: Entrepreneurial Education for Boosting Local Innovation

13:00 – 14:00: **Lunch**

14:00 – 15:30: **Paper and demo session: Equality and safety issues with digital innovations**

Chairs: Tim Unwin, UNESCO Chair in ICT4D and Paul Spiesberger, Technische Universität Wien

Paul Spiesberger: Engineering Consequences of Mobile Systems Technological Constraints in Developing Countries Exemplifed by Mozambique

Kutoma Wakunuma: Hey women can play dirty too! Social media Building and Construction – A tale of empowerment in the developing world

Sirkku Männikkö Barbutiu: A Facebook Account of Ones Own

15:30 – 16:30: **Free time**

16:30 – 21:30: **Tirana tour and gala dinner –** Visit Bunkart 2, an underground bunker made to protect the Ministry of Interior staff during communism. Traditional Albanian dinner at restaurant Era Vila.

Day 3: 24 June 2018

09:15 – 09:30: **Opening**

09:30 – 11:30: **Paper session: Digital Technologies and International Crisis**

Chairs: Silvia Masiero and M. N. Ravishankar, School of Business and Economics, Loughborough University, UK

Faheem Hussain: Beyond Bullets Challenges and Aspirations of Rohingya Refugees in the Digital Space

Mette Von-Deden: Hopeful lives in uncertain spaces Exploring information practices of undocumented migrants living on the margins of society

PJ Wall: Mobile Health Innovation in Sierra Leone – A Critical Realist Study

Silvia Masiero: Reducing Information Poverty under Crisis – A Study of Ushahidi

11:30 – 12:00: **Coffee break**

12:00 – 13:00: **Closing panel: Robert Davison, Kozeta Sevrani and Tim Unwin**: Future vision for sustainable innovation and regional development

13:00 – 14:00: **Lunch**

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Keynote Speakers

Professor Robert Davison

Professor of Information Systems at the City University of Hong Kong

Robert is currently researching on Knowledge Management and Collaboration in Chinese firms, and the Chair of the IFIP WG 9.4. He has published over 200 articles in a variety of journals and conferences, and his work has been cited in excess of 6500 times (H=41).

In a **Publishing in International Journals** keynote Robert will open up the black box of publishing from the perspective of an Editor in Chief of two very different journals: the AIS Basket of 8 "Information Systems Journal" and the niche "Electronic Journal of Information Systems in Developing Countries".

Dr. Mirlinda Karçanaj

General Director of the National Agency of Information Society (NAIS) in Albania

Mirlinda graduated the Faculty of Natural Sciences, in the Department of Computer Sciences, where she also completed her Master of Science and PhD in Informatics. Her research fields include: digitalization, systems interoperability, centralized online services, concerns and solutions regarding information infrastructure, electronic payment and electronic governance in Albania. Her work has been presented in a number of national and international conferences, as well as Albanian and foreign scientific journals.

Mirlinda will talk about **ICT innovations: e-Albania, the unique e-government portal**. The portal currently provides more than 570 electronic services, out of which 120 e-services bear legal value due to the e-seal or e-signature. The portal has acted as a robust catalyst in decreasing queues in public agencies' front desks, reducing corruption and bureaucracy, providing citizen equality, decreasing service obtainment time and promoting government transparency.

Erton Graceni

Executive Director at Protik Innovation Center in Albania

Erton holds a master's degree in Business Management & Technology from the Sheffield University, UK and a bachelor degree in Information Technology. He has completed an Executive MBA in General Management & Leadership Development at the Harvard Business School. During his professional experience he worked as a consultant for several governmental and international organizations such as the World Bank, the World Health Organization, UNDP, the Office of the Prime Minister of Albania, etc.

Erton is very much involved in activities which aim to improve business and social performance of young entrepreneurs in Albania. He will discuss about **Challenges for Young Entrepreneurs in Albania: The role of Society, Universities, the Government and the Private Sector on the Development of Innovation and Entrepreneurship in Albania.**

Irena Malolli

Director of Infrastructure Projects, Ministry of Infrastructure and Energy in Albania

Irena graduated as an Electronic Engineer in the Faculty of Electrical Engineering in Tirana Polytechnic University in 1991. She holds a Master degree in Telecommunication and Information Engineering, as well as an MBA degree. Actually she is a PhD student in the Faculty of Economic. She has a long experience in the telecommunication and ICT field contributing in the regulatory and policy-making topics and also in the development of e-government and ICT strategy and legislation. Her research fields include data traffic management and pricing policies, ICT developments, e-government etc. Her work has been presented in a number of national and international conferences, as well as Albanian and foreign scientific journals.

Irena will talk about **Digital Integration in the South Eastern Europe Countries**. Digital infrastructure, broadband development, harmonization of spectrum policies for 5G networks are part of common commitments under Multiannual action plan of Western Balkan Countries adopted in Trieste Summit on July 2017. Speaking about innovation through ICT she will focus on Internet of Things and 5G networks challenges in Albania and in the region.

Conference Committee

Conference Chair: Endrit Kromidha, University of Birmingham

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Kozeta Sevrani, University of Tirana

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Irena Malolli	Ministry of Infrastructure and Energy, Albania
Silvia Masiero	Loughborough University, UK
Petter Neilsen	University of Oslo, Norway
Devinder Thapa	University of Agder, Norway

Mobile Phone Use for Empowerment: A Critical Realist Ethnographic Study of Women With Disability in Nigeria

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Keywords: Critical Realism, Disability, Ethnography, Empowerment

1. Introduction

This research focuses on how mobile phone use can empower women with disability in a developing country such as Nigeria. Information and communications technology (ICT) has been shown to have positive impacts on women's empowerment (Hoan, Chib, & Mahalingham, 2016). The use of ICTs by women have improved their income growth, marketable skills and work efficiency (Maier & Nair-Reichert, 2007). Specifically, the mobile phone has emerged among other ICTs as an important instrument for women's empowerment and poverty reduction (Bhavnani, Chiu, Janakiram, Silarszky, & Bhatia, 2008). Mobile phones can empower women by improving their social network status, increase their awareness and their socio-economic development opportunities (Islam & Slack, 2016). However, research on the use of mobile phone to empower women with disability has received no attention in the information systems domain and ICT4D (Walsham, 2017). In this context, Disability refers to a diverse group of people who have significant limitations in functioning and often experience exclusion from participation in their societies (Krahn, Walker, & Correa-De-Araujo, 2015). To contextualize the issue understudy, we detailed the need for this research in the form of problem statement of the research, which will be discussed next.

2. Research Problem

The predominance of people with disability (PWDs) is on the rise, as such it is imperative to address the issues facing PWDs and eliminate the barriers that stop them from participating in economic, social, political and personal choices. Arguably, women with disabilities face widespread discrimination; are denied their rights and severely marginalized within the society. The UN convention on the rights of people living with disabilities guarantees equal access to health care, social and economic activities. Yet, PWDs are marginalized and excluded in many developing countries (Mitra, Posarac, & Vick, 2013; WHO, 2011) including Nigeria. This shortcoming leads to, for example, people with disabilities usually achieving lower levels of education, poorer health, less economic achievements and high poverty rates than people without disabilities (Barnes, 2012; Mitra et al., 2013; WHO, 2011). However, research has not yet addressed how mobile phone use can empower women with disabilities in a developing country like Nigeria. Following the call by researchers for theory

development in the IS domain (e.g. Chiasson & Davidson, 2005; Markus & Saunders, 2007; Orlikowski & Iacono, 2001) and especially in ICT4D field (Avgerou, 2010; Heeks, 2006), this research seeks to develop a theory that can explain how mobile phone use can empower women with disability in Nigeria. In order to address this problem, a critical realist approach will be adopted with the aim of unveiling the underlining mechanisms that affect disabled women from using mobile phone to achieve empowerment. Critical realism is adopted in order to identify and investigate the deep causal structures rather than the empirical events of what we see (Mingers, Mutch, & Willcocks, 2013).

3. Research Questions

This study plans to find answers to the research question: How does mobile phone use empower women with disability in Nigeria? This will be answered through the sub-questions below:

What are the effects of mobile phone use in empowering women with disabilities in Nigeria?

To understand the outcomes of mobile phone use on empowering women with disabilities in participating in social, political and economic environment.

What relationship must exist for such empowerment to occur?

To understand the relationship between women with disabilities and the use of mobile phone for their empowerment.

What generative mechanisms must exist to enabled disabled women to be empowered through the use of mobile phones?

To uncover the underlying causes that affect disable women from achieving empowerment using mobile phone.

4. Research Approach

To adequately answer the research questions, the critical realist ethnographic strategy will be adopted because little is known about the phenomenon. The choice and relevancy of methodology are guided by the ontological and epistemological assumptions (Archer, Lawson, & Norrie, 2013; Easton, 2010). Studying and understanding the use of mobile phone for empowering women with disability requires a rigor and broader methodology to ascertain it's in-depth. Thus, this research will adopt Ethnography methodology. Ethnography research methodology will be adopted to uncover the experiences and understandings of the research subjects. This is necessary to explain the relationship between individual agency and social structure (Porter, 1996). The study is a qualitative design study. A critical realist approach (Archer et al., 2013; Bhaskar, 2013) and Sen's capability approach will be adopted to deeply understand the phenomenon. Capability Approach is a framework for evaluation and assessment of individual well-being (Sen, 2014). In critical realism, the capability approach adopts social ontology, where individual capabilities are perceived as causal powers for an

individual to be as he is.

In critical realism, multi-method data collection is being advocated because it generates rich data that can uncover the causal mechanism in a given phenomenon. Data will be collected from disable women through Interviews and observations (Yin, 1994). However, in ethnographic research participant observation is the primary form of data collection (Fox, 2009) which this study will follow.

The data will be analyse using thematic analysis which is a method of organizing and defining data in detail by analysing and reporting the patterns in the data with the aid of Nvivo software.

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Students' behaviour intention and continuous use of Moodle in Albania

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Keywords: Moodle, E-leaning, UTAUT, Albania, Technology adoption, Education, Smart PLS.

1. Introduction

E-learning platforms have improved the efficiency in information dissemination and student-teacher-university collaboration. The students can access most of the teaching resources and activities 24/7 even without the need for a face to face contact with the teacher.

The adoption of e-learning platforms is a must for universities in Albania, in order for them to remain competitive and attract the best students. To gain the much-wanted benefits of e-learning technologies, the European University of Tirana (EUT) has implemented for the first time in November 2016 the UET LMS platform, based on Moodle. All students of the EUT are provided with this e learning platform access. The main functionalities available in the portal for students and teachers where: 1) resource sharing like files, folders, web links, wikis, 2) Activities like announcements, assignments, questionnaires, forums, 3) grades, 4) timetables, etc.

University invested its financial resources and time to develop the e-learning platform. So, it need to be aware of how this investment is used and develop right interventions, so the students use it and profit from this system. UET need to know what are the factors that predict the students' intention to use the UET LMS. The more intention to use UET LMS the student has, the more likely he or she will use it. The behaviour intention to use is a good predictor of actual use of the system [2]. The adoption of technology by users is one of the main well-known research field in information technology. One of the most widely used model is Unified Theory of Acceptance and Use of Technology (UTATUT) [3], based in the family of Technology Acceptance Model (TAM) [4] model. This study will identify and analyse the factors that affect the students' adoption of Moodle platform (UET LMS). It will analyse and discover the difference in their relative importance to student's intentions to use it.

2. Conceptual Model and Research Hypotheses Development

Many theories and models are developed to explain user's adoption of technology. The most used theories of technology acceptance model in individual level are those of the so called TAM family. In this study we use UTAUT [3] model as it is a unified adoption model of many other well-known models in the field. It predicting and explaining power is proved to be higher that other similar models in technology adoption [5]–[8].

3. Research model and Methodology

The research model we propose is adapted from UTAUT with an additional variable we believe are important in determining the student behaviour. The behaviour intention to use student portal is explained by 5 variables; performance expectancy, effort expectancy, social influence, facilitating conditions, trust in website. Intention to continue use the portal is explained by 2 variables: behaviour intention and trust in website.

A quantitative approach through a questionnaire was the main method to study the system adoption. In conjunction to that, some qualitative methods were used too through some unstructured interview with students and teacher in UET. Theoretical constructs were measured using validated items from prior research. Out of 1500 questionnaires sent, we received 227 valid responses from the students in 1month period by the end of the second semester, on June 2017. That was the last month of the second semester and it was six months that the UET LMS was available and functioning for all students and teachers. Females were 71.4% of respondents.

5. Results and Discussion

The research model was analysed by using Partial Least Square-Structural Equation Modelling [9]. We checked strictly the procedure of checking Composite reliability, Converged Validity and Discriminant Validity. We checked the results of loadings (Composite Reliability) and cross-loading (Converged Validity) of all items with their own constructs. Our model explains 45.7% of behaviour intention to use the UET LMS. The most relevant factor in predicting the behaviour intention is Social influence, which is not a commune result in adoption models. The other two predicting factors of BI are trust in website and Performance expectancy. The other hypothesised factors are not statistically important for Behaviour Intention (BI). Effort expectancy is a predictor of Performance expectancy, but it is not a predictor for BI to use the UET LMS. Our model shows a strong predicting factor for Intention to continue use (CONTU) of students to use UET LMS by 75.1%. The two factors predicting CONTU are BI and trust in website (TrustW), with BI being strongly more important than TrustW.

5. Conclusions

This study helps the universities to focus on important factors, like for example communicate more positive examples of UET LMS use to students by students. Enforcing more the use of the platform by teachers, and timely entering the information, as discovered in the interviews, will make the system more useful for students and increase their intention to use the system. Behaviour intentions itself is the most important factor in predicting the intention to continue use the portal. Also, the trust in the UET LMS website is very important for predicting the intention to continue use it, so the UET should invest enough people and money to keep the system always secure and available to students.

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Review and Analysis of ICT4D Project: A Case of Telecentres in Botswana

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Keywords: Telecentres, ICT4D, Critical Success Factors.

Through public and private partnership in Botswana, a developing country in Africa, is pursuing rural community development through telecentres. Access to information and communications technologies is regarded by the government as vital in the advancement of the quality of life in least developed area (Colle & Roman, 2003). The government has partnered with telecommunications companies and Postal Services Company and national libraries to run a one stop telecentres in rural communities. The centres termed Kitsong centres are run by the community under the support of the donor organisations. Kitsong which is a Setswana word means “Source of knowledge”, has come as a proper name fitting the ICT development since the main aim of the projects is to connect the community and to allow access to information which is expected to turn into usable knowledge for the community. The development of the communication technologies such as the internet has influenced the focus on telecentres as a tool of economic development (Townsend, Espitia, Jorge, & Lee, 2001)

The Kitsong Centre package usually includes a porta-cabin, computers, internet modems with simcards, printers, fax machine and general office equipment. The centre is also powered using solar powered electricity. At the time of conducting this research there were about one hundred and fifty Kitsong Centres countrywide. Every year during the celebration of the WSIS day, a Kitsong Centre is established in the hosting village and since the centre uses existing public infrastructure, access is easily achieved for local dwellers (Joseph, 2014).In this study we analyse the success of the telecentres in poverty alleviation using the Critical Success Factors approach.

The economic success of Botswana raises expectations on other developments such as ICT infrastructure, satisfactory customer satisfaction etc. The telecommunications infrastructure in Botswana is amongst the most modern and extensive in Africa. By the year 1994, Botswana has already completed a fibre optic backbone that linked main cities and served as a supplement to the microwave inter-exchange network (Mbarika, 2003). The small population of the country makes it ideal to achieve these social and infrastructural developments. Botswana has a projected population of 1,926.872 people in 2015 (Totolo, Renken, & Sey, 2015) Also the gradual increase in high education attainment among the general public in particular the public service also favour satisfactory customer satisfaction. Unfortunately service delivery and project implementation has been problematic to achieve in Botswana.

This paper seeks to analyse the impact, the success or lack of thereof of telecentres adoption

in Botswana by reviewing existing literature and using the author experiences and observations as a guide. Reports on telecentres in Botswana were perused and compared with extant literature to establish if certain attributes were found on the Botswana case. Telecentres in Botswana and the world over has been achieved through the collaborative effort of donor agencies which included partnerships between International Telecommunications Union, UNESCO and in some cases the Canadian International Development Research Centre (IDRC).

The Botswana government also embarked on the Sesigo Project which was aimed at computerizing and networking public and community libraries as well as building the capacity for library employees to serve in e-enabled environment across Botswana (Totolo, Renken, & Sey, 2015). Apart from the adoption of telecentres, the government is currently involved in facilitating e-governance process which is aimed at paving way for key steps to achieve knowledge society. People living in Botswana's rural communities are now beginning to access and make use of the ICTs to carry on with their daily activities such as education, business, leisure and even entertainment (Joseph, 2014). Telecentres can be considered some digital innovation and as captured by Roling, Ascot and Chege (1976), who concluded that innovation leads to inequitable development unless preventive measures are taken. The idea of telecentres is an innovating idea that can be reinvented according to the needs of the hosting community. The implementation and the adoption of telecentres also come forth as some innovation that involves multiple innovations (Roman, Winter 2003.

The critical success factors for the adoption of telecentres in Botswana include: 1) The liberalization of the telecommunications industry. The open market allowed expansion on communications networks and increased mobile network coverage. This leads to more ideas as seen by the success of the Nteletsa II project . 2) Sound Policies and Vision-Policies formulated includes the Universal Services and Access Policy (Telecommunications and Postal Services, 2016), Maitlamo which is the ICT Policy of 2004 and the Vision 2016 which has since been extended to vision 2036. These policies allowed the development agenda to be communicated and discussed effectively. For regulation the Botswana Telecommunications Regulatory Authority (BOCRA) was setup and the human resources development, the Human Resources Development Council (HRDC) was set up which lead to training of youth in computer science and IT related courses. Simple business models are another factor that makes Kitsong Centres and telecentres more successful than complicated business models. This is because usually the telecentres serves local communities who have limited purchasing powers. The revenue is generated from few activities while keeping the operating cost to a minimal for instance using already existing facility like Botswana Post Offices, the library, simple porter cabins powered using solar energy. The availability of technological equipment, organisation and governance, engagement of local champions, social space and mobility, partnerships and progressive attitude were identified as the critical success factors to the telecentre initiatives in Botswana.

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Beyond Bullets: Challenges and Aspirations of Rohingya Refugees in the Digital Space

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Keywords: Refugee, ICT, Migration.

1 Background

The primary focus of this research is to identify the key trends of communication in digital media space for Rohingya refugees in Bangladesh, who are one of the most persecuted populations in the world today. Since last August, 2017, more than 668,000 Rohingya refugees fled to Bangladesh to escape systematic violence by Myanmar's military and local militias. About 400,000 Rohingya refugees were already living in Bangladesh, having arrived over many years beginning in the early 1980s [1]. 50% of the Refugees are children and youth (ages 3-24) lack access to any kind of learning opportunities [2]. The refugees also do not have legal access to local communication channels, and primarily rely on face-to-face interaction for accessing critical information. The objective of this research is to address this gap. Based on the findings of this research and other refugee crisis experiences, the eventual goal is to develop a robust and replicable Digital Access to Information Framework for forcefully displaced population worldwide.

2 Research Method

Qualitative research in the forms of in-depth key informant interviews, focus group discussions (FGD), and expert elicitation will be conducted, primarily within the diverse groups of the refugee population in the most densely populated camps in Bangladesh, in the Cox's Bazar region. Some of the research questions to be used during this field research are: What are the major challenges related to communication and access to information (in traditional & digital spaces) for Rohingya refugees? What are the most reliable platforms for communication and information access for the refugees at present? Is there any digital platform in this list? What is the most popular platform for digital communication? For the initial research, 10 in-depth interviews (4 women, 6 men) and 2 FGDs (10 people in each session, equal men/women ratio) were conducted in the camps, which included general people, refugee leaders, and humanitarian service providers.

3 Initial Findings

3.1 Challenges in Digital Space

Majority of the respondents complained about not having access to enough and effective

information [3]. Only 21% have access to radio sets and over-the-air program contents are not customized for them [4]. Majority of access to mobile phones. However, the local network and signal strengths are very poor. Internet connection is very infrequent. Bangladesh Government also made it illegal for Rohingya refugees to have access to local SIM cards, thus making them vulnerable towards further exploitation and extortion for digital access. The research found that women are significantly marginalized in digital communication and are forced to rely on male family members or community leaders to communicate or having access to information.

3.2 Opportunities in Digital Space

Most of the refugee households have access to mobile phones and are using illegal Bangladeshi SIM, and some are still using SIMs from Myanmar. Many small mobile repair shops are being established by the refugees which are also being used as information and communication hubs, where refugees are exchanging audio-visual contents related to news and entertainment. Even with infrequent net access, some IP based voice messaging services (e.g., WhatsApp, Viber, etc.) are found to be hugely popular for communication and information sharing (and a source of spreading fake news as well). There are hundreds of safe spaces constructed by different NGOs to provide counseling, healthcare, and limited education services to Rohingya women, children, and adolescent girls. Moreover, the local FM stations are using a hybrid solution of mobile telephony and low power FM to broadcast localized programs for the Rohingyas.

4 Future Plan

These places, along with the existing makeshift mosques (equipped with microphones, speakers, solar panels) can be connected to provide coordinated information services for the refugee population. Viability of establishing a Knowledge Network for the displaced population empowered by offline browsing and 4G-radio for education can assessed. Barefoot Social Network that interfaces with local opinion leaders and ensures participation of the marginalized groups (women, children, adolescent girls and boys, etc.) can be established as well. Education related solutions using offline-online digital contents on life skills, STEM, teacher training, and humanitarian work can be offered via the proposed low-tech social network. This research plans to focus on the use of mobile phones and Internet by the Rohingya refugees, and majority of this group are either youth and women. Maitland et al. already depicted similar stories about the Syrian refugees [5], but for the Rohingyas, there has been no systematic studies till now. The findings from this work can add valuable insights to the already established domain of ICTD for migrant and refugee population.[6]. Furthermore, in near future, the plan is to adopt a critical realist approach within ICTD for this research [7]. That will help to identify the key causalities needed to be present to ensure a successful digitally enabled information and communication ecosystem for the Rohingyas, and eventually any other displaced population.

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E-transaction and cybersecurity reform in Malawi: Implications for e-government

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1 Introduction

In this paper, we analyses the implications of the e-transactions and cybersecurity reform in e-government in Malawi, an effort to enhance the dissemination of knowledge on research that integrates e-government and public management. This is one of the public service reform projects, e-transactions and cybersecurity act was passed in 2016. It makes provisions for electronic transactions, for the establishment of Malawi computer emergency response team (MCERT), for criminalizing offences related to computer systems, information technologies and provide for investigation, collection and use of evidence. In April 2017, National Cybersecurity Strategy was launched as part of the reform. This project started in 2016, facilitated by the Commonwealth Telecommunications Organization (CTO). The main objective of reforms in e-government in Malawi is to modernize ICT systems, tools, and processes for effective delivery of services [1]. One of the strategies under ICT in the millennium development goals (MGDS III) is the development of public online services aimed at increasing access to information and communication services [2].

Among the projects initiated as part of public service reforms in e-government in Malawi include the national fiber backbone project, financed by the Chinese government, digital Malawi project, involved the design of the digital platform for data exchange, the migration project and the government-wide area network project.

2. The Problem

Gil Gacia et al. [3] appeals for more research that integrates digital government and public management to enhance the production and dissemination of knowledge, that brings greater influence on practice, these studies are scarce. This research discusses the e-transactions and cybersecurity reform under the public service reforms initiative in Malawi and their potential role in e-government. This research answers the question; how e-government through the

reform is impacting on public service delivery.

3. Conceptual Framework

This article is an analytical review of implications of e-transactions and cybersecurity reform in Malawi. The framework guiding our analysis Figure 2 below is adapted from Cordella et. al. [4]. If social and technology systems develop their capabilities and practices with an upward spiraling of interactions in the design of systems for better interoperability, it may improve information sharing and decision making [5].

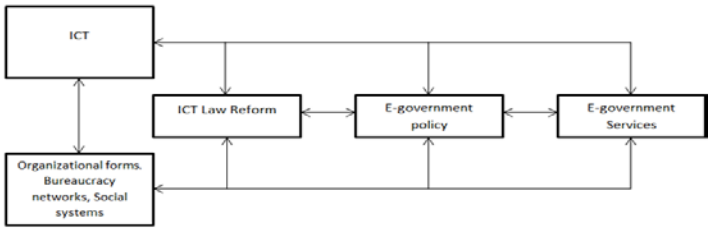

Fig. 1: E-Government enactment framework Source: adapted from [4]

We analyze data collected from secondary sources that include Journal articles, Government reports, policies, publications, and other public related documents in Malawi. The legal framework becomes a benchmark for e-government policy that will improve e-government services if it is enforced but that involve social systems, organizational forms, and bureaucracy networks.

3 Discussion

In this section, we discuss the effects of e-transactions and cybersecurity reform. E-government facilitates public management reforms [6], with e-government, public services will be transformed and this, in turn, may change public management legacy styles that may reduce bureaucratic hierarchical structural levels. Some of the benefits include: e-transactions and cybersecurity reform will enhance justice delivery[7], reduce costs, reduce fraud, increase efficiency, bring convenient and accurate services, [6, 8], improve democratic accountability, economic benefits, availability of Services [7], stimulation of innovation and feedback process [1]. There are many problems that would be reduced with this reform some of them include: lack of transparency [7], uncertainty associated with transactions [9], lack of proper legal framework [10] a barrier to e-government development [11], fear of data security [10], resistance to change by users [10], Issues of ghost workers [12], corruption [9, 12]. Corruption is retarding economic development in Malawi.

4 Conclusion

We synthesize knowledge from different sources, compiled the benefits and problems that would be reduced by e-transactions and cybersecurity reform in e-government.

Acknowledgments

This work was made possible by Tallinn University of Technology, European Regional Development Fund and the University of Malawi.

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Hey women can play dirty too! Social media, Building and Construction: A tale of empowerment in the developing world

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This paper explores the role of social media in women's empowerment. In particular, the paper explores the role of social media and the influence it is having in enabling women to participate in building and construction. The paper focusses on Zambia where rapid urbanisation is taking place and where women are playing a significant part in the changing landscape of building and construction. Rapid urbanisation has been made possible by the availability of land which previously lay untapped, docile and undeveloped and now its availability has led to the development and construction of new structures. Suddenly, it is as if a sleeping Lion has been awoken as at every turn in Lusaka, the capital of Zambia and beyond, new structures are springing up. As lay people begin to see the importance of owning land, there seems to be a scramble to purchase a piece of land to construct one's own home. Where owning land and constructing a home was mainly the preserve of men, women are also now getting involved in the arena. One way women are getting involved in building and construction is through their use of social media which is used as a vehicle for the women to become building and construction developers in their own right. It is Zambian women's ability to bypass traditional hierarchical gender structures by using digital social media that has enabled them to take part in this new phenomenon. This extended abstract aims to give a glimpse of this. Using Sen's Capability approach, the paper endeavors to explore how social media is enhancing women's place in a field that has been male dominated and how through this, is providing them with capabilities to be able to do things they value and therefore elevate their well-being in society. It aims to do this by exploring the role of social media in its contribution to women's empowerment through building and construction. Social media [1] offers opportunities which include collaboration, content communities which allow the sharing of media content between users and the opportunity to create personal profiles, invite friends and colleagues and thereby allow the exchange of varied kinds of information. Using the capability approach as its evaluation tool, the paper also aims to explore the capabilities that have resulted for women thereof. The paper uses Sen's ideas of a capability approach which is concerned with an individual's ability to achieve development and freedom through valuable functionings and therefore wellbeing [2]. In addition, Sen views one's capabilities as a form of freedom to be able to do the things that a person has reason to value [3]. Therefore, the capability approach allows this paper to explore and understand the women's networking and informational capabilities [4] as they use social media. The capability approach has grown in its use in different disciplines including ICT4D research [5, 6]. For this research, it is most valuable as it can be used to evaluate inequalities and well-being [7, 8] and therefore

showcase the capabilities that women have developed as a result of their use of social media to empower themselves. An online questionnaire using google forms was distributed to research participants through the authors own contacts as well as through colleagues and friends. Some of the questionnaires were directly administered to a known Zambian online platform used by women interested in building and construction known as Bana Mayo: Building/Construction through Motivation and Inspiration. Bana Mayo is a term of respect for Women. The questionnaire was intended to understand how social media has changed user's lives. It was also intended to capture the essence of gender and what role social media has played in trying to bring equity between women and men. In addition, the questionnaire's aim was to understand resulting user's social and economic development if any as a result of using social media. Lastly, the questionnaire was also intended to understand the challenges that may result from the use of social media.

Findings thus far suggest that most women chose social media platforms related to real estate business and land acquisition. The platforms were not chosen on the basis of gender but on how informative they were to the needs of women. For example, it was important for the women to choose and belong to platforms that were helpful with respect to the sort of information they were after which specifically related to building and construction. For example, women were keen to know about properties or land being sold and at what cost. They were also on the look-out for bargains and how they would be able to connect with good bricklayers and plumbers for constructions they were undertaking as well as where they would source building materials. Top on the agenda was also the desire to learn about good and fashionable designs for their constructions either in order to attract a good clientele for their rental properties or in order to improve the homes they had built for themselves and therefore elevate their living standards. The women also wanted to expand their knowledge about rules and laws around land acquisition particularly with respect to traditional and commercial land. This suggests that social media presents new ways of being for women in developing countries like Zambia and therefore offers women a tool to exercise self-reliance, engage in new ways of empowering themselves and therefore better their lives. In this case, social media presents new ways of allowing women to have a voice and find new ways of overcoming or at least trying to overcome the obstacles that often beset them. So although women in a country like Zambia may still function within a male dominated system, social media is allowing them new ways of being. One would argue that social media is allowing the women involved in building and construction to disrupt as well as deconstruct the very systems that subordinate them. For example, not too long ago, construction, land acquisition as well as real estate development was mainly the preserve of the male elite but because of women challenging the existing 'order of things' and the patriarchal structures through social media use, things are changing. Social media is impacting on the way in which urbanisation is creating new structures, but also in the capabilities and functionings [3] it is providing women and allowing them to be able to 'be' and 'do' the things they want and value. These include the creation of new identities and empowerment for themselves, and the offer of online digital spaces to be able to explore their lifeworld's in new ways. The availability and use of social media by the women of Zambia interested in building and construction has meant that women have been able to develop their capabilities to use social media to their advantage by sharing

and exchanging information and new ideas as well having the freedom to explore new business ventures in the field of building and construction. The women have been emboldened to use social media as a vehicle to organise themselves and become developers in their own right to build and construct homes. The result is that they are having economic independence that comes through homeownership or by building structures that they can rent out or sale and derive an income from, therefore, earning themselves capital to better their lives and those of their families.

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Mediators to Advocate and Facilitate End-User Participation in Digital Innovation

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The majority of health information systems implemented in developing countries are using technology conceived and developed in western countries and are therefore not necessarily appropriate for this context of implementation [1]. Developing countries have thus at large been passive receivers of technology, rather than taking an active part of its creation. As generative technologies that allow configuration and recombination of technology components to rapidly form novel solutions are becoming more available, the barriers for individuals and organizations in developing countries to take part in innovation are potentially lowered. Based on this potential it is argued that local participation in digital innovation should be emphasized in the debate on ICT and development [2] and that strengthening of human capacities should be in focus [3, 4]. Leveraging the potential that lies in generative technologies, the process of innovation can be moved closer to the context where the technology is to be used. Individuals and organizations in developing countries can take a more central role in digital innovation and global technological processes of development, producing solutions that are more relevant to local challenges and conditions.

In areas such as healthcare, local software developers are not the end-users of technology, and their social world may differ substantially from users such as health workers at rural health clinics [5]. By being experts on local problems and conditions, these 'real' end-users may have much to contribute with in finding novel solutions to relevant issues. They do however often not possess the competence to reflect on possibilities and constraints that lies in technology and might thus be excluded from processes that highly affect them. An important question is how this group can be involved in the process of digital innovation. This paper illustrates how moving the arena for innovation closer to the context of use by allowing end-users to participate, might provide benefits by basing new technology on the challenges experienced by end-users in their local work-setting. This would, however, require technologically and socially 'fluent' mediators to advocate and facilitate their participation.

Our empirical case is based on a two-year Action Research [6] project in Uganda where a new digital data entry interface for health commodity ordering was implemented in the generic health information software DHIS2. The software is used in several developing countries to collect, aggregate, analyze and present health-related information. It is designed with a platform architecture and allows development of custom apps using an application programming interface (API) in combination with web-based programming languages and technologies. While studying the established digital ordering system through contextual

interviews, observations, and discussions with both end-users (data entry personnel and clinical health workers) and the developers that had implemented the system, the end-users revealed that the interface did not suit their established way of work. Based on this, one of the authors participated in the development of a prototype for a new interface through a participative design process where end-users at several health facilities were engaged in the process of innovation and design.

Knowledge of, and hands-on experience with the challenges that users faced uncovered several issues that were largely unknown to the developers of the existing interface. To find solutions to these, the end-users were further included in generating ideas for solutions, prototyping, and evaluation of design suggestions. Throughout this process, the interface was drastically redesigned. For example, the health workers demonstrated how the existing interface presented ordering forms in ways that were not meaningful to them. Discussions of how this could be solved resulted in a dashboard-like design, including the information a typical health worker would need. In turn, modular components in DHIS2 and HTML5 browser technologies, allowed rapid materialization of ideas.

In our case, rather computer-illiterate end-users was provided with the opportunity to participate in the innovation of new digital solutions based on their current challenges. This was enabled by 1) the generative technologies used, and 2) a mediator that could communicate with users and materialize their ideas. On the technical side, DHIS2 was a central software component in the established solution, and further innovation had to be based on this. As such, the software could both act as an enabler or constrainer to innovation and user involvement [7-9]. As its architecture allowed the development of web-based apps that could communicate with the software through the API, it provided sufficient technical generativity to respond to innovative ideas. For this to be utilized, in line with prior research by Msiska & Nielsen [4], the mediator needed to possess competence on how to use and customize the software, and how to develop web-based modules. Also, the mediator had to entail two other sets of human capacities. First, the mediator was required to facilitate end-user participation [10, 11]. Relevant capacities included methods for user interaction such as focus groups, participative observations, and prototyping. Second, the mediator had to advocate for the relevance of involving end-users to other project actors such as the software developers in the team, and the Ministry of Health.

Generative technologies and user involvement in design seems to provide fertile grounds to innovation, especially relevant to resource constrained settings. However, human capacities and incentives need to be present to leverage on its potential. We argue that the strengthening of local human capacities to advocate for and facilitate participatory methods to digital innovation and design should be subject to extended focus in the debate on ICT and development. By strengthening awareness and creating incentives for end-user engagement in the process of digital innovation, local end-users such as health workers will be provided with a voice in decisions that affect their work. Through their environment, designers will be able to develop technology that may be more suited to local practices, and challenges and ideas unknown to software developers might be discovered to fuel further local digital innovation.

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Hopeful lives in uncertain spaces: Exploring information practices of undocumented migrants living on the margins of society

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Keywords: Information practices, undocumented migrants, surveillance

Towards a study of information practices in undocumented migration

This study examines information practices of undocumented migrants in a context of poverty, illegality and surveillance. It puts into focus the individual and social aspects of information and communication technologies (ICTs) from the perspectives of undocumented migrants living on the margins of society. International Migration has become a reality that affects nearly all corners of the globe. ICTs and digital platforms are increasingly seen as crucial in international migration. Literature suggests that growing global access and use of ICTs with sharing of information are significant to migration outcomes and, as pointed out by Castells (2010) [1], ICTs have become global drivers of migration, for instance because news broadcasting and social media contribute to knowledge of life being lived differently and possibly better elsewhere [2,3]. This, in conjunction with societal issues of poverty and unemployment in the global south [4], and opportunity of labour in the global north [5,6], compel many migrants to leave their homes and embark on dangerous journeys across the Mediterranean or the desert in search of better futures for themselves and their families. Digitalisation of border controls, such as electronic surveillance via databases and biometric identification systems, such as the Schengen Information System (SIS), EURODAC or Visa Information System (VIS), has been one of the primary European responses to tackling the influx of migrants and refugees. Research suggests that electronic surveillance systems are designed to control the movement and mobility of people in general and to restrict the entry of undocumented migrants, asylum seekers, and refugees in particular [6,7]. As Gilliom (2001) [8] points out, the turn to digitalisation of a surveillance society represents a revolutionary shift in the power of the state, which echoes Foucault's influential work on the rise of a surveillance society [9]. As argued by Diminescu (2008) [10], the intensification of state power and control amplified by digitalisation implies that the power of the state is no longer constrained by physical boundaries. By virtue of their 'illegibility', undocumented "(...) migrants are at the root of a surveillance society" [10:588]. While electronic surveillance has significant practical implications for the movement and mobility of undocumented migrants and other socially marginalised groups, not much is known about the social implications. Firstly, it seems pertinent to assume that due to the uncertainty of life, access to and utility of ICTs as tools of navigation and information-seeking become pronounced. Secondly, the duality of migrants as users of digital technology and as objects for use of digital technology by being subjected to digital surveillance creates paradoxes that are still not well understood. This raises new emergent questions. How do the migrants navigate in these 'virtual' and 'non

virtual' spaces of surveillance and possibilities amplified by ICTs? That digital technologies play an important role for people in transition has been widely covered in mass media portraits of migrants and refugees, especially during and after the onset of the Syrian Civil War in 2011. Public images of migrants and refugees with the newest digital technology challenge popular narratives of what constitutes a refugee and a migrant – as someone in need, passive and poor [11], and not somebody with digital technology at their disposal, actively using it as a tool of navigation, information-seeking and to keep contact with significant others. Furthermore, the fact that one of the first things aid organisations provide to migrants and refugees is a cigarette and charging of their phones [12] is very telling of the contemporary significance of ICTs to migrants and refugees. Research within information and communication technologies on this matter is scarce and significant gaps exist. However, this field of research is emergent. ICTs are increasingly seen as helpful in handling the global surge in international migration, but studies tend to cluster around the short-term role of digital tools in emergency management at a population level [13,14] and not on the long-term impact of ICTs for migrants and refugees [15].Two notable exceptions that focus on the influence of ICTs for refugees and migrants and how they themselves experience the use of ICTs, are the recent studies by Díaz and Doolin (2016) [16] and Newell et al. (2016) [17]. Díaz and Doolin (2016) focus on the role of IT skills and the interrelationship with obtaining social inclusion in host societies of resettled refugees. Likewise, Newell et al. (2016) examine the use (or non-use) of various ICTs among migrants during a critical time of border crossing in a context of electronic border surveillance. While, these studies are influential contributions to the field of ICTs and migration, they do not reveal the role that ICTs occupy in the private sphere of migrants and refugees as part of everyday life practices. As the studies are respectively investigated in an institutional setting and during the critical time of border crossing. As argued by Torralba (2015) [18], the majority of information practices take place in people's private sphere and not in an institutional setting. Consequently, in order to truly understand the information practices of the people being studied, one needs to investigate the matter in peoples' homes and in their private sphere. This study is inspired by Torralba (2015) [18] and will take place in the private sphere of the undocumented migrants to truly understand what exactly is at stake for them [19]. This study aims at understanding the role ICTs occupy in the everyday lives of undocumented migrants and how they navigate in 'virtual' and 'non virtual' spaces of surveillance and possibilities amplified by ICTs to generate valuable insight on the complex interplay between ICTs, information practices, surveillance and wider processes of undocumented migration. Answering these questions and understanding the mechanism shaping information practices as part of everyday life in a context of poverty, illegality and surveillance, the study is structured by the following three research questions:

RQ1. How is digital technology experienced among undocumented migrants? And what defines their information practices? Including which digital tools are being used?

RQ2. What characterises everyday life experiences of undocumented migrants? Does life correspond to initial hopes and dreams for a better future. In addition, what role does digital technology play in these experiences?

RQ3. To what extent does utilisation of digital technology and platforms influence the broader processes of migration? In addition, to what extent does electronic state surveillance play a role in migration processes?

Methods and sample

This study is empirically delimited to adult undocumented migrants of African origin who have arrived in Italy recently or stayed in the country for a few years and who have come on an undocumented basis. I will adopt a qualitative research methodology based on long-term ethnographic fieldwork (6 months), where information practices and everyday life experiences will be studied. The primary data collection tool will be participant observation in the local context of the daily lives of the migrants. Ethnographic and semi-structured interviews will also be part of the data collection tools [20, 21]. The methodological entry point of the fieldwork will be at two dispersed and separate organisations working with migrants. One is based in the North of Italy and one is based in the South to capture a broader regional understanding of the phenomenon of international migration in Italy. Initiating the fieldwork through these organisations will ensure direct access to potential informants and gatekeepers. After some time, I will seek to move 'away' from the institutional settings and collect data in the private sphere of the migrants' lives and in their communities.

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Engineering Consequences of Mobile Systems' Technological Constraints in Developing Countries Exemplified by Mozambique

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1 Extended Abstract

This work challenges the fast and dynamic movement of new technologies in developing countries like Mozambique and places itself in the research field of ICT4D. The research was carried out as part of the ICT4DMZ1 project. The aim of this work is to empower people in developing countries through the means of technology and enable social progress in Mozambique. To do so, local engineering experts who better understand the country's challenges are key to success [1]. This work analyses the current technological constraints of mobile phones in Mozambique to further enable ICT4D projects. Since the ubiquitous technology; mobile phones can be found everywhere, it was used as the prime device in this study [2]. In the past, several researcher underlined the potential of this technology [3][4][5][6]. Mobile phones are easily accessible and are readily available in Mozambique [2].

Two Research Questions (RQ) are defined and laid out:

1. RQ1 - Which technological communication constraints are engineers from Mozambique facing while developing mobile applications?

2. RQ2 - What are applicable communication technologies in Mozambique?

A study in a field trip to Maputo was conducted and carried out at the Universidade Eduardo Mondlane (UEM) to answer RQ1. A sample of 451 paper surveys with 31 questions were distributed to students in Maputo. The questions were designed to collect data about mobile phones (hard- and software), the mobile phone habits and usage patterns of the participants (activities & scenarios), the future outlook, their current mobile navigation, map usage and demographics. The goal was to gain an insight into current mobile hard- and software possibilities, future development and usage of the technology by the students. The gathered data was then analysed with descriptive statistical methods such as frequencies to count the results or cross-classified tables to compare conjunct depending questions. Multiple choice questions were managed with sets of variables and then analysed with descriptive statistics.

The evaluation of the data shows that mobile phones are available and heavily used, that Android is the most used Operating System (OS) and that the Internet is partly available but is expensive to use. Students are used to consume information on mobile devices, they prefer

modern communication technologies (Internet, Chat) over older standards or means of communication (SMS) and think that navigation is important in their life. In the future, there will be a wider and more dynamic view of mobile phones, in particular smart phones, since more than half of the participants expressed a desire to purchase a new phone.

Local students developed over the period of one semester an Android prototype application called FindUEM2 which localizes Points of Interests (POIs) and locations such as rooms at the campus of the UEM or other facilities such as libraries or restaurants. The outcome of the conducted study was then used in this research as a basis to find out if the students can use the developed mobile technology to enhance or simplify aspects of their lives. It turns out that only 25% of users have access to FindUEM. Accessibility, connectivity, cost of internet access, limited access to certain platforms due to the OS or outdated technology were all issues that arose during this project and answered RQ1. This opened the discussion for RQ2.

A new theoretical interface in form of an SMS based Android server was introduced. The new system shares the same software stack with FindUEM and reduces therefore development and maintenance costs. The communication works through simple SMS sessions between the user and an Android phone, which can simply be placed somewhere at the UEM campus. Predefined and easy to remember SMS commands are sent to an Android phone which acts like a server and uses the FindUEM database, Google APIs and Internet requests to provide the user with the same information as the smart phone Android FindUEM application.

This work states that the introduced new interface has the advantage of using already existing infrastructures and does not depend on investments, new purchases or expensive technology. It is cost effective and can be future-proof in combination with a modern smart phone application. Other already existing applications could benefit from this concept as well as many people including marginalized communities and people who have no access to new smart phones– the core concept of Universal Design. Nevertheless, shortcomings in terms of scalability, communication costs for the Android receiver phone and the strain such a server will put on a single mobile OS are aspects for future discussions and there are therefore remaining unanswered questions. Nevertheless, it is possible to state that there are in answer to RQ2, several applicable communication technologies which could be used in Mozambique to further enable ICT4D projects to be carried out.

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Mobile Health (mHealth) Innovation in Sierra Leone: A Critical Realist Study

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Keywords: ICT4D, M4D, mobile health, mHealth, critical realism, Sierra Leone.

1 mHealth in Sierra Leone

This paper reports on an mHealth initiative in the Bonthe district of Sierra Leone. The project commenced as a pilot in January 2013, with Nokia C2-01 Java based mobile phones given to 217 community health workers (CHWs). A mobile application was installed on each phone which allowed CHWs to view which household visits were due, register pregnant women, make emergency referrals to their affiliated health centre, track their own progress, and collect household data for transmission to the health facility to support clinical and managerial decision-making.

The mHealth project continued after completion of the pilot phase in April 2014, but was severely disrupted when the Ebola virus epidemic struck Sierra Leone between May 2014 and March 2016. Although there was no formal mHealth management team in place in Bonthe during much of this time, the project was still operating where possible with many of the CHWs continuing to use the original Nokia mobile phones and mHealth app. In 2017 a decision was made to strengthen the project, with additional resources being allocated and key people drafted back onto the mHealth management team in Bonthe. Samsung J2 Android mobile phones and an updated version of the mHealth app will be given to approximately 300 CHWs in July 2018, and it is envisaged that the next version of the mHealth project will be fully operational by August 2018.

2 Research Approach & Theoretical Framework

This research adopts a qualitative, longitudinal case study methodology combined with a critical realist [1-5] ontological perspective. The objective is to identify why the mHealth project evolved the way it did by hypothesizing mechanisms that may have determined the outcome of the case. This process is called retroduction [1] and it requires the researcher to take some unexplained phenomenon and propose hypothetical mechanisms that, if they existed, would generate or cause that which is to be explained [4]. Although the process of applying such retroductive reasoning is challenging [6], difficult, time-consuming and resource-intensive [7], it has been suggested that the field of mHealth in developing countries is better researched by using approaches involving the use of critical realism [8], and that such

critical realist approaches bring much value to ICT4D research [9].

Our research relies on Margaret Archer's morphogenetic approach [10]. The morphogenetic approach recognises that agents create causation which has the potential to alter structure. This approach is particularly suited to the study of ICT4D provides a tractable, comprehensive approach within which we can model and theorise ICT4D change in complex contexts [11]. The methodology requires identification of discrete time periods called morphogenetic/morphostatic (M/M) cycles, each of which seeks to explain how change (morphogenesis) or reproduction (morphostasis) take place. Morphogenesis occurs where people and structures are transformed, and structural reproduction/morphostasis occurs where people and structures are largely reproduced. This cycle can be used to analyse the relationship between structure and agency in any context. Thus, the morphogenetic approach when applied to this research, will allow a theorisation of how the interplay between mHealth structures and agency produce emergent use of the mHealth systems. Our research framework is presented in Appendix 1.

3 Results, Analysis & Discussion

A variety of data was collected by semi-structured interview, focus group discussion, observation, and document analysis. This data was then used to construct a detailed, factual case study description and chronological account of events. Discrete M/M cycles were then identified, and these were analysed to produce analytical histories of emergence. The analytical histories of emergence then formed the basis for inferences about causal mechanisms, i.e. the basis for retroduction.

The retroductive process allowed us to hypothesize several mechanisms, two of which are now briefly discussed. The first mechanism is the belief held by the CHWs that the work they are doing is important and of great benefit to their communities. This belief mechanism drives the CHWs to complete their work in the most challenging of environments, sometimes at risk to their own health and safety, and often for little or no remuneration. Closely related to this is the eagerness of the CHWs to adopt mobile phones and the mHealth mobile application as they believe this technology has the potential to positively reconfigure their work practices and make them more effective.

A second mechanism hypothesized is the self-reinforcing adoption of mHealth mechanism. Included in this are mHealth policy, good governance and supervision structures, inclusivity, and participatory design and decision making. This mechanism drives implementation of mHealth projects in the belief that mobile phones and mHealth infrastructure can transform health services and increase access to healthcare in the Global South. The mechanism explains why the implementers of this mHealth project have been determined to keep the project operational in extremely difficult circumstances and to devote significant resources to the next iteration of the project.

Other mechanisms have been hypothesized but the space restrictions imposed by this abstract prohibit further detailed discussion. The hypothesized mechanisms explain how the

interaction of different structural, cultural and agency factors have influenced the project. This approach allows a theoretically informed and empirically rich account of how context and mechanism interact in this specific case.

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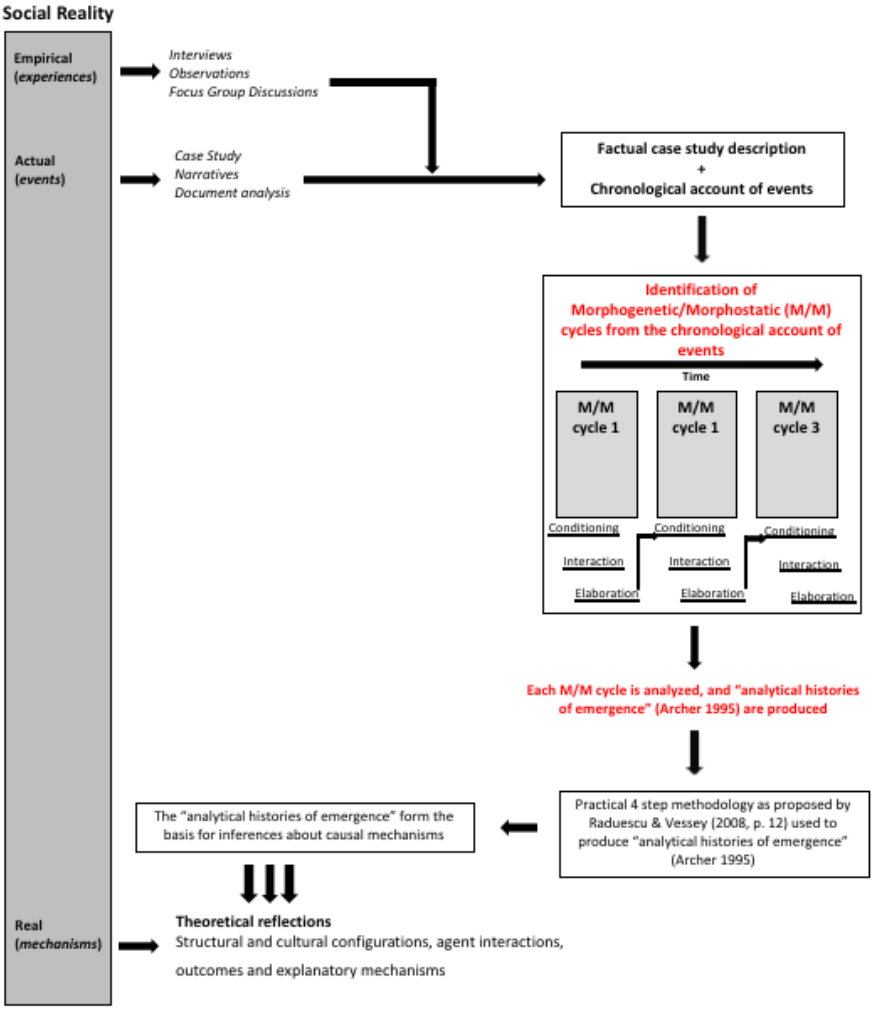
Appendix 1 - Theoretical Framework



Analytical histories of emergence are retroductive, corrigible accounts of sociological transformation over time. By definition they can never be final because we can always improve on our explanations as more or better data becomes available. These causal (generative) accounts form the basis for theorizing change.

Community health workers and mHealth: the importance of agency

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Keywords: mHealth, community health workers, capabilities, empowerment

1. Background

1.1 Community Health Workers

Across developing countries, community health workers (CHWs) are the frontline providers who shoulder the health service delivery burden. As a member of the community, CHWs are assumed to more likely establish the much-needed bond of trust that facilitates health related interaction between the state health care and the communities. They are often regarded as internal agents of change not only for delivering health care but for awakening under-served and rural communities to their human potential and right to health-related knowledge. The greatest value of the CHW concept lies in the fact that, by definition, he/she comes from the community she/he is chosen to represent and presumably remains in close contact with the community. Language and cultural barriers often confront a more highly trained medical specialist and can often seem insurmountable [1].

It is presumed that CHWs who are from the communities they serve, not only manage greater access for health service delivery but are also able to gain the confidence of community members to join various health programs. Experience has shown that the more deeply rooted the CHW in the community, the greater is the impact for creating health awareness and generating a change in the health behaviors of many individuals [2, 3].

1.2 Community Health Workers and mHealth

The use of mobile technologies has been noted by CHWs for collecting field-based health data, receiving alerts and reminders, facilitating health education sessions, and in conducting person-to-person communication within their communities. Functions of mobile technology such as portability, locatability through GPS, instant connectivity have also enabled an improved communication between the health workers and the district level health staff. However, systemic reviews of mHealth use by CHWs suggest that in most cases, technology is seen as being eulogised for meeting efficiency goals [4, 5]. Technology here gets positioned as an end itself rather than as a means to enable CHWs for creating more health-related engagement within their communities. CHW enablement through technology can aid in strengthening the effect CHWs have on their communities with respect to imparting health knowledge and creating health awareness. Thereby improving health service delivery and reducing health inequities within rural and underserved communities [6, 7].

1.3 Capability Approach

We use the lens of the capability approach (CA) in order to understand how CHW enablement takes place through technology? In other words, we look at the importance of agency as the chief factor in comprehending CHW enablement. The CA is a broad normative framework for the evaluation of an individual's wellbeing, social arrangements and the design of policies and proposals about social change in the society. Sen's CA is essentially concerned with "freedom", which in a broad sense refers to the operative opportunities people have, to lead the lives they have reason to value. The core characteristic of the capability approach is its focus on what people are effectively able to do and to be, that is, on their capabilities [8, 9].

The CA also very intelligibly recognises the importance of both agency-freedom and well-being freedom. A person's capability can be evaluated in relation to his/her well-being whether defined in an elementary fashion (nutritional status) or in a more intangible manner (self-esteem). According to Sen (1999), an agent is someone who acts and brings about change at one's own free will as opposed to someone who is forced, oppressed or passive. So, we might define agency as 'the ability to act on values' or as Sen puts it "what a person can do in line with his or her conception of the good" [10, 11].

Understanding how technology enhances the agency of CHWs is crucial. CHWs are those agents that create the much-needed bond with and within these communities for health-related interaction. The stronger the bond between the two, presumably the higher the influence of the CHWs on them, for engaging health related change. In order to strengthen this bond, technology's assistance as a means to strengthen the ability of the CHW is imperative. Functions of technology such as connectivity, portability, data aggregation, multimediality and locatbility can not only assist in quality data collection and reporting but also provide channels to CHWs for improving the quality of the communication/engagement they have with their beneficiaries/communities.

2. Objective

To understand the role mobile technologies play, in enhancing the capabilities of community health workers through the Indian case of the Mother and Child Tracking software.

3. Methodology

3.1 Case Study

In order to study this phenomenon a multisite case study was conducted on the Indian Mother and Child tracking application in India. The Mother and Child Tracking Software (MCTS) was installed in the year 2009, as an Indian government mHealth initiative towards strengthening the existing district health information system. The MCTS takes shape into mobile phones and handheld tablets and is used to facilitate timely health service delivery for maternal and infant patients within certain district health centres in India through CHWs [12].

3.2 Data Collection

A qualitative case study involving in-depth interviews and observation was conducted in two primary health care centres. 6 CHWs were observed using the mHealth tablet and mobile phone during their routine tasks. 20 community health workers, 9 primary health care staff and 1 focus group (a total of 30) individual interviews and a focus group involving 15 members was conducted. The interviews lasted for 90-120 minutes. The case was defined by the use of the MCTS application by CHWs and developed around their perception of its effect on them and their routine tasks. Interviews were conducted in the local language, were audio recorded and converted into expanded notes. Interviews were coded for key thematic areas using both deductive and inductive codes. Deductive codes included mHealth's potential effect on motivation, psychological empowerment and self-sufficiency.

4. Findings

The most salient results of mHealth in enhancing the capabilities of the CHWs were self-esteem, motivation and recognition within their community. Technological efficiency outcomes such as improvement in data quality, collection and reporting, along with improved communication with the district health centre were observed. But there was also an (inadvertent) emergence of different degrees of psychological empowerment for the CHWs; wherein the health workers now feel an enhancement in their self-competence and self-esteem leading to their increased recognition within the community. This occurred due an improvement in the quality of data provided by the CHWs in their village health meetings, the use of videos to assist the CHWs in explaining health issues to the beneficiaries, improved timely assistance in emergency cases and receiving acknowledgement from the staff at the district health centre (due to the improvement in data collection and reporting).

5. Contribution

This paper aims to shed a new light on mHealth within the developing country context. The results found here give policy-makers, both in international organisations as well as national governments, a strong reason to incorporate mHealth applications into their health planning and programmes especially in rural areas where CHWs are put in charge of health service delivery. The link between mHealth and CHW capability enhancement can assist health policy makers and planners in the local appropriation of technology within rural areas; where the focus moves from just attaining technology efficiency to also empowering health workers for enhanced community health management. The hope is that with technology's aid CHWs would eventually, be formally involved in the local health planning thereby becoming a community mouthpiece for addressing and reducing health inequities within their communities.

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Reducing Information Poverty under Crisis: A Study of Ushahidi

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Information is a crucial good under crisis. Coining the notion of information poverty, Chatman (1996) sustains that marginalised groups in a society are comparatively more vulnerable to crises, as their condition may make it harder to obtain the information necessary to tackle problems. In a crisis or emergency, information is needed on what has happened, which short-term measures to adopt, and what strategies are there to cope with long-term consequences (Tusiime & Byrne, 2011). Information, Chatman continues, is even more relevant when the crisis is sudden and affects core dimensions of people's lives.

Information and communication technologies (ICTs), particularly social media and digital platforms, have been framed as helpful in the management of complex emergencies. But while evidence on impact of digital tools clusters around short-term emergency management, less is known about their role in the provision of crucial information under crisis. While Chatman's theory seems to point to strong potential of ICTs, practical evidence on this is scant and does not point into a clear direction. Most importantly, the affordances of digital technologies for this are still obscure and undertheorised.

This paper adopts the lens of affordances-in-practice (Zheng & Yu, 2016) to study the potential of social media for reducing information poverty in contexts of humanitarian crisis. To do so, it conducts a mixed-method case study of Ushahidi, Africa's first crowdsourcing platform for the reporting and geolocalisation of violence or other disruptive events (Okolloh, 2009). Designed and launched during the violence outbreaks that followed Kenya's general election in 2007, Ushahidi (means "witness" in Kiswahili) enables local observers to submit reports using their mobiles or the Internet, and by doing so creates a geospatial archive of events. Applied in multiple regions worldwide, the platform is designed to reduce information poverty, leading users to base their behaviour on the crucial information provided.

Ushahidi provides material for a case study on the use of social media in conditions of crisis. The paper uses data from an ongoing virtual ethnography of Ushahidi in adopting nations, and secondary data in the form of press releases and web material. The analysis, structured in terms of affordances of the platform and their actualisation, aims to fill the gap in theorisation of social media use for crisis information, and extract practical implications for platform designers.

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A Facebook Account of One's Own

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1 Extended Abstract

Virginia Woolf wrote about the importance of an own space and own money for women to enable them to realize their true potential in her famous piece "A Room of One's Own" [1]. Paraphrasing Woolf, we wish to argue for the potential of a social media account of one's own for the empowerment of rural women. Understanding the account as a space which a woman can create and define according to her own liking and purposes, allows us to explore the dynamics of female empowerment through social media, as our research interest focuses on under which conditions social media can become transformative in human development [2].

The worldwide explosion of mobile use has been followed by the social media explosion. Even in the global South, the dispersion of mobile technologies has paved way to an ever extensive use of social media. In Sri Lanka, the context of the current study, 1.5 million cellular mobile connections and over 300,000 broadband and dial-up internet connections were subscribed in 2016, increasing country's Internet penetration to 30% and the total number of Internet users to a 6.1 million – the total population being 21 million [3].

This paper reports on a longitudinal study investigating the appropriation and use of ICTs in a specific context of rural Sri Lanka where telecentres were established over a decade ago in the ambitious aim of building an island-wide infrastructure of accessibility to the ICTs through these establishments [4]. The original goal of providing access to the technology and training in the use of it, to the whole population has been only partially realised as the original financial model of telecentres has proven to be unsustainable. In addition, telecentres are not reaching out to the whole population. Geographically, it can be noted that remote, rural areas with underprivileged population cannot maintain telecentres. Demographically, telecentres seem to reach out to younger population only. Even a gender difference can be identified: women are often poorly represented among telecentre users.

For these reasons, a longitudinal study was initiated in 2015 with the purpose of organizing sequential educational training interventions in the telecentres for women and school children and studying the effects of these interventions. Here we focus on the effects of the interventions and on the development of the ICT appropriation of a group of women in their thirties and forties. We have studied their media ownership, exposure and use through media surveys and through collaborative workshops where the potential of the ICTs has been demonstrated and the participants have been able to test the technologies.

Our results demonstrate the diffusion of ICTs: increasing number of women own the technology now. They also show an increasing variation of the use – the mobile is no longer just a telephone for conversations but the social media is becoming increasingly known and used. Particularly Facebook accounts have become a common feature. In the group of ten women, two years ago, not one knew about Facebook, today, eight of them have an account of their own, and all of them are well-informed of this technology. The use of the technology/account is well-integrated into the everyday life of these women, illustrating how women tend to have a pragmatic relation to technologies. Women use the Facebook account in relation to issues that are important to them: family and friends, social engagements, social relations, business activities, voluntary work. In the resource-constrained environments of tea estates, social media seem to evoke innovative organic uses of the technology well-grounded in the socialities of the communities. Facebook accounts are an example of the spaces of one's own that expand the lifeworld of these women facilitating new, innovative opportunities to define themselves as active participants in the modern world, despite of their geographically remote rural location.

This longitudinal study gives us a unique opportunity to follow and analyse a development and make important observations of the innovative appropriation dynamics. Our results suggest that interventions alone cannot make a difference for the development but there are other more crucial factors, such as community dynamics and social influencers that are more significant in a community oriented context for female empowerment.

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Digital Innovation and the Dynamics of ICT4D Projects

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Digital innovation (DI) is as a central concept in information systems research. DI highlights the transformational qualities of digital ICTs to individuals, industries and soceties and evoke connotations to key notions from previous decades such as workplace computerization, Zuboff's informate [1] and the ambiguous notion of digitalization. Digital services, applications and content can be reused and recombined and increase in breadth and value with the number of people involved in their production and consumption. DI differs fundamentally from traditional product innovation involving disconnected, closed and analogous components and require different resources, motivations and human capacities. Today's dominant digital platform ecosystems such as Google, Facebook and Apple demonstrate how a combination of modular and layered software architecture and appropriate governance structures can harness an unprecedented capacity to innovate digitally.

DI opens up new spaces where individuals and organizations in developing countries can participate and take on new roles in innovation. However, DI may also simply reinforce traditional development industry dynamics whereby ICT4D innovations are conceived of by western academics, designed by contracted developers, become implemented in governmental organizations in developing countries through partnerships with local NGOs, and are funded by international donors such as the World Bank and the International Monetary Fund [2]. This would be unfortunate, because DI has the potential to foster new kinds of development modalities and 'innovation networks', informed directly by the aspirations of the 'underdeveloped'. Our question is thus: how does ICT4D project dynamics influence digital innovation? We begin to answer this question by considering digital innovation in the context of global health through the illustrative example of the DHIS2 software (www.dhis2.org).

In global health, the oligopolic development industry tendencies outlined above are solidified by the strong compartmentalization of funding and activities into vertical health program silo structures (e.g., HVI/AIDS, TB, malaria). At the same time, there is a normative international drive towards standardization of integrated health information systems exemplified by the sustainable development goals (SDGs) and initiaives such as OpenHIE (https://ohie.org/). Hence, the structures that govern the innovation potential of ICT4D projects often extend beyond the project participants immediate control (see e.g. [3], [4], [5]). International organizations play a large role in financing public health, and in the implementation of ICT4D projects. Their involvement create short bursts of technical expertise to a particular problem based on standardized 'packaged' solutions rather than local innovation. Unfortunately, this does not generate sustainable local capacity to tackle emergent issues through digital innovation.

DHIS2 is an open source software package used as a national health information system in developing countries. DHIS2 has a number of configurable modules and a platform architecture with application programming interfaces (APIs) that enables it to be customized across domains and extend by apps that meet specific requirement and needs [6]. The layered and modular architecture of DHIS2 thus allows for decentralized local innovation involving different actors and competencies [7], and possibly democratizes innovation by letting anyone participate [8]. However, the realization of this digital innovation potential relies on a combination of (financial) incentives, knowledge and human capacity to innovate [9]. With the current dynamics of ICT4D in public health in developing countries, the engagement with DHIS2 as a platform for digital innovation is primarily centered on the agendas of global donors and not by the local needs of Ministries of Health. Few incentives are available for local DHIS2 stakeholders to get involved in digital innovation in areas and directions not directly relevant for the donors. Even though a cadre of national and regional DHIS2 experts are located throughout Africa and Asia, they are primarily enrolled through short-term assignments in large donor-driven implementations of the software.

There are cases where local experts are making changes in the DHIS2 code base or develop apps to address local needs. However, there are many hurdles to make these local innovations a sustainable part of the generic core of DHIS2 [10]. There are also a few examples where DHIS2 is re-appropriated and used in other domains than health. Examples where re-appropriation has taken place include the integrated road safety management information system in Tanzania, the new year accident reporting system in Vietnam [11] and the civil registration and vital statistics system in Tajikistan [12]. While these initiatives successfully support local needs, they also have in common that they remain isolated software branches of DHIS2 and none of them have managed to establish generic solutions to be taken up elsewhere.

While DHIS2 is generative in the sense that it has successfully been adopted and customized in a variety of local settings, the additional risk and cost of making local innovations generic and available across contexts seems too high, with the current top-down donor-driven and project-oriented funding and incentives structures. In practice, digital innovation often constitutes reinventing the wheel, through idiosyncratic local customization, rather than as a service-oriented business model, where ‘third party’ developers produce software platform extensions that can be adopted across similar settings and programs. While the fringes of DHIS2 ecosystem increasingly have access to digital devices, networks, services and contents, these contexts remain more or less disconnected from the wider social networks where new ideas are likely to form [13].

We need to further study the dynamics of digital innovation in the development industry [9], in order to understand who stands to gain from digital innovation in ICT4D and what software architectures, governance structures and funding modalities are needed to enable digital innovation. Currently, the development dynamics of ICT4D projects influence DI in developing countries in such a way that local stakeholders remain consumers of and not participants in digital innovation.

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Entrepreneurial Education for Boosting Local Innovation

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Innovation and entrepreneurship are crucial processes for the economic growth, (OECD, 2009; Wennekers and Thurik, 1999) and for the competitiveness of countries and regions. Entrepreneurship is a complex phenomenon. Since the seminal works by Baumol (1968), Bull and Winter (1993), Shane and Venkataraman (2000), Gartner (2001), Zahara and Dess (2001) the boundaries of this research field are still in the middle of an exciting debate involving academics, scholars and practitioners. It's a field where different disciplines, paradigms, perspectives converge. High-tech entrepreneurship or Technological entrepreneurship can be considered as a particular subset of the main entrepreneurship topic (Giacon, 2008; Prodan 2007) and is interpreted as the capacity, competence and attitude to transform new ideas, technologies and inventions into commercially viable products and services to create economic and social value, through innovative business models (Allen, 2009;). Technological entrepreneurship plays a central role in regional transformation (Venkataraman, 2004). The relevance of such processes has been recently highlighted in the frame of the European strategy for the Regional Smart Specialization, where the innovative entrepreneurship is identified as the core process for the achievement of the objectives of intelligent, sustainable and inclusive growth of Society (Wintjes and Hollanders, 2010; Romano et al., 2013).

Entrepreneurship thrives in ecosystems in which multiple stakeholders like companies, entrepreneurs, and policy makers have important roles to promote the creation of next wave of entrepreneurs (WEF, 2008). It is in this perspective that the concept of sustainable innovation ecosystems rises as that of the enabling infrastructure for public policies sustaining innovation in the regions and territories (Asheim and Gertler, 2005), as well as, for fertilizing investments in human capital creation for the achievement of outstanding innovation and economic performances (GII, 2013, Cornell University, INSEAD, and WIPO). In these ecosystems, it becomes clear the fundamental role that the higher education institutions and universities can play as incubators of knowledge intensive entrepreneurial human capital which could bring novel ideas (Venkataraman, 2004) and support the process of knowledge creation, absorption and diffusion (Romano et al., 2013).

But the achievement of such ambitious goal, calls for Universities to promote a reconfiguration of their traditional organizational processes and programs in order to become entrepreneurial, to mutate into agent of innovation and regional development in the Schumpeterian sense (Ropke, 1998). This emerging model of universities, called Entrepreneurial University (Clark, 1998; Currie, 2002; Etzkowitz, 2004; Gibb and Hannon,

2006; Guerrero-Cano, 2008), allows to support the creation of entrepreneurial attitudes and mindsets that constitutes the engine of economic growth (Etzkowitz 2004, OECD, 2009).

Framed in the above premises, the focus of our study is to analyze how Universities across Europe can create an Entrepreneurial mindsets and attitude in people in the final aim to contribute directly to stimulate the "technology entrepreneurship" for development.

Based on an analysis of some recognized European cases of entrepreneurial universities the article aims to find out some important insights to highlight the strategic pillars of a discontinuity in the process of human capital creation as it happens in an Entrepreneurial University. The lessons learned will contribute in setting out some guidelines for developing countries to realize a "process based" model for entrepreneurial mindset creation.

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ISBN: 978-1-78926-343-5

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