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The Role of the Social System in the Diffusion of Innovation in Low to
Middle Income Countries: The case of Be He@lthy, Be Mobile

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ABSTRACT

Actors across the private, public and third sector are increasingly embracing the idea of promoting the use of externally developed social innovations to address important social challenges globally. Successful diffusion of these types of innovations has the potential to offer long term solutions to grand challenges. However, when diffusing innovations into low to middle income countries (LMICs), significant problems arise, particularly due to lack of cross-sectoral alignment in financial and technical resource deployment. This thesis contributes to the understanding of how multiple actors engage in activities to support the diffusion of externally developed social innovations into LMICs. We argue that through purpose-led alignment around a mission-orientated goal that is focused on solving social challenges and through the combining resources and knowledge across all sectors, through the active empowerment of civil society in creating value and continuous feedback loops, externally developed social innovations can contribute greatly to the emergence of new innovation ecosystems in LMICs. A systematic literature review illuminates the role of the social system in successfully enabling widespread diffusion, especially in creating value from the use of the innovation. We propose that the social system perspective, which conceptualise diverse actors engaged in a dynamic process, permits a systems view of diffusion in which long term collaborations and the integration of indigenous knowledge into communication processes are associated with successful diffusion. The role of social systems in value creation is been further investigated through an in-depth case study of the World Health Organization's Be He@lthy, Be Mobile initiative across three different countries (Senegal, Sudan and India). The case highlights how civil society drives the diffusion process through its ability to manoeuvre across the social system and to actively search for innovative solutions. While our research has implications for the introduction of improved strategic investment across sectors it also contributes to the theory of innovation diffusion by moving away from an innovation-centric view and instead adopting a systems-centric view. It hence allows us both to view diffusion as a co-creation process and to reconfigure adopter and diffuser communities into one conceptual field.

Keywords: innovation diffusion, social innovation, social system, value creation, systematic literature review, enabling technology, low to middle income country

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LIST OF ABBREVIATIONS

BHBM	Be Healthy, Be Mobile
BOP	Bottom of the Pyramid
DOI	Diffusion of Innovation
DPA	Diabetes Patient Association
EDSI	Externally Developed Social Innovation
LMIC	Low to Middle Income Countries
LMR	Low Resource Market
ITU	International Telecommunication Union
SDG	Sustainable Development Goals
WHO	World Health Organization

1 INTRODUCTION

This thesis investigates the diffusion of innovation (DoI) as a social phenomenon and seeks to understand its current role in innovation management. By illuminating the role of the social system in the diffusion process, it also offers new ways to improve the effectiveness of diffusion practices and to support the long term embeddedness of externally developed social innovations in low to middle income countries. The diffusion of innovation was first theorised by Rogers in 1962, who identified the concept as “a process in which an innovation is communicated through certain channels over time amongst members of the social system” (Rogers, 2003 p.5). At its core, diffusion is a social phenomenon informed by the interconnectedness of actors involved in the design through implementation, communication and uptake of an innovation. As such, diffusion can be understood as a communication process between key stakeholders in the social system, comprising four pillars: (1) the innovation, (2) communication channels, (3) time, and (4) the social system (Rogers, 2003).

The past 20 years has seen significant research into the core components of innovation - relative advantage, compatibility, complexity, trialability and observability - and how these support its overall uptake, while time is primarily associated with the rate of adoption for an innovation to be adopted by all members of society. It is moreover associated with the innovativeness of each member of a social system. Scholars in the innovation field have also considered the various channels through which an innovation is communicated between individuals to support its adoption. While there has been significant research on how innovation is communicated through channels and networks (Moore, 1999, 2002; Bergenholtz and Waldstrom, 2011; Kastle and Steen, 2014), with considerable focus on developed economies, to date these questions have not been thoroughly addressed in a low to middle income context. Significantly, the role of the social system as the critical fourth pillar in the diffusion process, particularly the diffusion of social innovations into low to middle income context, remains largely ignored in innovation based studies.

One reason is likely to be the undeniable complexity of this conceptual category. As Rogers makes plain, the social system concept refers to a “set of interrelated units engaged in joint problem solving to accomplish a common goal” (Rogers, 2003 p.23). The social system has a structure, defined as the patterned arrangement of these units, which also gives stability and

regularity to individual behaviour. Rogers conceptualises the social system as a set of interrelated units (such as individuals, former groups, and organisations) engaging in activities to solve a social problem (Rogers, 2003). My research meanwhile constructs diffusion as a social process in which multiple actors engage in activities to solve a social problem by diffusing an externally developed social innovation (EDSI).

The broader definition of social innovation positions it as a socially constructed and embedded novel solution to a social problem or need and the distribution of political and ethical benefits (Phills et al., 2008). Concerned with the development of new, creative and sustainable approaches that promote social inclusion, wellbeing, and prosperity (Alvord, Brown, and Letts, 2004; Mair and Marti, 2006, Mair et al., 2012), social innovation can be a powerful tool to address social challenges, as the United Nations' Sustainable Development Goals (SDGs) have shown. The nature of social innovation also entails diffusion as a multi-actor process, including for example the public, private and third sectors.

An externally developed social innovation meanwhile refers to a social innovation designed outside of the country in which it is intended to make an impact. Under an EDSI, the research refers to innovations such as microfinancing, solar cookers, sanitation products, that originate in the formal economy but diffuse into developing markets. Especially, after the pandemic, there is a new wave of innovation - mostly digitally enabled - to make its way to developing markets.

The present research focuses on the diffusion of an externally developed social innovation into a low to middle income country (LMIC). To do so, it illuminates the role of the social system in the diffusion process. Furthermore, a significant gap in the literature exists in relation to the social system's role in innovation diffusion, especially in low and middle income countries. Therefore, this study's empirical work is designed to clarify the activities carried out by actors of the social system when supporting the diffusion process.

In order to locate our study, a systematic literature review was carried out on a narrowly defined body of literature, which evaluated the past 20 years of the academic literature on innovation diffusion, especially designed to shed light on the diffusion of externally developed social innovations in low to middle income countries (LMIC). This review is followed by an empirical

study to understand how an externally developed social innovation has been diffused into three geographical locations, namely, Senegal, Sudan and India.

The literature review's outcome highlights the need for deeper understanding of how externally developed social innovations diffuse in an LMIC context. Much of the literature is concerned with innovation such as grassroots, resource constrained and its diffusion at the bottom of the pyramid (BoP) or to subsistence markets. The importance of subsistence markets and the challenges associated with the diffusion of social innovation to these market through co-creating institutional conditions (Vengopal and Viswanathan, 2019) could inform the diffusion process, particularly the activities carried out by the actors of the social system. Externally developed social innovation is considered an under researched field. Therefore, the number of articles concerned with EDSIs is limited, due to their specific nature, despite a rising number of EDSIs entering the market to solve large scale social problems.

In presenting and examining the project's nature and consequences, our research contributes to theory in two crucial areas. In chapter 3, it reconfigures the idea of communities of adopters and diffusers as a single concept rather than being the separate entities identified in Rogers' original work (1962). This single, dynamically-evolving construct, where the adopter community is no longer viewed as mere end of process beneficiaries, but instead as involved in all stages of value creation, allows for a new and effective way to manage innovation diffusion. We consider diffusion as dynamic, recursive and multi-directional because there are feedback loops of communication, unlike much of the literature which positions the diffusion of innovation as a one-way process of communication. This is likely to be especially the case in the diffusion of social innovation as it entails multiple actors. By conceptualising diffusion as a co-creative process, there is a possibility for a new innovation to emerge, with those new innovations holding the possibility for the continuous adoption of the original innovation.

In order to develop a deeper understanding of these different feedback loops within the diffusion process, it is first necessary to understand the activities undertaken by actors making up the social system, from the innovation's design through to final implementation, because diffusion contributes to the co-creation, and not just the creation, of value. The present research is based on a study of activities undertaken by actors of the social system in the diffusion process of an externally developed social innovation into three countries, Senegal, Sudan and India. In chapter 4, the recognition of all actors' active participation in each diffusion stage,

transforms disciplinary understandings of the diffusion process, highlighting its inherently co-creative nature.

The rest of this chapter outlines the academic and personal rationale for undertaking the present research, which aims to shed light on the fourth pillar of Rogers theory of innovation diffusion and contribute to the improvement of innovation practices such that they support the embeddedness and continued use of social innovation in LMICs. I also outline the overall research design, thesis structure, my research findings and the dissemination to date by the WHO and conference papers.

1.1 Research rationale

The research rationale is discussed from a personal perspective and with reference to the ongoing scholarly debates presented in the academic literature.

1.1.1 Academic rationale

The research is positioned at the intersection between overlapping bodies of literature around diffusion of innovation and innovation management and the management of social innovation in the context of low to middle income countries. My work is especially concerned with the importance of the social system and its pivotal role in contributing to the successful diffusion of social innovation when it is developed outside the country where the impact is intended. The concept of the ‘social system’ being the fourth pillar in the diffusion process has been conceived somewhat narrowly in previous literature. In this research we look at the social system as our unit of analysis comprising of multiple actors working together to deliver the innovation. Scholars looking at the diffusion process mostly conceptualise ‘social system’ as complex adaptive systems, networks or most recently ecosystems, focusing on innovator input to the diffusion process (Trischler et al., 2020; de Jong et al. 2018; Vargo and Lusch 2016, Nielsen et al, 2016, Adner and Kapor 2010). The growing conceptual prominence of the ecosystem is one potential reason for the lack of focus on the social system within the literature on diffusion. Through my research I aim to provide a clear articulation of the social system concept and to offer a substantial reconfiguration of the fourth pillar. This research views diffusion as emergent in nature, where the overall outcome no longer depends on central authority, but instead derives from the action of interdependent actors within a social system, based on local knowledge while continuously adapting to feedback received from the end users.

The predominant focus of social innovation has been on strategic issues such as products, processes, and business model design to bring about positive societal outcomes (Varadarajan, 2017). Managing social innovation broadly focuses on illuminating the role of the individual entrepreneur, venture or nature of the innovation (Lawrence Dover and Gallagher, 2013; Leadbeater 2008; Morino, 2009), while other scholars concentrated on the ways social innovation contributes to systems change (Mulgan, 2017; Westley, 2008). The literature has provided some focused inputs into how to bring about social innovation for addressing various types of social issues such as environmental degradation, social and economic inequality, and poverty (Kolk, Rivera- Santos, and Rufin, 2014; Mair, Wolf, and Seelos, 2016; Varadarajan, 2017). Extant research has also emphasized the importance of mechanisms such as bricolage, customization, and local embedding in implementing social innovation in low to middle income contexts (Ernst, Kahle, Dubiel, Prabhu, and Subramaniam, 2015).

Research to date on innovation in low to middle income countries (LMIC) has focused mainly on product development (Cooper and Edgett, 2007), innovation management (Tigabu et al., 2013; Porter and Kramer 2011; Seebode, Jeanrenaud, and Bessant, 2012), types of innovation (Schumpeter, 2010; Prahalad 2004; Mohr, Sengupta and Slater, 2004; Yu and Hang, 2010), and contexts and types of problems in low to middle income countries (Zanello et al., 2016). In the context of innovation in LMIC, research has focused mostly on the type of product and the way it has been developed, with much emphasis on the value proposition and design processes such as *jugaad* or frugal innovation (Radjou and Prabhu, 2012, 2015) and socio-technological innovation (Smith, Stirling and Berkhout, 2005). However, researchers have overlooked a central aspect of diffusion theory – the process by which innovation moves through and becomes adopted by the social system and the role of each actor in this process.

Ramani et al. (2012) attribute the failure of innovations to diffuse into LMICs to a combination of four general causes: technology design; product design; delivery design; and missing institutions, capabilities or linkages. With such a number and variety of factors influencing diffusion in low income markets, strategies to promote the uptake of health related innovations such as those addressing NCDs need to take account both of local exigencies of culture, context and resource constraints (Ray and Ray, 2011, Zeschky et al., 2011, Radjou et al., 2012) and of structural, economic, social and institutional factors - the innovation ecosystem that allows development and diffusion to happen (Zanello et al., 2016). Further, several barriers affecting

the diffusion of social innovation are highlighted in the literature, including: limited access to resources (financial, technical, or human), limited infrastructure, lack of best practice for scaling social innovations, and the absence of networks for sustaining let alone upscaling these innovations (Khan, Mulgan, Pulford and Vasconcelos 2010; Dhont, Oiej and Schroder, 2018; Howalt, 2018).

The literature to date indicates an increased understanding of the networks, relations partnerships and ecosystems in innovation's successful diffusion with most studies looking at the diffusion of innovation focused on innovations originated and diffused in economically developed contexts. Very few cases examine the diffusion of externally developed social innovations and their diffusion into low to middle income countries (Zanello et al., 2016). Innovation literature has moved up a level from the organisation to investigate how it occurs in groups – variously called networks or ecosystems. Consequently, the focus has been more on development than diffusion.

To extend our understanding of diffusion as a co-creative process, (in Chapter 3) we conceive the adoption community as being dynamically involved in all activities along the overall innovation process from design through implementation and scaling. Both empirical papers contribute to the diffusion of innovation literature in two significant ways. First, they reconfigure the concept of the social system by including adopters and diffusers into a single community, and second, they construct the diffusion process as a recursive process with feedback loops rather than a one directional process. The reconfiguration of the adopters and diffusers into a single community supports the emergent literature on taking an actor-actor view on innovation's diffusion. Crucially, this research extends the innovation literature on the co-creation and diffusion of value from social innovation into low to middle income countries.

1.1.2 Personal rationale

My personal rationale for embarking on the PhD journey was twofold. First, I have been working in the field of entrepreneurship education for the past 15 years, developing considerable insight into practical approaches to entrepreneurship and the difficulties faced by entrepreneurs seeking to scale their innovation processes for impact while tackling social problems outlined by the SDGs. All too frequently this group of actors experience significant challenges in creating solutions that are at once good for people, kind to the planet and

financially sustainable. This hands-on experience provided me with broad practical knowledge, while also highlighting an even greater need for deeper understanding of the problem through evaluation and critiquing of current theories in the growing fields of social innovation and scaling innovations for impact.

Second, I have a long-standing interest and background in partnership with private and public sectors to find innovative ways to tackle challenges associated with poverty, education and health. Actors in the public, private and third sectors are working to resolve these problems, yet despite their focused efforts, effective and appropriate solutions remain elusive. Finding solutions to such complex and challenging problems requires a collaborative approach where social problems are taken as part of an interconnected social system. Engaging with such actors on innovation projects often brought challenges, especially in regard to non-transparency between actors around the overall mission and the lack of technical and financial resources when diffusing social innovation into LMICs.

Furthermore, building on my previous work supporting social entrepreneurs and recent years of extended research I hope to offer insight into the diffusion of one particular social innovation for one specific social need into three different geographical locations through the lens of the social system. As a result of this work, I then hope to provide an evidence based approach that backs up my personal experience and highlight the role of multiple social system actors and key activities order to support long term views of diffusing an externally developed social innovation to LMICs.

1.2 Overview of research design

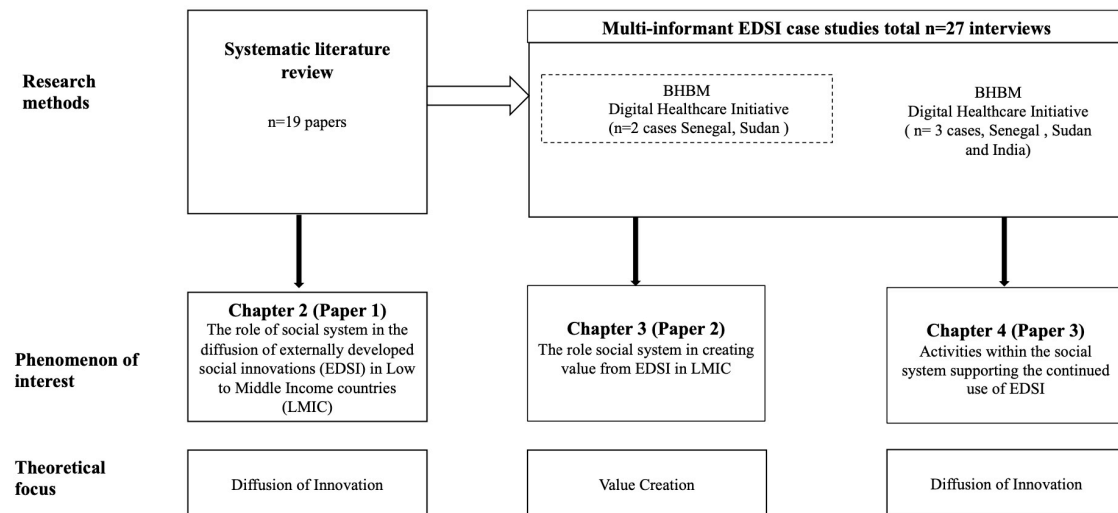
To address the overall research question on the nature of the social system's role in the diffusion of EDSIs into LMICs first, a systematic review of the academic literature was conducted to identify the factors associated with the successful diffusion of EDSIs into LMICs. The systematic literature review (SLR) helped to develop my research question, which formed the basis of Chapter 3; What role actors of the social system play in creating value from an externally developed social innovation?'; and Chapter 4; How multiple actors within a social system engage in activities to support the diffusion of EDSIs in LMICs?'.

Having identified a gap in the literature about the insufficient explanation of the role of social system in the diffusion of EDSIs, I was fortunate to given access to a major project entitled Be He@lthy, Be Mobile (BHBM). A global digital health initiative, led by the WHO and the International Telecommunication Unit (ITU), BHBM uses mobile technology (mHealth) to tackle noncommunicable diseases (NCDs) such as diabetes, cancer, cardiovascular disease and chronic respiratory diseases. Given the project characteristics, the present research refers to BHBM as a social innovation. Indeed, BHBM is addressing a social problem (Mulgan 2006, 2012) with a novel solution by using mobile technology (Leadbeater, 2008; Morino, 2009; Huddart, 2010) and is primarily focused on the creation of value for society over market (Phills et al., 2008).

While BHBM has so far been introduced to 11 countries, Senegal, Sudan and India, were identified for data collection as they provided the best fit to help answer the research question. Data collection included a total of 27 in-depth interviews including key decision making actors of the social system who were actively involved in BHBM -digital health intervention -from the beginning of the diffusion process in all three geographical locations. All the people who have been interviewed were representing the social system and they were also key decision makers, identified by members of the WHO, BHBM team or/and by local groups. Chapter 3 was developed using data from the cases of Senegal and Sudan, with a specific focus on how actors of the social system engaged in the diffusion of BHBM. Chapter 4 was developed from the full dataset (including all three locations), highlighting activities carried out by all types of social actors along the innovation process to support the continued use of the innovation locally.

Figure 1-1 provides an overview of the overall research design process, with more detailed information on the empirical cases presented in both Chapter 3 and Chapter 4.

Figure 1-1 Overview of research design



1.2.1 Introducing the empirical case of this study

As the overall contribution of this research is based on the findings from the systematic literature review (Chapter 2) and the empirical case study (Chapter 3 and Chapter 4), a brief introduction to the core empirical case will be necessary. Through this case, I provide an insight into the diffusion of the BHBM mHealth initiative in three different geographical locations.

In 2012, the WHO together with ITU founded a joint initiative—Be He@lthy, Be Mobile—with the aim of reducing the global burden of noncommunicable diseases (NCDs), specifically, cancers, diabetes, heart disease and lung disease. The initiative works with governments to design, deploy and scale up mobile and digital health services using existing, evidence-based solutions that have been demonstrated to lead to healthier behaviours. BHBM was structured as a multi-sector and multi-partner initiative to accelerate digital and mobile health uptake and to build global evidence for best practice. Since 2012, BHBM has launched official programmes in nine countries representing a blend of high-, middle- and low-income contexts from all regions of the globe, all committed to changing the course of the NCD epidemic through digital and mobile health. NCDs themselves represent a major social and economic challenge for individuals and nation states. Therefore, NCDs also feature under a specific goal

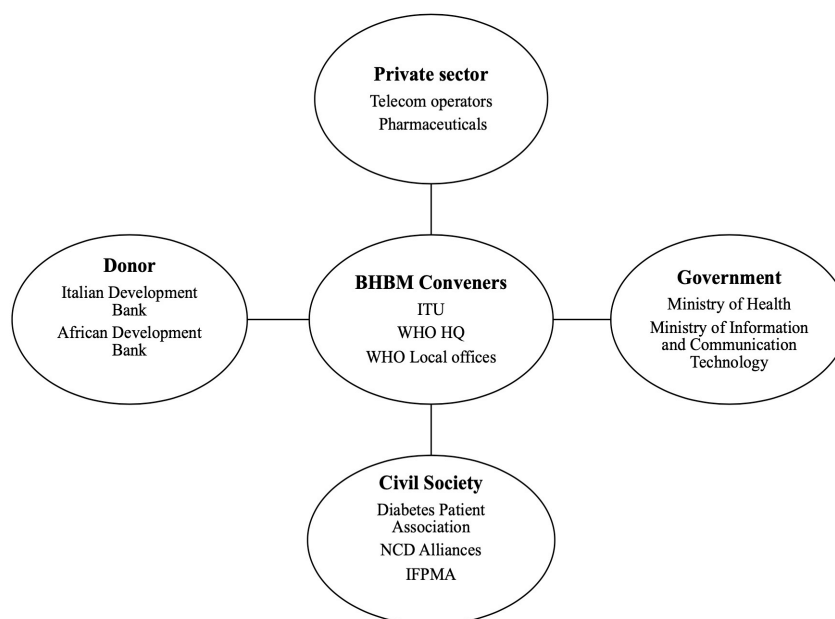
– Goal #3: Good Health and Wellbeing - in the UN's Sustainable Development Goals (UN, 2015). In the context of the thesis, especially with the focus on social systems and their role in the diffusion process, other goals such as #9, #10 and #17 are equally relevant. With the help of international experts, the initiative has developed digital and mobile health solutions for cervical cancer, diabetes and tobacco cessation and is already working on formal guidance for other issues such as ageing, health technology platforms, hypertension and programme monitoring and evaluation. Several countries have adopted these solutions and implemented them in their own settings and contexts as national-scale programmes.

Table 1-1 Brief overview on countries in which BHBM was introduced between 2013-2019

Country	Start date	BHBM programmes	Current status
Costa Rica	2013	mTobaccoCessation	Still in a pilot stage and facing resource (financial and technical) challenges. No technical platform
Senegal	2014	mDiabetes	Ongoing with strong support from Patient Associations and the private sector (Sanofi). BHBM is enabled by a digital platform managed in Geneva.
India	2016	mTobacco mDiabetes	Both mHealth initiatives are ongoing and negotiations are underway between the WHO and the Government of India to launch further mHealth initiatives such as mAgeing. BHBM is using existing platforms that had previously been used as information platforms.
Sudan	2017	mDiabetes mCervicalCancer	Ongoing with strong support from the Italian Development Cooperation (mDiabetes) and the African Development Bank Group (mCervicalCancer) BHBM is enabled by a digital platform managed locally as a result of the African Development Bank Group investment to improve health access and strengthen the overall healthcare system.
Egypt	2017	mTB-Tobacco mDiabetes	Both mHealth initiatives are still in a pilot stage and facing resource (financial and technical) challenges. mDiabetes is part of the President's "100 million healthy lives" initiative. No technical platform.
Tunisia	2017/2018	mTobaccoCessation mDiabetes	Both mHealth initiatives are in a pilot stage and facing resource (financial and technical) challenges. The government plans to build capacity to cover all 24 regions eventually. No technical platform.
Philippines	2018	mTobaccoCessation	Still in a pilot stage and facing resource (financial and technical) challenges. No technical platform
Burkina Faso	2019	mTobaccoCessation	The partnership was finalised with Expertise France, the French agency for international technical expertise, to launch mTobaccoCessation in early 2019. No technical platform.
Zambia	2019	mCervicalCancer	Still at the introduction phase with financial support from the African Development Bank Group

In parallel, the initiative has successfully developed partnerships with the public and private sector, forming a broad coalition of collaborators who share plans and emerging evidence from digital and mobile health projects, academic research, consumer insights, digital innovations and provider perspectives. The BHBM partnership is composed of a complex web of different public and private actors from health, technology and innovation.

Figure 1-2 Overview of the BHBM landscape as identified in the BHBM strategy (2017-2020)



To reflect the diversity of actors involved in the diffusion of BHBM, five different categories of actors were identified, namely, BHBM conveners (actors leading BHBM), actors representing the private sector, governments, civil society and donor organisations.

BHBM Conveners

- The *World Health Organization (WHO)* – is an international agency operating as a non-profit organization with a mission primarily to engage with government agencies, national governments also to work with health partnerships, foundations, non-governmental organisations, and civil society. The WHO operates on a regional level through country offices. These country offices report directly to the WHO and work closely with their country's Ministry of Health.
- The *International Telecommunication Union (ITU)* - is one of the oldest United Nations agencies with a mission to improve ICT access to underdeveloped and underserved

markets. The ITU includes the international network of telecommunication companies and ensures that networks and technologies seamlessly interconnect to support effective communication between all telecommunication companies working directly with the private sector. The ITU also operates on a country level and works closely with each country's Ministry of Information Technology.

Private sector

The private sector refers to actors providing health services or products that are not owned or directly controlled by the government. In the context of the present study, this category refers to:

- *Telecomms companies* (Sudan, Senegal, India)
- *Pharmaceutical companies* (Sudan, Senegal)
- *WhatsApp Business* (Sudan)

Public sector

The public sector consists of all governments and government controlled and funded agencies. This category denotes in the present study the following entities:

- *Ministry of Health* (Sudan, Senegal, India)
- *Ministry of Information and Communication Technology* (Sudan, Senegal, India)
- *Ministry of Family and Welfare* (India)

Civil society

“Civil society refers to the space for collective action around shared interest, purposes and values, generally distinct from government and commercial for-profit actors” (WHO, 2021). It includes charities, development NGOs, community groups, faith-based organizations, professional associations and advocacy groups, and in the present study comprises:

- *Diabetes Patient Association Groups* (Senegal, Sudan)
- *NCD Alliances* (Senegal, Sudan, India)
- *The International Federation of Pharmaceutical Manufacturers & Associations* (IFPMA) (Senegal, Sudan)
- *Village Groups* (Senegal, Sudan, India)
- *Medical Societies* (Senegal, Sudan)
- *Youth volunteers* (Sudan)
- *Health experts* (Senegal, Sudan, India)

Donor Organizations

The present study makes reference to the following donor organisations:

- *The Italian Agency for Development Cooperation*
- *African Development Bank Group*
- *WHO SEED fund*

1.2.2 Case selection

Most of the literature on the diffusion of social innovation into low to middle income countries is based on single in-depth case studies, such as Mpesa's account of mobile banking in Kenya (Jack and Suri, 2011), BRAC's work in Bangladesh (Smillie, 2009) and Aravind's mission to solve illiteracy by improving the overall eyesight of people by subscription of glasses in the rural part of India (Mehta and Shenoy, 2011). The majority of cases considering the diffusion of social innovation into LMICs are observed individually by scholars and focused on one geographical location. Each of these innovations (product or service) are designed to find solutions to a particular social problem and have their own characteristics leading to their success.

The factors associated with successful diffusion of a product such as basic sanitation facilities (Ramani et al., 2012) and ITN delivery for malaria prevention (Krezanoski, 2016) are often limited by the attributes and characteristics of the product designed for solving a specific problem in a specific location. However, services enabled by digital technology such as BHBM health intervention offers a wider opportunity for successful adoption. Placing a digital platform at the heart of an innovation not only improves local infrastructure but also provide access to knowledge and skills on which new services could develop.

Despite the fact that BHBM has its own specific attributes and characteristics, it is not designed to be used in a specific country. Placing a digital platform to tackle NCD globally enables new services to emerge as a response designed and delivered in collaboration with existing local services. This research will facilitate deeper understanding of the activities carried out by the social system to support diffusion. We achieve this through receiving insight from the diffusion of one social innovation into three geographical locations. The three geographical locations – Senegal, Sudan and India - were selected on the basis of the following criteria:

1. Presentation of sufficient variety in the ways and approaches to introducing an EDSI to reveal how the diffusion process was enacted by actors of the social system.
2. Representation of EDSI diffusion into LMICs.
3. Diffusion of one social innovation to three different geographical locations.
4. For all three selected cases, the monitored projects are ongoing, with the diffusions largely successful in terms of financial sustainability and contribution to solving the local NCD problem.

Table 1-2 Brief summary of the three cases selected from BHBM

Country	Formal start	Formal end	Donor	Financial sustainability	Creating social impact
India					
mTobacco	2016	ongoing	Government and WHO	Embedded in government annual budget	2 million users enrolled from which 77% reported to be helpful to quit tobacco
mDiabetes	2016	ongoing	Government and WHO	Embedded in government annual budget	107 000 registered users (2018) 57% of the registered participants followed a healthy diet, 72% followed the advice on physical activity, 52% were screened for diabetes, and 67% checked their glycaemic status
Senegal					
mDiabetes	2014	ongoing	WHO and private sector	Private sector and formation of new services	Over 370 000 diabetic patients, their family members and health care providers since its launch. During the 2014 Ebola virus disease epidemic, the Government of Senegal used the programme to send 4 million SMS to raise awareness
Sudan					
mDiabetes	2017	ongoing	The Italian Development Cooperation and WHO	Public sector and formation of new services	10.9 % of the adult population in Sudan has diabetes. At the time of data collections studies were ongoing and data was not available on numbers associated with BHBM as no academic study has been conducted.
mCervical Cancer	2017	ongoing	African Development Bank Group and government	Public sector and formation of new services	Breast cancer and cervical cancer 36.6% account for cancer cases in women in Sudan. At the time of data collections studies were ongoing and data was not available on numbers associated with BHBM.

1.3 Research aims and objectives

This thesis contributes to the understanding of the overall research question, namely, ‘What is the role of the social system in the diffusion of EDSIs into LMICs?’ Through examination of three specific sub-questions, it addresses three primary research objectives: (1) to systematically review the literature on ‘What factors are associated with the successful diffusion of externally developed social innovations (EDSI) in LMICs?’; (2) to investigate ‘What role actors of the social system play in creating value from an externally developed social innovation?’; and (3) to illuminate ‘How multiple actors within a social system engage in activities to support the diffusion of EDSIs in LMICs?’. In particular, this thesis provides a novel approach by moving away from an innovation-centric view and instead adopting a systems-centric view.

1.3.1 Thesis structure

The thesis follows the ‘paper format’ approach in order to deliver research contributions through a series of distinct chapters in the style of journal articles. Each chapter considers the overall research question through a different lens and is structured through a self-contained framework, starting with the paper’s overall argument, followed by a literature review, research methodology, findings, discussion and the conclusion.

1.3.1.1 Systematic Literature Review – Role of social systems in diffusion of innovation

A systematic review was carried out in order to illuminate the key factors associated with the diffusion of externally developed social innovation - social innovation developed outside the context of their intended use - in low to middle income countries. We examine especially the role of the social system in successfully enabling widespread diffusion and adoption. As part of the review, a *a priori* framework was developed as a result of analysing 19 empirical papers against Roger’s original framework, which consisted of 4 core categories; (1) aim, (2) relations (3) communication (4) climate. The outcome of the review resulted in identifying a new category under ‘capacity’. Within this modified framework ‘value creation’ emerged as a sub-category to ‘communication’; (2) ‘collaborative behaviour’ to ‘climate’; and ‘adaptive, ‘self-organising’ and ‘indigenous’ under ‘capacity’.

Despite considerable previous research into the ways in which actors exchange information and knowledge as part of the communication process, far less investigation has been conducted into the ways in which value is created, delivered and captured through diffusion and, most importantly, what role each actor plays in this process. Looking at the role of actors in the creation of value as part of the diffusion process supports the foundation for both empirical papers and key research contributions. This chapter concludes by suggesting that the social system perspective, which includes diverse actors engaged in a dynamic process, permits a systems view of diffusion in which long term collaborations and the integration of indigenous knowledge into communication processes are associated with successful diffusion.

1.3.1.2 Role of social systems in value creation

Following on from the literature review, Chapter 3 addresses the question ‘What role actors of the social system play in creating value from an externally developed social innovation?’. First, the chapter reviews the literature on value creation, including core activities linked to the three stages of value creation and the concept of value co-creation. It then proceeds to give an introduction to both cases, an outline of the methods and an analysis of the data. This chapter includes two tables; one (Table 3-1) summarizing key resources within the social system and the second (Table 3-2) identifying key activities associated with the value creation process and providing an adapted framework on co-creation of value. The overall findings support the successful diffusion of an externally developed innovation on two accounts: first, by looking at the role of the social system in the total value creation process and second, by illuminating the role of civil society to drive the diffusion process through its ability to manoeuvre and to actively search for innovative solutions. Ultimately, empowering civil society to take an active role in creating value from a social innovation could change existing governance structures to become more supportive to long term diffusion. This chapter concludes with a call for future research on how to sustain a complex social innovation once it has been introduced to the market.

1.3.1.3 The activities within the social system

To develop insights into the above theme, Chapter 4 addresses the question how multiple actors within a social system engage in activities to support the diffusion of an externally developed social innovation into LMIC. This chapter takes a contemporary view of multiple actors involved in the innovation process where innovator and adopter cooperate closely, in particular

for the development of the innovation. It then offers a perspective on innovation ecosystems and how actors come to engage in activities around a digital platform to support the continued use of the innovation. After reviewing the literature, the chapter outlines the case methodology and introduces the three cases in which the data is analysed through the process of abduction. The findings of this chapter are presented in three tables (Tables 4-3, 4-4, 4-5) outlining activities along the three stages of the innovation process across Senegal, Sudan and India. Chapter 4 concludes with findings which highlights key activities along the innovation process, such as creating purpose-led alignment, combining resources, deploying digital platforms and exploiting local knowledge including the formation of new services as the main outcome of the diffusion process. This emergence of new services and the formation of an ecosystem indicate the need for future research to illuminate the role of ecosystems supporting the scaling of externally developed social innovations to LMICs.

1.3.1.4 Conclusions

Chapter 5 brings the findings together from the previous three chapters and discusses the theoretical and practical contributions of the thesis as well as its main limitations. The chapter closes with suggestions for ways in which the overall research findings may inform practice and inspire future academic work. Figures 1-3 below summarise the overall aims, objectives, structures, method and key observations of the thesis.

Figure 1-3 Thesis objectives, structure, research methods and key findings

Chapter 1	Introduction	This chapter outlines the research rationale for addressing the question <i>what is the role of social system in the diffusion of EDSIs into LMICs?</i> The aims and objectives of the research along with the overview of research design, thesis structure and research dissemination to date are presented.	
Chapter 2 (Paper 1)	The role of social system relations in the diffusion of social innovations in low resource markets	Objective 1: To systemically review the literature to build a framework on the factors associated with social systems in the diffusion of externally developed social innovations (EDSI) in low resource markets (LRM)	Systematic literature review: Evidence from 19 scholarly articles synthesized into a framework. Four concept emerged from the synthesis : (1) indigenous capacity of the social system (2) importance of indigenous knowledge in the communication of value from the innovation (3) adaptive capacity of the social system and (4) collective value creation.
Chapter 3 (Paper 2)	The role of social systems in the creation of value: the case of BHBM in Senegal and Sudan	Objective 2: To investigate the role of social system actors in creating value from an externally developed social innovations (EDSI) in low to middle income country (LMIC)?	In-depth case study: Evidence from two countries to illustrate how value is created by the social system. Illuminating key roles and interactions of the social system along the three stages of value creation. Highlighting civil society's role in maximizing value by ' <i>searching</i> ', ' <i>manoeuvring</i> ' and ' <i>replicating</i> ' to improve efficiency of the diffusion process.
Chapter 4 (Paper 3)	Activities within the social system supporting the continued use of EDSI to LMIC: the case of BHBM	Objective 2: To identify activities that underpin the introduction and continued use of an externally developed social innovation (EDSI) in low to middle income countries (LMIC).	In-depth case study: Evidence from the diffusion of BHBM enabled by a digital platform in three countries. By illuminating activities along the three stages of the innovation process highlighted <i>creating intimate alignment (purpose-led)</i> , <i>combining resources</i> , <i>deploying digital platform</i> , <i>exploiting local knowledge</i> , to underpin the continuous use of an externally developed social innovation in LMIC.
Chapter 5	Conclusions	This chapter sets out the theoretical and practical contributions of the overall thesis, including limitations on the research and future directions are proposed.	

1.4 Research Dissemination

Table 1-3 presents a summary of the dissemination of this research to date. Beyond theoretical advancement, my overall intentions for undertaking research on the diffusion of social innovations have always been to contribute to practice through better understanding of the activities associated with the innovation process and to help the private, public and third sector engage in fruitful discussions on co-creation of value from innovation and project design scalability for long term, real social impact. To meet these expectations, I proposed the overall topic of the thesis and designed the research method with discussion and refinements received from my supervisors. To ensure relevance and enhancement of practice I developed a strong collaboration with the WHO and with their support collected the data which I analysed alone while continuously testing it against the academic literature and the framework developed in Paper 1 as part of the literature review. In addition, I worked closely with the team of Be He@lthy, Be Mobile at the WHO to develop a handbook on best practice for building strategic partnerships to support the diffusion of mHealth programmes globally. The handbook is now circulated to all member states involved in the partnership so far and acts as a guide to member states wishing to join the digital agenda. I was invited to join the UN 75 Health Security panel discussions on universal access to healthcare and the role of digital technology to enable this process. In order to contribute to the academic conversation on managing social innovations effectively and to expose the potential of digital technology to catalyse the diffusion of externally developed social innovation, I drafted three papers with advice and feedback from both of my supervisors. All three papers have been submitted and accepted at academic conferences and are in preparation to be sent to academic journals.

Table 1-3 Research dissemination

Paper	Journal papers	Conference papers and academic presentations	Practical presentations and documents
Paper 1 (Chapter 2)	In preparation: Ihasz O, Vyakarnam S. & Adams RJ. The role of social systems in the diffusion of externally developed social innovation into low resource markets.	<p>‘The role of social systems in the diffusion of externally-developed social innovation into low resource markets.’ accepted at British Academy of Management September 2020.</p> <p>“Social system relations in the diffusion of social innovation into low resource markets.” presented at R&D Management Conference Paris, June 2019</p>	<p>UN75 panellist on ‘Health Security’ and contribute writing the Agenda for ‘<i>Urgent Actions for a More Secure World</i>’.</p> <p>Presenting findings to the Department of Digital Health & Innovation, WHO HQ, September 2020</p> <p>Findings are included in the WHO’s Handbook on mHealth Programmes, September 2020</p>
Paper 2 (Chapter 3)	In preparation: Ihasz O, Adams RJ, Vyakarnam S. The role of social systems in the creation of value from externally developed social innovations: the case of Senegal and Sudan	“Listen to our voices” : the case of BHBM in Sudan and Senegal submitted R&D Management Conference July 2021	
Paper 3 (Chapter 4)	In preparation: Ihasz O, Vyakarnam S. & Adams RJ. Activities within the social system to support continuous use of a social innovation to low to middle income context : the case of BHBM	“The case of Be Healthy, Be Mobile: the role of digital platform shaping sustainable innovation in developing countries” submitted to R&D Management Conference , July 2021	

1.5 References to Chapter 1

- Adner, R. and Kapoor, R., (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic management journal*, 31(3), pp.306-333.
- Alvord, S. H., L. D. Brown, C. W. Letts., (2004). Social entrepreneurship and societal transformation: An exploratory study. *Journal of Applied Behavioral Science* 40(3) pp.260–282.
- Bergenholtz, C., and Waldstrom, C. (2011). ‘Inter-Organizational Network Studies: A Literature Review’, *Industry and Innovation*, 18(6): 539–62.
- Cooper, R. G., and Edgett, S. J. (2007). *Generating Breakthrough New Product Ideas: Feeding the Innovation Funnel*. Canada: Product Development Institute. [SEP]
- de Jong, J.P., Gillert, N.L. and Stock, R.M., (2018). First adoption of consumer innovations: Exploring market failure and alleviating factors. *Research Policy*, 47(2), pp.487-497.
- Eisenhardt, K.M. and Graebner, M.E. (2007). Theory building from cases: Opportunities and challenges. *Academy of management journal*, 50(1), pp.25-32.
- Greenwood, R. (2008). *Configuration Theory*. In: Clegg, S. R. & Bailey, J. R. (eds.). Thousand Oaks, CA: SAGE Publications, Inc.
- Greer, C.R., Lusch, R.F. and Vargo, S.L., (2016). A service perspective. *Organizational dynamics*, 1(45), pp.28-38.
- Huddart, S., (2010). Patterns, principles, and practices in social innovation. *The philanthropist*, 23(3), pp.221-234.
- Jack, W. and Suri, T., (2011). *Mobile money: The economics of M-PESA* (No. w16721). National Bureau of Economic Research.
- Katsuru R.V. (2013) *Arvind Eye Hospital, Madurai, India: In service for Sight* IN: HBS 9-593-098 Boston: Harvard School Publishing
- Kastelle, T., & Steen, J. (2014). Networks of innovation. *The Oxford Handbook of Innovation Management*, pp.102-120. Oxford University Press
- Lawrence T.B., Dover G., and Gallagher B. (2013). Managing Social Innovation. *The Oxford Handbook of Innovation Management*, pp.316-335. Oxford University Press
- Leadbeater, C. (2008). *Understanding Social Innovation*. Melbourne, Australia: Center for Social Impact:1–5.
- Mair, J., I. Marti. (2006). Social entrepreneurship research: A source of explanation, prediction, and delight. *Journal of World Business* 41(1) pp.36–44.

- Mair, J., Martí, I. & Ventresca, M.J. (2012). Building inclusive markets in rural Bangladesh: How intermediaries work institutional voids. *Academy of Management Journal*, 55(4), pp.819-850.
- Mehta P.K & Shenoy S. (2011) *Infinite Vision: How Arvind Became the World's Greatest Business Case for Compassion*. San Francisco: Berrett-Kochler Publishing
- Miller, D. & Mintzberg, H. (1983). The case for configuration. In: Morgan, G. (ed.) *Beyond method: strategies for social research*. Sage.
- Mohr, J.J., Sengupta, S. & Slater, S. (2004). *Marketing High Technology Products and Innovations*, 2nd ed. Upper Saddle River, NJ: Prentice-Hall.
- Moore, G.A. (2002). *Crossing the Chasm: Marketing and Selling Disruptive Products to Mainstream Customers* HarperCollins
- Morino, M. (2009). 'The Innovation Imperative' [online], *Social Innovations Stanford, Social Innovation Review*.
- Mulgan, G., (2006). The process of social innovation. *Innovations: technology, governance, globalization*, 1(2), pp.145-162.
- Mulgan, G., (2012). The theoretical foundations of social innovation. In *Social innovation* pp. 33-65. Palgrave Macmillan, London.
- Mulgan, G. (2017) Social innovation –the last and next decade. NESTA (9th February 2017)
- Nielsen, K.R., Reisch, L.A. and Thøgersen, J., (2016). Sustainable user innovation from a policy perspective: A systematic literature review. *Journal of Cleaner Production*, 133, pp.65-77.
- Ordanini, A., Parasuraman, A. & Rubera, G. (2014). When the recipe is more important than the ingredients: A qualitative comparative analysis (QCA) of service innovation configurations. *Journal of Service Research*, 17, pp.134-149.
- Phills, J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering social innovation. *Stanford Social Innovation Review*, 6, pp.34-43.
- Porter, M.E. and Kramer, M.R. (2011). The Big Idea: Creating Shared Value. How to reinvent capitalism—and unleash a wave of innovation and growth. *Harvard Business Review*, 89(1-2).
- Prahalad, C.K. (2004). *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits*. Upper Saddle River, NJ: Wharton School Publishing.
- Radjou, N. and Prabhu, J. (2015). *Frugal Innovation: How to do more with less*. The Economist.
- Radjou, N., Prabhu, J. and Ahuja, S. (2012). *Jugaad innovation*. Random House India.
- Ragin, C.C. (1989). *The comparative method-moving beyond qualitative and quantitative strategies*. Ragin CC

- Ragin, C.C. (2014). *The comparative method: Moving beyond qualitative and quantitative strategies*. University of California Press.
- Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.) New York: Free Press.^{[1][SEP]}
- Schumpeter, J.A. (2010). *Capitalism, socialism and democracy*. Routledge.
- Seebode, D., Jeanrenaud, S. and Bessant, J. (2012). Managing innovation for sustainability. *R&D Management*, 42(3), pp.195-206.
- Smillie I. (2009) *Freedom from Want: The Remarkable Success Story of BRAC, the Global Grassroots Organization That's Winning the Fight against Poverty*. Sterling VA: Kumari Press
- Smith, A., Stirling, A. & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy*, 34(10), pp.1491-1510.
- Tigabu, A.D., Berkhout, F. and van Beukering, P., 2015. The diffusion of a renewable energy technology and innovation system functioning: Comparing bio-digestion in Kenya and Rwanda. *Technological Forecasting and Social Change*, 90, pp.331-345.
- Tranfield, D., Denyer, D. and Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British journal of management*, 14(3), pp.207-222.
- Trischler, J., Johnson, M. and Kristensson, P. (2020) A service ecosystem perspective on the diffusion of sustainability-oriented user innovations. *Journal of Business Research*, 116, pp. 552-560,
- Westley, F., and Antadze, N. (2009). 'Making a Difference: Strategies for Scaling Social Innovation for Greater Impact,' *The Innovation Journal: The Public Sector Innovation Journal*, 15(2)
- Yu, D. & Hang, C.C. (2010). A reflective review of disruptive innovation theory. *International journal of management reviews*, 12(4), pp.435-452.
- Zanella, G., Fu, X., Mohnen, P. & Ventresca, M. (2016). The creation and diffusion of innovation in developing countries: a systematic literature review. *Journal of Economic Surveys*, 30(5), pp.884-912.

2. THE ROLE OF THE SOCIAL SYSTEM IN THE DIFFUSION OF SOCIAL INNOVATION

ABSTRACT

This article contributes to the understanding of social system components which support the successful diffusion of social innovation into low to middle income countries (LMICs). The importance of finding solutions addressing the most pressing global challenges such as those articulated in the UN's Sustainable Development Goals (SDGs) compels us to develop a better understanding of the factors underpinning the successful diffusion of social innovations. As a precursor to this endeavour, we systemically review 19 empirical scholarly articles from the previous two decades – a period that has witnessed increased attention to social innovation as one possible solution to the SDGs. We are especially interested in the diffusion of externally developed social innovations (EDSI), that is, innovations developed outside the context of their intended use. In the diffusion process we illuminate the importance of the social system as the fourth pillar in Rogers' diffusion of innovation theory and develop a framework for factors associated with the role of social system in the successful diffusion and adoption of EDSIs. Findings suggest that viewing diffusion through the lens of social system offers a new perspective, thereby constructing it as a multi-directional communication process between diverse actors dynamically engaged with the integration of local knowledge into diffusions. This significant shift also permits a systemic view of diffusion, highlighting the need to reconsider the role of diffusers and adopters in this dynamic process.

Key terms: diffusion; social innovation; social system; low to middle income countries

2.1 Introduction

Estimating the global spend on development aid is a challenging task. Contributions from governments in 2017 amounted to approximately USD\$1.5tn (OECD, 2019). More difficult to quantify is the value of contributions and endeavours from charities, NGOs and commercial organisations in tackling these global challenges. Whatever the value, the challenges doggedly endure, seemingly impervious to solutions and, for a number of reasons, failure rates remain high. Of particular concern is the challenge of promoting widespread adoption and use of technological social innovations developed outside of the context of their intended use. Social innovation, that is, the ‘application of new, creative and sustainable approaches that promote social inclusion, wellbeing and prosperity’ has been identified as a powerful means of addressing some of the world’s most intractable social problems (Alvrod et al., 2004) with the intention to bring social (and possibly environmental) value as well as economic value (Phills et al., 2008; Mulgan et al., 2007; Dacin et al., 2010). These externally developed social innovations, whether of greater or lesser complexity, have long been proposed as solutions to developing economy challenges.

For example, the World Health Organization's (WHO) Global Malaria Eradication Program (GMEP) which launched in the 1950s (Alonso et al., 2011); although great strides have been made, eradication has yet to be achieved. One strategy, the wide-scale adoption of insecticide-treated nets (ITNs) has led to significant reductions in malaria morbidity and mortality worldwide. However, as Krezanoski (2016: 39) notes, the effectiveness of ITN delivery for malaria prevention relies on a diversity of activities, including ITN manufacturing and design, integration into national and international malaria prevention policies, supplying and distributing ITNs to households and individuals, and, finally, programmes focused on spurring demand for and use of ITNs by individuals at risk.

Similarly, in 2007 readers of the influential British Medical Journal voted sanitation the most important public health advance of the past 175 years (Ferriman, 2007), while the UN has enshrined sanitation as a human right (UN, 2015). In spite of efforts over generations to increase the number of people using safe sanitation on a daily basis, today 2.4 billion people lack access to basic sanitation services such as toilets or latrines, with at least 1.8 billion people globally using a source of drinking water that is fecally contaminated (UN, 2015). Over the decades, a number of approaches have been tried, including technological (Ramani et al., 2012),

market-based (Jenkins and Pedi, 2013), and community-led (Crocker et al., 2017) sanitation initiatives; these have met with mixed success. The global adoption and diffusion of improved sanitation is impacted by numerous factors; these exist at the macro- and micro-levels, as well as on the supply and demand sides. Challenges include both water and non-water related factors (Fry et al., 2008), ranging from water-stressed contexts to policy and infrastructural shortcomings as well as socio-economic and cultural issues at the level of the individual user (Okurut and Charles, 2014, Winters et al., 2014). Compounding these challenges is the requirement that any solution should represent an affordable and attractive proposition to target users - the world's poor – and so enhance the likelihood of adoption and continued use.

A substantial body of literature already exists on diffusion from the perspective of both external factors (political stability, financial capability, economic openness, level of ICTs) as well as internal factors (human capital, resources, culture) influencing the diffusion of innovation to LMIC markets (Pansera and Owen, 2015) mostly on a firm based level (Zanello, 2016; Strang & Soule, 1998). However, in response to the current, complex global challenges, an entirely new dynamic is now present, one which is shifting firm based perspectives to group-based perspectives where various actors collaborate to successfully diffuse an innovation. To understand diffusion from a group based perspective, we must first gain a deeper understanding of how actors in a social system collaborate throughout the diffusion process. While it is true that external factors play a key role in influencing the rate of diffusion, here we are interested in the decisive internal factors supporting the successful diffusion.

These observations raise the question of the nature of the factors promoting the successful adoption and diffusion of these externally-developed social innovations. In recent years, a sub-stream of the innovation literature has turned its attention to the so-called 'Bottom of the Pyramid' (BoP) (Ramani et al., 2012; Pansera and Owen, 2015), that one-sixth of the planet's population who survive on around one US dollar a day but who, nonetheless, represent a market opportunity (Hart and Christensen, 2002). Much of the BoP innovation scholarship has focused either on home-grown, bottom up innovation processes, such as *jugaad* (Radjou et al., 2012), resource constrained (Immelt et al., 2009) and frugal (Ray and Ray, 2011) innovation, or on the BoP as a source of innovations for developed markets (Prahalad, 2012). Scholars mostly observed how culture and religion, ethnicity, level of literacy, needs and geographical proximity influence the adoption rate of BoP innovations (Prahalad, 2004, 2006, 2012; Radjou and Prabhu, 2015; Zanello et al. 2016, Acheampong and Esposito 2014).

Though home-grown innovations continue to offer the prospect of credible solutions to LMIC social challenges (Agarwal et al., 2017), the bottom up approach may not always be the most effective (Adams et al, 2016). Externally-developed innovations have the advantage of being able to provide access to leading-edge technological thinking not generally available in LMICs where home-grown innovations are potentially sub-optimal. Additionally, BoP innovators lack access to resources, communication channels and information pathways to scale up innovation. However, scholars' focus on the bottom-up approach has had the effect of de-emphasising the role of technology transfers and spillovers from developed economies (Agarwal et al., 2017), leaving large gaps in our knowledge concerning the processes for diffusing efficacious externally developed social innovations into LMICs which, for technical, economic, social and cultural reasons, have often encountered barriers to their widespread adoption and diffusion (Adams et al., 2016).

Multi-actor collaborations have been emerging in the context of solving complex social problems such as SDGs over the past twenty years. Rogers' widely cited diffusion of innovation theory (DoI) offers a general view of the communication and influence processes operating both on and within the adopter community. He conceptualises the social system as a "set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (Rogers, 2003 p.23). However, one significant limitation of DoI is that it neglects the dynamic nature of these communication processes where adopters' choices are uniformed by the activities or choices of others, especially local actors (Strang and Soul, 1998). Looking at diffusion through a social system lens requires a far deeper understanding of these dynamics.

By taking a systems view of the diffusion of innovation, this research provides support for contemporary perspectives on diffusion suggesting diffusion being a non-linear, recursive, multi-actor process. In the process of diffusion multiple actors of the social system engage in joint activities to create value while the social innovation is being diffused. Our findings highlighted how multiple actors of the social system engage in the co-creation of value as part of the diffusion process, therefore suggesting that diffusion can co-creative communication process.

Recent studies also highlight the increasing prominence of a systems perspective on the innovation process as a creation, combination and recombination of information which is not only generated by one unit but by a whole system of actors (Dougherty, 2017; Bansal 2015). This view holds its own challenges in regard to understanding the relational dynamics between

various actors of the social system. In order to pursue this line of reasoning, we need to better understand the relational dynamics and communication processes between units of the social system.

What is missing from previous scholarship on the topic is a comprehensive understanding both of the way in which EDSIs successfully diffuse into LMICs and of the factors associated with the social system underpinning their diffusion and adoption. To address this gap and to assess the state of current knowledge in this field, we undertook a systematic review of the literature (Tranfield, Denyer & Smart 2003), adopting framework analysis as our method of synthesis (Ritchie & Spence 2009; Dixon-Wood, 2011). Drawing on the academic literature, I looked at two key themes (1) diffusion of EDSIs, and (2) the role of the social system in the diffusion process.

The paper proceeds as follows: drawing on Rogers' DoI theory, in particular the social system factors influencing the diffusion and adoption process (Rogers, 2003), we first develop a framework based the following key factors: (1) aim, (2) relations, (3) communication, (4) climate,. Second, and using the original framework as the basis for our analysis and synthesis, we systematically review the literature (Denyer and Tranfield, 2009) with specific focus on the role of the social system in diffusing social innovations (Bornstein 2004; Christensen et al., 2006, Phills at al., 2008; Mulgan 2010; George et al., 2016) in LMIC context. Despite the existence of a significant body of literature on the way actors exchange information and knowledge as part of the diffusion process, less attention has been devoted to understanding how value is created, delivered and captured, and most importantly what role each actor plays in this process. Third, we present our results and findings, suggesting that the social system perspective permits a systemic view of diffusion in which the integration of indigenous knowledge into communication processes and collaborative value creation is closely associated with successful adoption. We conclude with a discussion of our findings and draw conclusions.

2.2 Methods

To provide a benchmark for the state of the research evidence, a comprehensive synthesis of the academic literature was conducted using Tranfield et al.'s (2003) systematic literature review approach. Focusing on the role of the social system, the review adopts a configurational approach by looking at patterns of activities carried out by social system actors along the

diffusion process in which actors of the social system are interconnected and also aligned with a common goal (Greenwood, 2008).

Diffusion occurs within a social system, and is promoted, facilitated and encouraged by all the actors of the social system who are actively engaged in the communication process. These actors could be individuals, informal groups, or organisations. In this review, we view the social system not through the lens of individuals but instead through that of informal groups and organisations, who are bound together by one common objective, namely, “to solve a common problem in order to reach a mutual goal” (Rogers, 2003, p.24). The structure of the social system affects the diffusion process in various ways. First it offers a boundary within which an innovation diffuses, and second, it presents social norms influencing the diffusion and adoption (Rogers, 2003).

Consequently, the social system can be understood to constitute the social space within which an innovation diffuses, its boundaries reflecting the values and norms of the various actors as well as their respective roles in making decisions about the innovation. Within the social system, an innovation diffuses either through a top down approach in which innovators push messages down to potential adopters through a variety of communication channels, or as a horizontal process in which adopters communicate informally among themselves, conveying affirmation of the efficacy of the innovation (Rogers, 2003). Effective communication between both of these units is considered essential for successful diffusion.

Rogers posits that both change agents and opinion leaders have, as actors of the social system, a major role in the diffusion process (Rogers, 2003). Emerging from the adopter community, their main role is to communicate the innovation to other members of society (Rogers, 2003). Previous research has focused on understanding how these opinion leaders influence other social actors (Valente and Pumpuang, 2007), finding that international development agencies typically identify so-called change agents locally and then direct them to identify opinion leaders within the community as they are believed to play a pivotal role in getting an innovation adopted by an entire community.

Rogers (2003) refers to diffusion as a process by which an innovation is communicated through certain channels over time among the actors of a social system. This involves a particular form of communication concerned with the spread of messages about the new innovation. The

newness of an innovation adds a degree of uncertainty and perceived risk to this process which can be reduced by providing continuous information about the innovation. To understand the importance of the innovation and its benefits, we first need to understand the values associated with the innovation itself, specifically the value of externally-developed social innovations.

In order to reduce uncertainty concerned with the newness of an innovation, building trust is essential. Building trust between various social actors leads to an increased level of trust in the information itself which then influences the rate and continuity of the adoption. Communications are recognised to be a critical factor for successful diffusion (Rogers, 2003), in particular when this communication takes place through various information pathways (Newell et al., 2003) between social actors. Indeed, the absence of appropriate information and communications can contribute to failed diffusion attempts, for example in the case of the initial failure of electronic banking in Nigeria (Newell et al., 2003).

2.2.1 Framework Development

To support data analysis and synthesis we adopt the framework approach (Ritchie and Spence 2009; Dixon-Wood, 2011). Framework synthesis offers a highly structured approach to organising and analysing data and is distinct from other approaches in that it utilises a framework, informed by background material and existing knowledge. In addition to the starting framework, new categories can be developed and incorporated as they emerge from the data (Barnett-Page and Thomas, 2009). Our study begins by drawing on the innovation literature to establish a framework of factors associated with the successful diffusion of social innovations into LMICs.

To build a framework on social system factors influencing the diffusion of innovation in low to middle income countries, we looked at Rogers' (2003) conceptualisation of the social system as fourth pillar in his influential theory of the diffusion of innovation. First, we identified *relations* as a category to reflect on the various actors of the social system where these actors are not identical and the relation between them depends on the social system itself. Most of the social systems considered in the literature are hierarchically organised, giving different power to actors at different stages of the diffusion process. In addition to this formal structure view, Rogers also differentiates between formal and informal groups that exist within the social system; informal groups also exist in interpersonal networks, linking actors to interact with each other.

Second, we identified as a pertinent category the *communication* structure of a social system, including the various pathways through which information is communicated between actors of the social system. Communication structure has been of significant interest to communications scholars, including Rogers, who affirms that “it is as unthinkable to study diffusion without some knowledge of the social structure in which potential adopters are located, as it is to study blood circulation without adequate knowledge of the veins and arteries” (Rogers, 2003, p.25). Despite communication’s crucial role in the diffusion process, few of the studies within the 19 empirical papers have examined how the communication structure affects the diffusion and adoption of innovation within a system. (Godfried and Azerikatoa, 2017; Derwisch et al., 2016; Bathia and Ritchie, 2016; Tumbo et al., 2013; Foster and Heeks, 2013).

In order to gain a more nuanced and more accurate view, it is imperative to understand the role of each actor in the system and the role each actor plays in the communication. One essential aspect of the social system relates to the characteristics of these actors. Rogers differentiates between actors of the diffuser community, being a group or community of organisations or institutions actively involved in the communication of the innovation to the end user (adopter), compared to the adopter community, being individuals involved in making decisions about either adopting or rejecting the innovation. Within a given system, these individuals also occupy different positions and perform different functions, including that of being opinion leaders or change agents who influence individual decision making.

We considered *climate* to be the third category of social system factors influencing the diffusion of innovation. In addition, within this heading, trust has been determined as an important sub-category, and in particular, how trust becomes a key driving factor to support successful communication of the innovation. Opinion leaders and change agents are important actors in the social system, since they provide information and advice about the innovation. The relational dynamics between opinion leaders and change agents could accelerate or delay the diffusion, and may additionally prevent the adoption of undesirable innovations (Rogers, 2003).

The fourth category in our *a priori* framework is identified as *aim*, referring to a common problem requiring a solution and deploying overlapping resources in order to reach a mutual goal which binds the system together. Alignment has been identified as a key sub-category

under aim, and identifies a common goal and/or interest in which actors of the social system organize their resources. Therefore, the overall aim of the social system can certainly guide activities of each actors, it could also hold the key to successful diffusion. (Rogers, 2003)

Table 2-1 Framework of social system factors influencing diffusion of innovation (based on Rogers' DOI theory)

Relations	Communication	Climate	Aim
(1) Formality	(1) Information pathways	(1) Trust	(1) Alignment
(2) Power	(2) Communities		

2.2.2. Locating studies

The electronic journal databases used between April 2018 and September 2018 to conduct the research were Scopus, EBSCOhost, JSTOR, and ProQuest (Elsevier, Science Direct, Wiley Online Journals, and Emerald). As part of the search, policy papers and documents developed by the UN, UNRISD, OECD, and NESTA were also reviewed. We sought empirical studies published between 1998 and 2018 in order to develop an overview of the innovation literature concerning the diffusion of social innovation in the past 20 years. Significantly, in the past twenty years since the introduction of the Millennium Development Goals by the UN in 2000, followed by the introduction of the Sustainable Development Goals in 2015, innovation has become a core offering to solve social problems. This has led to the development of the innovation literature to provide insight and detailed understanding of social innovation (Bornstein, 2004; Christensen et al., 2006; Phillips et al., 2008; Mulgan, 2010; George et al., 2016).

Social innovation appears in the literature in many different guises. To capture the diversity of social innovation with a particular focus on the role of social system in the diffusion process, we needed to be both flexible and rigorous. Moreover, in order to capture the variety of studies examining the diffusion of exogenously developed social innovation, we explored at search strings which included the following keywords:

Table 2-2 Search strings

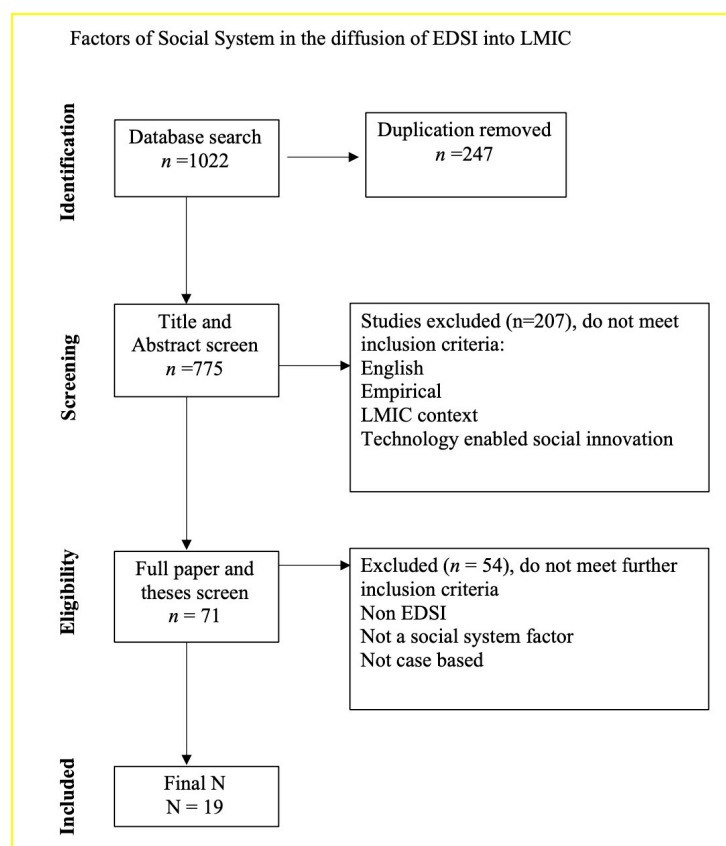
Theme	Search string
Social Innovation	“social innovation” OR “socio-technological innovation” OR “responsible innovation” OR “bottom of the pyramid (BoP)” OR “inclusive innovation” OR “disruptive innovation” OR “inclusive development”
Innovation Process	“diffusion of innovation (DoI)” OR “innovation process*” OR “innovation activity*” OR “adopt*” OR “diffuse*” OR “collective action”
Social System	“social system relations” OR “social system*” OR “partnership*” OR “network*” OR “eco-system*”

2.2.3 Study selection

This search resulted in the identification of 1022 scholarly articles in peer-reviewed journals and the grey literature in the last two decades (Figure 2). After removing the duplications, 775 articles were identified. These articles were selected to answer the core research question; What factors are associated with the successful diffusion of externally developed social innovations (EDSI) in LMICs?

Articles were included if they were empirical, evidence based, concerned with the diffusion and adoption of EDSIs in the context of LMICs, and presenting evidence for the role of social system in the diffusion process. The search focused on identifying articles that included technological innovations imported and designed to solve social problems associated with healthcare, education, clean water and sanitation, ICT and agriculture. Articles were excluded if they were non-empirical or non-evidence based, focused on corporate innovation, the engineering design process and innovations that were developed locally. (Figure 2-1). The summary of the 19 articles are added in Appendix B (pg.302).

Figure 2-1 Flow chart to identify studies for data extraction

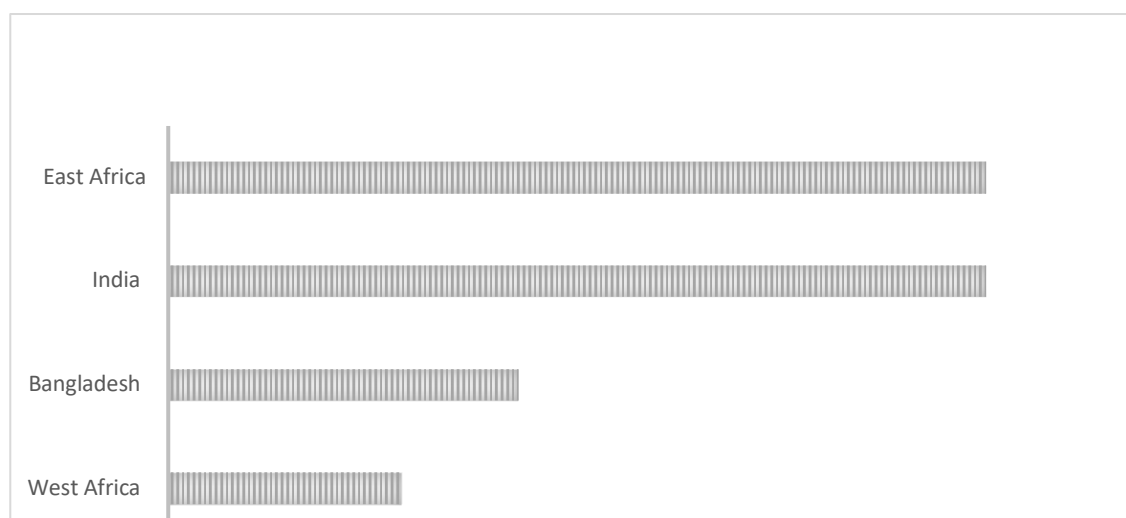


In this paper, success refers to the implementation and continued use of the innovation that provides a solution to a social problem or social need (Mumford et al., 2002; Alvrod et al., 2004; Marti and Mair, 2006; Mair et al., 2012; Phills et al., 2008). Under the category of low to middle income countries, we refer to countries defined by the World Bank (2015) as being resource constrained (socially, economically and environmentally) with limited or non-existent infrastructure or access to basic services.

2.2.4 Descriptive analysis

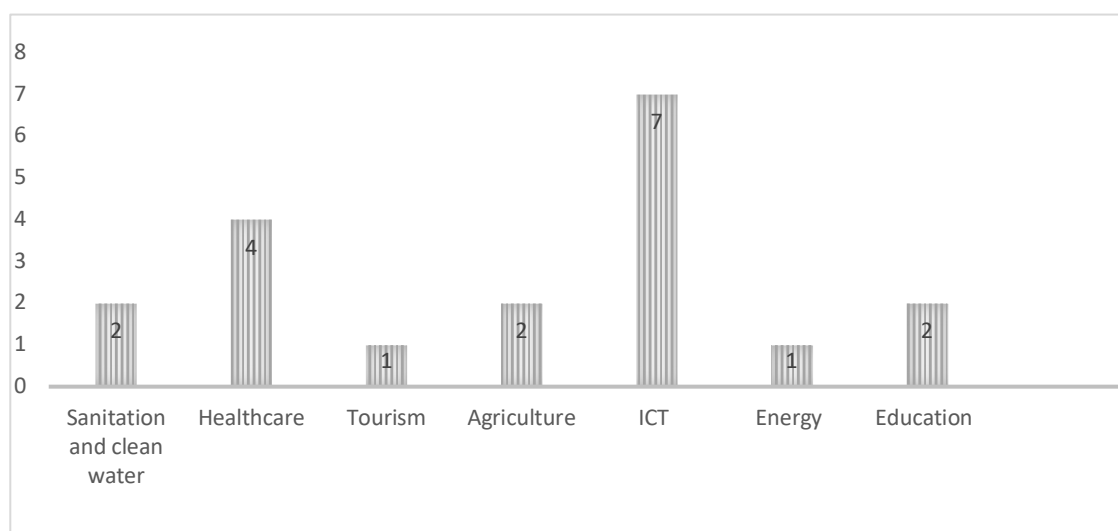
Figure 3 and Figure 4 show, respectively, the country setting and sectoral focus for each of the included studies (n=19). In terms of country focus, EDSI diffusion was studied mostly in countries of the Asian continent (10), primarily India (7) and Bangladesh (3). African countries were covered in studies of Uganda (1), Ethiopia (1), Kenya (2), Rwanda (1), Malawi (1), Tanzania (1) and Ghana (2). Across these countries, a range of social innovation themes were addressed including access to clean water, education, basic healthcare and financial inclusion.

Figure 2-2 Included studies country focus



Themes examined by the included studies were: sanitation and clean water (2), healthcare (4), tourism (1), agriculture (2), ICT (7), energy (1), and education (2).

Figure 2-3 Number of papers reviewed by sectoral focus



2.3 Findings

As a result of conducting the systematic literature review (Tranfield et al., 2013) we identified a new category, i.e., *capacity* of the social system. Capacity denotes the ability of the social system to exploit and capture value from innovation over a long period of time. Within this modified framework 'value creation' emerged as a sub-category to 'communication'; (2) 'collaborative behaviour' to 'climate'; and 'adaptive, 'self-organising' and 'indigenous' under 'capacity'. Positioning value creation as a sub-category of communication offers a new lens through which to observe and understand the diffusion process. Diffusion is no longer solely associated with the communication of the innovation but also with the co-creation of values from the innovation. Similarly, under the category of climate, we introduced digital as a new sub-category. The increased use of digital and mobile technology in low to middle income countries affects the level of trust between actors of the social system and also nurtures a more collaborative approach to diffusion. Previously, in Rogers' work, collaboration occurred in the types of decisions that a social system makes about the innovation. These decisions were primarily made by individual actors, rather than by an entire social system. Despite the fact that collective innovation decisions highlight the importance of all actors' involvement in consensus building, research to understand collective innovation decision-making has been scant within the diffusion literature.

2.3.1 Relations

Under the category of relation, we refer to informal and formal relational dynamics of social system and their influence on innovation diffusion.

2.3.1.1 Formality

A large part of the diffusion process takes place between formal and informal groups, through intermediaries and connectors such as public, private and not-for-profit organisations (Goldsmith et al., 2010). In the past few decades, relations occurring in the process of international development, and especially the ways in which practices of formal relations undermine the informal ones (Matthews, 2017), have attracted considerable scholarly interest. Informal relations meanwhile have been considered essential in reinforcing power between social actors (Reinicke, 1999; Held et al., 1999; Faul, 2016). The literature additionally foregrounds the active role of informal boundary spanners - individuals crossing internal

organizational boundaries (Booyens et al., 2017, Masuda et al., 2018) - who form close and often interpersonal interactions with the adopter community (Acheampong and Esposito 2014, Anderson and Kupp, 2008; Ramani et al., 2012) and provide important links to support successful diffusion (Bacon et al., 2008; Murray et al., 2010). Informal relations in the form of civil society interactions add to the diversity of the social system, prerequisite to building strong information pathways supporting the communication of innovation to a local level.

2.3.1.2 Power

Formal relations between political organisations, governmental institutions, and large corporations are often associated with power and hierarchical structures resulting in diverse social, economic and monetary gains globally (Gries et al., 2018). According to Gries, diffusion requires strong connections to global value chains, as well as sufficient positive local conditions to exist in developing countries. If these connections are in place, they could attract foreign investments and trade relations to enable EDSIs to diffuse into low to middle income countries. Diversity of relations and change in local conditions such as improved local involvement in the diffusion process (Gries et al., 2018) could challenge the malfunctioning of local governments, highlighted as a key barrier to diffusion.

2.3.2 Communication

The heading of communication is used by the present research to refer to the various processes in which information and knowledge are exchanged between actors in the social system.

2.3.2.1 Information pathways

In our *a priori* framework (Table 2-1) we identified communication as a critical feature of social system, and in particular, foregrounded the role of information pathways in enabling a clear flow of communication between social system members. Tumbo's (2013) study on the Makanya watershed in Tanzania found that norms, values, culture and religion varied in terms of the innovation apart from two factors, one being group belonging and the other being information pathways (Tumbo et al., 2013). The concept of neighbourhood was found to be one of the main indicators for successful diffusion and social cohesion (Tumbo et al., 2013). Folke (2005) also identifies the neighbourhood as a unit of analysis in developing contexts;

this requires further attention since it holds the key to designing new information pathways which will from the start of the process include local knowledge and existing practices.

Rogers' view on the role of opinion leaders in communicating information to the adopter community could denote another limitation of his theory, in that it appears to move the blame from the system to an individual, thereby counting the latter responsible for the successful adoption. While opinion leaders are still considered central to communicating the innovation's value, they remain part of a larger social system. Understanding the problem on a systemic level could thus help in identifying key factors influencing the success rate of the diffusion process. Matthews' (2017) study has found evidence that not only did opinion leaders appear to be among the least innovative of the community, in fact the real innovators appeared to be marginalised members of the community. This also supports our suggestion for integrating indigenous knowledge and existing practices to become a driving force behind successful diffusion.

2.3.2.2 Value creation

We have found value creation between social actors to be often internally-oriented and focused on activities associated with the diffusers. Value creation can nevertheless also require complex and dynamic co-ordination among multiple external actors, through processes including open-innovation (Chesbrough et al., 2006) customer-involvement, and strategic partnerships (Bharadwaj et al., 2013). In this sense, value creation and delivery capture both supply and demand-side considerations where value is created not only by diffusers, but also by customers (adopters) and other actors of social system (Massa et al., 2017). This has two important implications: first, value can be co-created with the customer through socially constructed experiences and during usage of the innovation (Grönroos & Voima, 2013); second, value creation becomes an important part of diffusion connecting all actors in the social system from the start of the process. Communication of the innovation's benefits through value creation facilitates further information exchanges amongst actors in the social system (individuals and institutions) and enhances further collaboration while lowering transaction costs associated with the innovation (Missimer et al., 2017; Wolleback & Selle 2008; Fukuyama, 2002; Putnam 1993).

2.3.3 Climate

Under the category of climate, we refer to the conditions in which actors of the social system carry out their activities as part of the diffusion process.

2.3.3.1 Trust

By contrast, lack of communication and misleading information can lead to a negative spiral and cause dysfunctionality (Rothstein, 2005, 2007), rising fear levels and betrayal between members of a social system (Godfried and Azerikatoa, 2017). Lack of access to information and the subsequent mistrust of new innovations were listed as key attributes behind unsuccessful diffusion (Folke et al., 2002; Missimer et al., 2017; Godfried and Azerikatoa, 2017), in turn leading to resistance towards the innovation and the subsequent discontinuity of adoption or continuous rejection (Silvestrea and Neto, 2013). For an innovation to be trusted it needs to be cost-effective, accessible and secured (Godfried & Azerikatoa, 2017).

In the case of India, using smart healthcare devices to monitor e-health and wellbeing, Papa et al., (2018) found significant evidence that sourcing external knowledge to strengthen trust for the innovation could be a real breakthrough in supporting successful diffusion. According to their findings, the key to economic growth is not only developing new innovations but also transforming knowledge into economic value. In India's case external knowledge sourcing was found to be an important driver to large scale diffusion creating a technology-driven intelligent environment (Papa et al., 2018)

In India healthcare monitoring is still poor compared to other countries in the world, in spite of its relative affordability. The role of digital technology has created a new form of value and trust regarding the innovation. According to the empirical studies listed in our paper, there is a clear shift towards distributing information across society with the use of digital technology. Trust in information thus becomes a key mediating variable between information quality and information usage between the diffusers and adopters (Kelton et al., 2008). To develop a deeper understanding of this phenomenon, future research is required to understand how actors of the social system engage with the use of digital in these communication processes.

2.3.3.2 Collaborative behaviour

Findings from the empirical cases also highlighted collaborative behaviour as an enhancing factor for successful local diffusion (Booyensa et al., 2017). Dey (2016) illustrates how members of a rural Bangladeshi society integrated the use of mobile phones into their daily lives creating new and often inventive practices (Dey et al., 2016). The farmers' benefits were shaped and re-shaped through iterative interactions between multiple actors, through collective action and collectively creating value with or without direct support from the diffusers. This also supports our suggestion to shift the local community to a position of much greater overall control as regards value creation, thus conceptualising them as an active part of the overall diffusion process rather than a mere end user for the innovation. To support this line of thought, we have also found evidence for collective action as a key factor in the successful uptake of the technology in Tanzania (Tumbo et al., 2013).

2.3.4 Aims

Under the category of aim, we refer to the connection between actors in the social system and a common goal, which in most cases means the need to solve a particular social problem or address a social need (Alvrod et al., 2004; Mulgan et al., 2017; Phills et al, 2008).

2.3.4.1 Alignment

We have also found evidence in the literature of factors contributing to the challenges for achieving alignment between members of the social system defined here as identifying a common goal and/or interest in which actors of the social system organize their resources. Godfried and Azerikatoa (2017) and Booyensa (2017) demonstrate that incomplete, outdated and underdeveloped institutional arrangements could lead to misalignment of interests and decreased levels of trust within the social system.³

2.3.5 Capacity

Following our review of the 19 empirical studies and consistent with the framework analysis approach (Barnett-Page and Thomas, 2009), we have identified *capacity* as a new category of influential social system factor for the diffusion of EDSIs into LMICs. Under this heading we

refer to the ability of the social system to exploit and capture value from innovations over a long period of time. In particular, we identify adaptive, self-organising and indigenous capacity.

2.3.5.1 Indigenous capacity

Indigenous capacity refers to deep understanding of local knowledge and practices together with the creativity capacity of indigenous people. The challenge of diffusion tends to present in tandem with exogenous participatory processes designed to encourage scaling-up while ignoring already existing innovation practices (Matthews, 2017). Considering indigenous knowledge through the lens of the sensitivity to local custom (Vyakarnam and Fiafor, 1991) and practice will provide a better and more nuanced understanding of the diffusion of EDSIs.

Notably, exogenous participatory processes could lead to indigenous communities being overpowered by outside ideas and processes. For example, prior to the introduction of an exogenously developed payment process in rural West Africa, the Hausa women of Maradi (Cooper, 1997) were able to bypass the patriarchal system to their advantage through women to women economic exchanges. However, the introduction of an externally developed innovation designed without involvement of the women in the diffusion process has resulted in their disempowerment. As this case makes plain, the lack of respect for the creativity and intelligence of indigenous people has led to the discontinuous use of the innovation (Matthews, 2017). Studies in this literature review (Matthews, 2017; Betts and Bloom 2014; Gollakota and Doshi, 2011) further suggests that indigenous knowledge results in a carefully, appropriately and inclusively developed local infrastructure that is fundamental to accelerating diffusion.

Combining indigenous knowledge from the local community with the overall understanding of the innovation and their benefits to both adopters and diffusers could lead to successful diffusion (Folke et al., 2002, 2005), while the dismissal of local knowledge and already existing local practices could act as key barriers to adoption. In the unsuccessful case of replacing wood-burning stoves with the charcoal in Zanzibar, Makame (2007) highlights the importance of existing local practices. Even though the new charcoal stoves offered substantial relative advantage to customers, they were not compatible with the local needs and practices. Gollakota and Doshi (2011) argue that the diffusion of the stove into rural Zanzibar was hampered by the incompatibility between local practices and exogenously adopted social strategies of learning and expectations rather than by the innovation itself.

Others, such as Betts and Bloom (2014), also point to the overlooked potential of indigenous knowledge and practices, and advocate for the placement of communities and local systems at the heart of the innovation process to improve the diffusion and adoption of EDSIs (Matthews, 2017; Betts and Bloom, 2014).

2.3.5.2 Adaptive capacity

Adaptive capacity refers to how actors in the social system respond to change and complexity associated with solving a social problem through a specific innovation. Uncertainty and surprise were found to be key barriers leading to resilience in diffusion (Missimer, 2017). Meanwhile trust (Tumbo, 2013) diversity (Folke, 2002) and the capacity for learning (Missimer, 2017) are identified as key driving factors to support successful diffusion.

According to Folke (2002), adaptive capacity could generate diversity of innovation management options to respond to uncertainty. He argues that current governance has the power to disrupt or remove mechanisms to overlook the creative responses of the adopter community. Ignoring the creative capacity of the adopter community could eventually disrupt the overall adoption process and prevent the innovation from creating impact. Therefore, we need agile, open and multilateral governance that allows for learning without foreclosing future developments. Studies identified in this review, especially that of Folke (2002), claim that social systems that are both flexible and oriented to proceed through learning by doing are better adapted for long term survival.

Folkes's work (2002, 2006, 2018) is rooted in systems theory in which complex systems are about relationships among members of the social and ecological system. Complex adaptive systems may also consist of human (networks, society) and also non-human (i.e. environment, technology and information systems). Folke's work on complex adaptive systems supports Rogers later work (2003) on diffusion theory and views of diffusion being a nonlinear dynamic process, in which new models of interactions and behaviour could occur from the complex interactions between actors of the social system and the environment. By adapting a systems view to diffusion the definition of the social system also changes and brings us closer to ecosystems and their role in innovation management.

Derwisch et al. (2016) meanwhile investigates the introduction of a new improved seed developed outside Malawi, where farmers' improved understanding of the externally developed innovation's benefits has increased the rate of adoption and created long term change in local agricultural practices. The increased level of interactions between peers through learning has resulted in an improved level of adoption of the improved seeds between farmers.

2.3.5.3 Self-organising capacity

Order, structure, and patterns arise spontaneously from the internal dynamics in the system, which systems scholars call homeostasis, autopoiesis, or self-organisation (Kauffman, 1993). We refer to self-organising as an internal capacity of the social system responding to social, economic and environmental needs. Through this active response to address social needs, actors in the social system explore fragmented information (Dougherty, 2017) and adapt this knowledge into potential solutions or identify new solutions. In the study of rural and urban farmers in South Africa, Booyense (2017) observes the networking behaviour of innovative enterprises. His study highlights how a social system's actors are capable of organising themselves through learning and information pathways to support the rate of adoption on a local level (Booyensa et al., 2017).

We consider self-organising to be important for two reasons. First, by creating space for agility and collaboration towards achieving long term goals rather than one-off, short term project outcomes, self-organising offers a promising category for further improvement, leading to the continued use of the innovation (Folke et al., 2002). Second, building on Dougherty's (2017) work on taking advantage of the emergence of new information pathways, we need to reconfigure the diffuser and adopter communities into one concept. By developing insights regarding the complexity of social system and their role in diffusion, we propose a new lens through which to view single economic-based strategies (Tsoukas, 2005; Grandori, 2010) when trying to diffuse innovations into LMICs.

**Table 2-3 Extended framework of social system factors influencing diffusion of EDSIs in LMICs
(based on Rogers' framework and findings from the SLR)**

Relations	Communication	Climate	Aims	Capacity
(1) Formal/Informal	(1) Information pathways	(1) Trust	(1) Alignment	(1) Indigenous
(2) Power	(2) Value creation	(2) Collaborative behaviour		(2) Adaptive
				(3) Self-organising

Though cognizant of the importance of external factors, our focus here is on developing deeper insight into the social system's internal factors along the diffusion process. We submit that identifying the social system as a key factor in the diffusion process gives rise to promising theoretical developments to extend Rogers' influential theory.

Table 2-4 Definition of factors influencing diffusion of EDSIs in LMICs

Category	Sub-category	Definition	Example from literature
<u>Relations</u> Refers to informal and formal relational dynamics of actors in the social system and their influence on diffusion	Formality	Strength of the relations between various actors in the social system that defines the type of communication between each actor	The role of formal and informal networks influences the rate of diffusion (Bacon et al., 2008; Murray et al., 2010). Farmers associated with peer interactions played an important role in successful adoption of improved maize seed in Malawi (Derwisch, 2016).
	Power	Hierarchical structures of the relations between various actors in the social system	Power structures within global actors and the malfunctioning of local governments and institutions in low and middle-income countries have been highlighted as barriers to diffusion (Gries et al., 2018).
<u>Communication</u> Refers to the various processes in which information and knowledge are exchanged between actors of the social system.	Information pathways	Ways in which information about the innovation is designed and delivered in the form of an exchange.	Neighbourhood was defined as a unit of analysis in a developing context as it could potentially hold the key to successful design of new information pathways including existing practices from the start of the process (Folke et al., 2005).
	Value creation	Broad set of tangible and intangible benefits created by an actor within the social system for an exchange.	Communication of the economic benefit facilitates further information exchanges amongst the social system and enhances further creation of value (Missimer et al., 2017; Wollebaek and Selle 2008; Putnam 2000; Fukuyama, 2002;).
<u>Climate</u> Refers to the conditions in which actors of the social system carry out their activities to support the diffusion process.	Trust	Trust is a strong combining factor, reducing uncertainty and complexity of the process in which information about the innovation is communicated throughout the social system.	Lack of communication and misleading information can lead to a negative spiral and causes dysfunctionality (Rothstein, 2005, 2007), increased fear and betrayal between members of social system (Godfried and Azerikatoa 2017). Failure to gain local trust led to resistance towards the innovation, resulting in the discontinuity of adoption or continuous rejection (Silvestrea and Netob 2014).
	Digital (trust)	New form of trust using the power of digital technologies	The role of digital technology has created a new form of value and trust pertaining to the innovation (Papa et al., 2018).
	Collaborative behaviour	Form of behaviour in which sharing existing resources and knowledge of each actor in the social system would lead to new practices and processes to reach the end goal.	Collaborative behaviour was found as an enhancing factor for successful diffusion locally both in Tanzania and Bangladesh (Booyensa et al., 2017; Dey et al., 2016; Tumbo et al, 2013;).

<p><u>Aim</u> Refers to the common goal which binds actors in the social system, such as the need to solve a particular social problem or address a social need</p>	<p>Alignment</p>	<p>Level collaboration between the actors in the social system.</p>	<p>There is a need for a strong governance to centre around a common goal and common purpose, especially when defining value of the innovation (Missimer et al., 2017).</p> <p>Incomplete, outdated and underdeveloped institutional arrangements could lead to misalignment of interest between actors in the social system (Godfried and Azerikatoa, 2017; Booyensa, 2017).</p>
<p><u>Capacity</u> The ability of the social system to exploit and capture value from innovations, services and processes over a long period of time.</p>	<p>Adaptive</p>	<p>Capacity of the social system to respond to change and complexity associated with solving a social problem.</p>	<p>Folke (2002) states adaptive capacity could generate diversity of innovation management options to respond to uncertainty. Uncertainty and surprise were found to be key barriers to diffusing the innovation (Missimer, 2017) and trust (Tumbo, 2013) diversity (Folke, 2002) were identified as key driving factors to support successful diffusion.</p>
	<p>Self-organising</p>	<p>Internal capacity of the social system responding to social, economic and environmental needs by developing new information pathways.</p>	<p>Internal capacity of the social system responding to social, economic and environmental needs by developing new information pathways.</p> <p>Capacity for learning was also identified, in particular how actors in the social system are capable of organising themselves, and became an essential component in the diffusion of the knowledge, learning and information associated with the innovation on a local level (Booyensa et al., 2017).</p>
	<p>Indigenous</p>	<p>Deep understanding of local knowledge and practices together with the creativity and absorptive capacity of indigenous people.</p>	<p>Overlooking the local practices and the creativity and intelligence of indigenous people as part of an external innovation process has led to discontinuous use of the innovation in West Africa (Matthews, 2017; Betts and Bloom, 2014).</p> <p>Combining indigenous knowledge and existing practices with the overall understanding of the innovation and its benefits lead to successful diffusion, while dismissing local knowledge and already existing local practices could seriously impede large scale adoption (Folke et al., 2002, 2005; Makame, 2007, Matthews, 2017; Short and Duthie 2020).</p>

2.4 Discussion

While Rogers' (1962) diffusion of innovation theory emphasises the importance of communication through the social system, it is limited in the extent to which it accommodates actors from the public, private and third sectors (Ramani & Mukherjee, 2014). Widespread uptake of the innovation requires coordinating incentives, connecting with multiple actors who can communicate the value of the innovation while also helping to mitigate the disadvantages that beset them (Vachani & Smith 2008).

2.4.1 Capacity of the social system

One of the most significant outcomes of the systematic literature review was the emergence of a new category, namely *capacity* of the social system. Capacity here denotes the ability of the social system to explore and capture value from an innovation over a long period of time. Within this concept of capacity, three sub-categories emerged, being adaptive, self-organising and indigenous capacity. The adaptive and self-organising capacity of the social system supports the view that diffusion is a two way communication process, where continuous feedback loops between actors through learning moves the innovation forward.

Learning plays a central role in introduction of an externally developed innovation into society, and occurs interactively. As part of diffusion, actors of the social system learn from the results of the diffusion process and make adjustments to improve the technology or to better adapt it to a local condition (Raven, 2005). Most of the communication in LMIC occur amongst members of the local community and connected to the learning that happens through diffusion. Derwish et al. (2006), highlights these activities with 'social networking activities' and the learning process associated with continuous feedback loops between local groups and peers such as networking between neighbouring farmers in Malawi.

Relocating informal local groups to the heart of the diffusion process changes the role of the adopter community from mere end user involvement to being actively involved in the diffusion process right from the start, when innovation is designed and introduced to address a specific social need. Positioning end users at the forefront of the diffusion process provides an opportunity to rethink the role of the diffusers and adopters, previously seen as separate entities,

as a single construct. With informal local groups situated in the early communication of the innovation, the opportunity now arises for information pathways to emerge in order to support diffusion and adoption. Highlighting the importance of indigenous capacity and adaptive capacity of the social system offers a fresh perspective through which to look at communication processes and the translation of social value into economic benefits, leading to scalable social innovations.

2.4.1 Value creation in diffusion

Secondly, as part of the systematic literature review another significant sub-category has been identified and labelled, i.e., value creation. While value creation is not a new concept in the innovation management literature, most scholars are concerned with the creation of value within an organisation (Amit and Zott, 2001, Casadesus-Masanell and Ricart 2010, Zott et al. 2011), rather than as part of a social system. Scholars have largely been preoccupied with the processes through which an innovation's value is created, delivered and captured within an organisation. To date, value creation has not been considered within the diffusion literature. By applying a systemic view to the diffusion of innovation, this act becomes a co-creative process in which value is created by all actors of the social system. Value creation also requires complex and dynamic co-ordination among multiple actors (Chesbrough et al., 2006) and to capture value that is both created by diffusers and adopters (Massa et al., 2017). Considering the creation of value as part of the diffusion process calls for a multi-actor perspective and collaborative approach to diffusion where value is created and delivered by all actors of the social system.

These challenges lead us to the recognition that broadening the conceptualisation of the social system into one multi-actor concept could significantly improve the diffusion and adoption of innovation. In our conceptualisation, the social system comprises a number of social actors from all three sectors. Such a multisectoral approach to the social system supports recent scholarly work looking at diffusion as an actor-actor process (Vargo et al., 2020) and supports the recent call in the literature to rethink the diffusion of innovation.

Consequently, we advocate considering diffusion not as a linear process, but instead as a two way communication process in which continuous feedback is provided. Such an approach not only increases the rate in which an innovation gets adopted but also supports its continued use and embeddedness into the local system.

Communication between units of the social system includes the management of knowledge, communication of value, power structures and the level of trust between these units. Sociology explains the power dynamics between members of the social system and, accordingly, how they affect the diffusion of EDSIs, showing that hierarchical structures are still acting as barriers to diffusion (Godfried and Azerikatoa, 2017; Gries et al., 2018) and local voices in terms of informal local groups are still underutilised and often unheard or silenced when communicating the innovation locally.

During the literature review, the ‘neighbourhood’ as emerged as a principal driver of successful social cohesion and empowerment (Tumbo et al., 2013) but not as a principal drivers for successful diffusion. ‘Neighbourhood’ as a unit of analysis has been highlighted as a principal driver in Tumbo’s (2013) study in Tanzania for reaching strong social cohesion between members of homogenous community bound by geographical positioning. In his study the difference between three different neighbourhoods depend not only on geographical proximity but also farming systems, ethnic composition and access to markets. Tumbos’s (2010) view challenges Roger’s view on homogenous communities being a principal driver of successful diffusion suggesting that communities with higher communication amongst its members lead to higher level diffusion and while ‘neighbourhood’ consider to be an important factor for social cohesion due to its geographical proximity it has its limitations. It is collaboration between various actors of the social system that determines the success of the diffusion into local communities.

The systematic literature review indicates that social innovations require collective actions for successful diffusion. The local community is thus well placed to support large scale diffusion, and any successful diffusion process must include their voices. In order to test our understanding of the framework developed in this review paper further empirical work is required.

2.5 Conclusion

Over the past 20 years, very little of the literature has challenged conventional scholarship on the diffusion process’s fourth pillar, i.e., the social system. This would seem to suggest a certain conceptual stagnancy, in turn indicating the urgency to consider diffusion literature through a different lens, and in particular to look at the emergent diffusion process where the

overall outcome is dependent on the action of multiple actors as part of the social system, including local knowledge and existing local practices. It may similarly be fruitful to reconstruct the diffusion of innovation into a dynamic communication process where actors are continuously adapting to feedback on the actions of others (Chiles et al, 2004; Dougherty et al., 2017).

Accordingly, the literature on innovation and technology management is both “familiar and disconcerting” (Dougherty et al., 2017), which is the reason we look at diffusion as a recursive, dynamic process (King, 1992; Schroeder et al., 1989) rather than a linear one. We conclude that failing to give due prominence to the social system and explain its role and importance in the diffusion process leads to poor adoption of managerial and innovation practices and processes, which in turn could considerably delay the diffusion of innovation into these target markets.

Considering diffusion systemically (Dougherty, 2016, 2017; Bansal, 2015, Vargo and Lusch 2011) is the perspective which most closely describes the concept of social system comprising multiple actors across multiple sectors. This systemic view presents the most apposite manner to build on Dougherty’s (2017) critique to current approaches to solving social problems. Actors within the diffusion process are often fixated on problems associated with the projects rather than enabling the emergence of knowledge amongst disparate communities to support continuous use of the innovation. To frame strategy by incorporating a systemic view of the diffusion process would lead to new forms of trust between multiple social actors towards long term collaborations.

By reflecting on the attributes of externally developed social innovations being a service or product (Agarwal et al., 2017) we would be able to develop better informed pathways through which the innovation is communicated. Furthermore, by developing a deeper understanding of the role of community and collective action (Matthews, 2017), we would be able to involve both the community of diffusers and the community of adopters in the decision making process, while also considering diffusion as a dynamic and recursive process rather than a linear one. There is growing evidence in the literature to support a systemic view to both the innovation and diffusion processes. To sustain this line of thought, we would like to contribute to theory on the diffusion of innovation with our empirical work which illuminates the role of the social

system in supporting the successful diffusion of an externally developed social innovation into three different countries.

Having reviewed the literature, I would like to remind the reader of the overall research question; ‘What is the role of the social system in the diffusion of EDSIs into LMICs?’ that is being investigated and point to the specific sub questions; (1) ‘What role actors of the social system play in creating value from an externally developed social innovation?’ and (2) ‘How multiple actors within a social system engage in activities to support the diffusion of EDSIs in LMICs?’. In Chapter 3 and Chapter 4 we will investigate these two sub-questions through an in-depth case study of Be He@lthy, Be Mobile.

2.6 References to chapter 2

- Acheampong, G., & Esposito, M. (2014). The nature of entrepreneurship in bottom of the pyramid markets. *International Journal of Entrepreneurship and Small Business*, 21(4), 437.
- Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented Innovation: A Systematic Review. *International Journal of Management Reviews*, 18(2) pp.180-205
- Agarwal, N., Grottke, M., Mishra, S. & Brem, A. (2017). A systematic literature review of constraint-based innovations: state of the art and future perspectives. *IEEE Transactions on Engineering Management*, 64, 3-15.
- Alonso, P. L., Brown, G., Arevalo-Herrera, M., Binka, F., Chitnis, C., Collins, F., Doumbo, O. K., Greenwood, B., Hall, B. F. & Levine, M. M. (2011). A research agenda to underpin malaria eradication. *PLoS medicine*, 8, e1000406.
- Alvord, S. H., Brown L. D., & Letts C. W. (2004). Social entrepreneurship and societal transformation: An exploratory study. *Journal of Applied Behavioral Science* 40(3) 260–282.
- Amit, R. and Zott, C., (2001). Value creation in e-business. *Strategic management journal*, 22(6-7), pp.493-520.
- Anderson, J. and Kupp, M., (2008). Serving the poor: drivers of business model innovation in mobile. *info*.
- Bacon, C.M., Ernesto Mendez, V., Gómez, M.E.F., Stuart, D. and Flores, S.R.D., (2008). Are sustainable coffee certifications enough to secure farmer livelihoods? The millenium development goals and Nicaragua's Fair Trade cooperatives. *Globalizations*, 5(2), pp.259-274.
- Bansal, P. & Song, H.C. (2017). Similar but not the same: Differentiating corporate sustainability from corporate responsibility. *Academy of Management Annals*, 11(1), 105-149.
- Barnett-Page, E. & Thomas, J. (2009). Methods for the synthesis of qualitative research: a critical review. *BMC Medical Research Methodology*, 9.
- Betts, A., Bloom, L. and Weaver, N., (2014). Refugee Innovation. *Forced Migration Review*.
- Bharadwaj, A. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. *MIS Quarterly*, 24(1), 169-196.
- Bhatt, P., & Altinay, L. (2013). How social capital is leveraged in social innovations under resource constraints? *Management Decision*, 51(9), 1772–1792.
- Booyens, I., Hart, T. G. B., & Ramoroka, K. H. (2017). Local Innovation Networking Dynamics: Evidence from South Africa. *The European Journal of Development Research*, 116–118.

- Casadesus-Masanell, R. and Ricart, J.E., 2010. From strategy to business models and onto tactics. *Long range planning*, 43(2-3), pp.195-215.
- Chesbrough, H., Vanhaverbeke, W. & West, J. eds., (2006). *Open innovation: Researching a new paradigm*. Oxford University Press on Demand.
- Chikweche, T., & Fletcher, R. (2013). Customer relationship management at the base of the pyramid: Myth or reality? *Journal of Consumer Marketing*, 30(3), 295–309.
- Chiles, T.H., Meyer, A.D. & Hench, T.J. (2004). Organizational emergence: The origin and transformation of Branson, Missouri's musical theaters. *Organization Science*, 15(5), 499-519.
- Christensen, C.M., (2006). The ongoing process of building a theory of disruption. *Journal of Product innovation management*, 23(1), pp.39-55.
- Cohen, W.M. & Levinthal, D.A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152.
- Cornwall A. (2005). Beyond Buzzwords: “Poverty Reduction”, “Participation” and “Empowerment” in Development Policy In: UN RISD Report 2005 (Decembre)
- Crocker, J., Saywell, D., Shields, K. F., Kolsky, P. & Bartram, J. (2017). The true costs of participatory sanitation: Evidence from community-led total sanitation studies in Ghana and Ethiopia. *Science of the Total Environment*, 601, 1075-1083
- Dacin, P.A., Dacin, M.T. and Matear, M., (2010). Social entrepreneurship: Why we don't need a new theory and how we move forward from here. *Academy of management perspectives*, 24(3), pp.37-57.
- Denyer, D. & Tranfield, D. (2009). *Producing a systematic review*. In: Buchanan, D. & Bryman, A. (eds.) *The Sage handbook of organizational research methods*. London: Sage.
- Derwisch, S., Morone, P., Tröger, K., & Kopainsky, B. (2016). Investigating the drivers of innovation diffusion in a low income country context. The case of adoption of improved maize seed in Malawi. *Futures*, 81, 161–175.
- Dey, B. L., Pandit, A., Saren, M., Bhowmick, S., & Woodruffe-Burton, H. (2016). Co-creation of value at the bottom of the pyramid: Analysing Bangladeshi farmers’ use of mobile telephony. *Journal of Retailing and Consumer Services*, 29, 40–48.
- Dixon-Woods, M. (2011) Using framework-based synthesis for conducting reviews of qualitative studies. *BMC* 9-39
- Dodgson, M., Gann, D.M. & Phillips, N. (2013). Organizational learning and the technology of foolishness: The case of virtual worlds at IBM. *Organization science*, 24(5), 1358-1376.
- Dougherty, D. & Dunne, D.D. (2011). Organizing ecologies of complex innovation. *Organization Science*, 22(5), 1214-1223.

- Dougherty, D. (2016). Taking advantage of emergence: Productively innovating in complex innovation systems. Cambridge: Oxford University Press
- Dougherty, D., (2017). Taking advantage of emergence for complex innovation ecosystems. *Journal of Open Innovation: Technology, Market, and Complexity*, 3(3), 14.
- Faul, M. V. (2016). Networks and Power: Why Networks are Hierarchical Not Flat and What Can Be Done About It. *Global Policy*, 7(2), 185–197.
- Ferriman, A. (2007). BMJ readers choose the "sanitary revolution" as greatest medical advance since 1840. *BMJ: British Medical Journal*, 334, 111.
- Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C.S. and Walker, B. (2002). Resilience and sustainable development: building adaptive capacity in a world of transformations. *AMBIO: A journal of the human environment*, 31(5), 437-440.
- Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global environmental change*, 16(3), 253-267.
- Fukuyama, F., (2002). Social capital and development: The coming agenda. *SAIS review*, 22(1), pp.23-37.
- Foster, C., & Heeks, R. (2013). Innovation and scaling of ICT for the bottom-of-the-pyramid. *Journal of Information Technology*, 28(4), 296–315.
- Fry, L. M., Mihelcic, J. R. & Watkins, D. W. (2008). Water and nonwater-related challenges of achieving global sanitation coverage. *Environmental Science & Technology*, 42, 4298-4304.
- George, G., McGahan, A. M., & Prabhu, J. (2012). Innovation for Inclusive Growth: Towards a Theoretical Framework and a Research Agenda. *Journal of Management Studies*, 49(4), 661–683.
- Godfried, A. & Azerikatoa, A. (2017). The development of a mobile money service: an exploratory actor-network study. *Information Technology for Development*. 23. 1-18.
- Gollakota, K. and Doshi, K., (2011). Diffusion of technological innovations in rural areas. *Journal of Corporate Citizenship*, (41), pp.69-82.
- Grandori, A. (2010). A rational heuristic model of economic decision making. *Rationality and Society*, 22(4), 477–504.
- Greenwood, R., Oliver, C., Sahlin-Andersson, K. and Suddaby, R. (2008). The SAGE Handbook of Organizational Institutionalism. London: SAGE Publications.
- Gries, T. & Grundmann R. & Palnau I. & Redlin M. (2018). "Technology diffusion, international integration and participation in developing economies - a review of major concepts and findings," *International Economics and Economic Policy*, Springer, vol. 15(1), 215-253

- Grönroos, C. and Voima, P., 2013. Critical service logic: making sense of value creation and co-creation. *Journal of the academy of marketing science*, 41(2), pp.133-150.
- Halme, M., Kourula, A., Lindeman, S., Kallio, G., Lima-Toivanen, M. & Korsunova, A. (2016). Sustainability Innovation at the Base of the Pyramid through Multi-Cited Rapid Ethnography. *Corporate Social Responsibility and Environmental Management*. 23, 113–128
- Hart , S. & Christensen, C. M. (2002). The great leap: Driving innovation from the base of the pyramid. *MIT Sloan Management Review*, 44, 51 – 56.
- Held, D., (1999). *The transformation of political community: rethinking democracy in the context of globalization* (pp. 84-111).
- Hossain, M., Simula, H., & Halme, M. (2016). Can frugal go global? Diffusion patterns of frugal innovations. *Technology in Society*, 46, 132–139.
- Idris, A., Kura, S.M. and Bashir, M.U., (2013). Public private partnership in Nigeria and improvement in service delivery: An appraisal. *Journal of Humanities and Social Science*, 10(3), 63-71.
- Immelt, J.R., Govindarajan, V. and Trimble, C. (2009). How GE is disrupting itself. *Harvard business review*, 87(10), 56-65.
- Jenkins, M. & Pedi, D. (2013). Guidance Note 1: Situation Analysis: How do I know if Sanitation Marketing will work in my country? UNICEF: Sanitation Marketing Learning Series. New York, N.Y., U.S.A.: UNICEF.
- Kauffman, S.A., (1993). *The origins of order: Self-organization and selection in evolution*. Oxford University Press, USA.
- Kaika, M. (2017). ‘Don’t call me resilient again!’ : the New Urban Agenda as immunology ... or what happens when communities refuse to be vaccinated with ‘smart cities’ and indicators. *Environment and Urbanization*, 29(1), 89–102.
- Kapoor, K. K., Dwivedi, Y. K., & Williams, M. D. (2014). Rogers’ Innovation Adoption Attributes: A Systematic Review and Synthesis of Existing Research. *Information Systems Management*, 31(1), 74–91.
- Kelton, K., Fleischmann, K.R. and Wallace, W.A. (2008). Trust in digital information. *Journal of the American Society for Information Science and Technology*, 59(3), 363-374.
- King, N. (1992) Modelling the innovation process: an empirical comparison of approaches. *Journal of Occupational and Organizational Psychology* 65(2), 89-100.
- Krezanoski, P. J. (2016). Delivering insecticide-treated nets for malaria prevention: innovative strategies. *Research and Reports in Tropical Medicine*, 7, 39.

- Loomis, C. P., & Dyer, E. D. (1976). *Social systems: The study of sociology*. Schenkman Pub. Co.
- Lorentzen, J. (2010). Low-income countries and innovation studies: A review of recent literature. *African Journal of Science, Technology, Innovation and Development*, 2(3), 46-81.
- Mair, J., I. Marti. (2006). Social entrepreneurship research: A source of explanation, prediction, and delight. *Journal of World Business*, 41(1) 36–44.
- Mair, J., Martí, I., & Ventresca, M. J. (2012). Building inclusive markets in rural Bangladesh: How intermediaries work institutional voids. *Academy of Management Journal*, 55(4)
- Matthews, J. R. (2017). Understanding Indigenous Innovation in Rural West Africa: Challenges to Diffusion of Innovations Theory and Current Social Innovation Practice. *Journal of Human Development and Capabilities*, 18(2), 223–238.
- Masuda, Y.J., Liu, Y., Reddy, S.M.W. et.al. (2018). Innovation diffusion within large environmental NGOs through informal network agents. *Nat Sustain* 1, 190–197
- Massa, L., Tucci, C.L. and Afuah, A., (2017). A critical assessment of business model research. *Academy of Management Annals*, 11(1), pp.73-104.
- Meagher, K. (2007). Introduction: special issue on 'informal institutions and development in Africa'. *Africa Spectrum*, 42(3), 405-418.
- Missimer, M., Robèrt, K. H., & Broman, G. (2017). A strategic approach to social sustainability - Part 1: exploring the social system. *Journal of Cleaner Production*, 140
- Mulgan, G., (2010). Measuring social value. *Stanford Social Innovation Review*, 8(3), pp.38-43.
- Mulgan, G. (2017). Social innovation –the last and next decade. NESTA (9th February 2017)
- Mumford, M.D., (2002). Social innovation: ten cases from Benjamin Franklin. *Creativity research journal*, 14(2), pp.253-266.
- Murray, R., Caulier-Grice, J. and Mulgan, G., (2010). *The open book of social innovation* (Vol. 24). London: Nesta.
- Nangoli, S., Ahimbisibwe, A., Namagembe, S. & Bashir, H. (2013). Social networks: A strategy for enhancing project-stakeholder commitment. *Journal of Strategy and Management*.
- Newell, S., Huang, J.C., Galliers, R.D. and Pan, S.L., (2003). Implementing enterprise resource planning and knowledge management systems in tandem: fostering efficiency and innovation complementarity. *Information and Organization*, 13(1), pp.25-52.
- Nicholls A., & Murdock A. (2012). *Social Innovation: Blurring Boundaries to Reconfigure Markets*, Palgrave Macmillan [SEP]

- OECD (2019). Aid at a glance charts. <http://www.oecd.org/dac/financing-sustainable-development/development-finance-data/aid-at-a-glance.htm>: OECD.
- Okurut, K. & Charles, K. (2014). Household demand for sanitation improvements in low income informal settlements: A case of East African cities. *Habitat International*, 44, 332-338.
- Pansera, M., & Owen, R. (2015). Framing resource-constrained innovation at the ‘bottom of the pyramid’: Insights from an ethnographic case study in rural Bangladesh. *Technological Forecasting and Social Change*, 92, 300–311.
- Papa, A., Mital, M., Pisano, P., & Del Giudice, M. (2018). E-health and wellbeing monitoring using smart healthcare devices: An empirical investigation. *Technological Forecasting and Social Change*, (September 2017).
- Phills, J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering social innovation. *Stanford Social Innovation Review*, 6, 34-43.
- Prahalad, C. K. (2012). Bottom of the Pyramid as a Source of Breakthrough Innovations. *Journal of Product Innovation Management*, 29(1), 6–12.
- Prahalad, C.K., (2006). *The Fortune at the Bottom of the Pyramid*. Pearson Education India.
- Prahalad, C.K. (2004). *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits*. Upper Saddle River, NJ: Wharton School Publishing.
- Putnam, R., 1993. The prosperous community: Social capital and public life. *The american prospect*, 13(Spring), Vol. 4.
- Radjou, N. & Prabhu, J. (2015). *Frugal Innovation: How to do more with less*. The Economist.
- Radjou, N., Prabhu, J. & Ahuja, S. (2012). *Jugaad innovation*. Random House India.
- Ray, P. K., and Ray, S. (2010). Resource-constrained innovation for emerging economies: The case of the Indian telecommunications industry. *IEEE Transactions on Engineering Management* 57(1), 144–156.
- Ramani, S. V., Sadre Ghazi, S., & Duysters, G. (2012). On the diffusion of toilets as bottom of the pyramid innovation: Lessons from sanitation entrepreneurs. *Technological Forecasting and Social Change*, 79(4), 676–687.
- Ramani, S.V. and Mukherjee, V. (2014). Can breakthrough innovations serve the poor (bop) and create reputational (CSR) value? Indian case studies. *Technovation*, 34(5-6), 295-305.
- Ramani, S. V., Sadre Ghazi, S., & Gupta, S. (2017). Catalysing innovation for social impact: The role of social enterprises in the Indian sanitation sector. *Technological Forecasting and Social Change*, 121, 216–227.
- Ratcliff, R., & Doshi, K. (2016). Using the Bass Model to Analyze the Diffusion of Innovations at the Base of the Pyramid. *Business and Society*, 55(2), 271–298.

- Reinicke, W.H., (1999). The other world wide web: global public policy networks. *Foreign Policy*, pp.44-57.
- Ritchie, J. & Spencer, L. (1994). Qualitative data analysis for applied policy research" by Jane Ritchie and Liz Spencer In A. Bryman and R. G. Burgess [eds.] "Analyzing qualitative data" pp.173-194.
- Rothwell, R. (1992). Successful industrial innovation: critical factors for the 1990s. *R&D Management*, 22(3), 221-240.
- Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.) New York: Free Press.
- Schroeder, R.G., Van de Ven, A.H., Scudder, G.D. and Polley, D. (1989) The development of innovation ideas. In: Van de Ven, A.H., Angle, H.L. and Poole, M., (Eds.) *Research on the management of innovation: the Minnesota studies*, pp. 107-133. New York: Harper & Row.
- Seebode, D., Jeanrenaud, S. & Bessant, J. (2012). Managing innovation for sustainability. *R&D Management*, 42(3), 195-206.
- Seelos, C. & Mair, J. (2012). Innovation is not the Holy Grail. *Stanford Social Innovation Review*, Fall, 44-49.
- Silvestre, B. & Neto, R. (2013). Capability accumulation, innovation, and technology diffusion: Lessons from a Base of the Pyramid cluster. *Technovation*. 34.
- Simmel, G. (2011). *Georg Simmel on individuality and social forms*. University of Chicago Press.
- Strang, D. & Meyer J.W. (1993). 'Institutional Conditions for Diffusion', *Theory and Society*, 22, 487-511.
- Strang, D. & Soule S. A. (1998). 'Diffusion in Organizations and Social Movements: From Hybrid Corn to Poison Pills', *American Review of Sociology*, 24, 265-290.
- Teece, D.J. (1986). Transactions cost economics and the multinational enterprise An Assessment. *Journal of Economic Behavior & Organization*, 7(1), 21-45.
- Tranfield, D., Denyer, D. & Smart, P. (2003). Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management*, 14, 207-222.
- Tsoukas, H. (2005). *Noisy organizations: Uncertainty, complexity, narrativity. Complex knowledge: Studies in organizational epistemology*. Edited by Haridimos Tsoukas, 338-377. Oxford. Oxford University Press
- Tumbo, S. D., Mutabazi, K. D., Masuki, K. F. G., Rwehumbiza, F. B., Mahoo, H. F., Nindi, S. J., & Mowo, J. G. (2013). Social capital and diffusion of water system innovations in the Makanya watershed, Tanzania. *The Journal of Socio-Economics*, 43, 24-36.

- UN (2015) General Assembly Resolution 70/169: The Human Rights to Safe Drinking Water and Sanitation. United Nations.
- Vachani, S. and Smith, N.C. (2008). Socially responsible distribution: distribution strategies for reaching the bottom of the pyramid. *California Management Review*, 50(2), 52-84.
- Valente, T.W. and Pumpuang, P., 2007. Identifying opinion leaders to promote behavior change. *Health education & behavior*, 34(6), pp.881-896.
- Vargo, S.L., Akaka, M.A. and Wieland, H., 2020. Rethinking the process of diffusion in innovation: A service-ecosystems and institutional perspective. *Journal of Business Research*, Vol. 116, pp.526-534.
- Vinet, L., & Zhedanov, A. (2011). A ‘missing’ family of classical orthogonal polynomials. *Journal of Physics A: Mathematical and Theoretical*, 44 (8).
- Vyakarnam S. & Fiafor J. (1991). Cultural issues in enterprise development – a case study of rural Ghana. *Small Enterprise Development*, 2 (3) 37-41.
- Waldron, F., Foley, R., Slowey, J., Alderman, A.N., Narveson, B.C. and Mathúna, S.C.Ó. (2012). Technology roadmapping for power supply in package (PSiP) and power supply on chip (PwrSoC). *IEEE Transactions on Power Electronics*, 28(9), 4137-4145.
- Walsh, J.P., Kress, J.C. and Beyerchen, K.W. (2005). Book review essay: Promises and perils at the bottom of the pyramid.
- Westley, F. and Antadze, N. (2010). Making a difference: Strategies for scaling social innovation for greater impact. *Innovation Journal*, 15(2).
- Westley, F. (2008). *The social innovation dynamic*. Frances Westley, SiG@ Waterloo.
- Winters, M. S., Karim, A. G. & Martawardaya, B. (2014). Public service provision under conditions of insufficient citizen demand: Insights from the urban sanitation sector in Indonesia. *World Development*, 60, 31-42.
- Wollebæk, D. and Selle, P., (2008). *A social democratic model of civil society* (pp. 47-69). Abingdon: Routledge.
- Zanello, G., Fu, X., Mohnen, P. & Ventresca, M. (2016). The creation and diffusion of innovation in developing countries: a systematic literature review. *Journal of Economic Surveys*, 30(5)
- Zott, C., Amit, R. and Massa, L., (2011). The business model: recent developments and future research. *Journal of management*, 37(4), pp.1019-1042.

3 THE ROLE OF THE SOCIAL SYSTEM IN THE CREATION OF VALUE: THE CASE OF SENEGAL AND SUDAN

ABSTRACT

This paper applies a systems lens to the diffusion of innovation, conceiving it as a dynamic, multi-actor process. Examining the role of social system actors in diffusion provides insight into ways to create value from the use of the innovation. Traditionally the literature on innovation's value creation has ignored the voices of local knowledge and already existing practices. Without local knowledge, the highly networked nature of diffusion, and the efficient exchange of resources (technical, physical and organisation), externally developed social innovations may continue to disappoint when diffused into low to middle income countries (LMICs). To explore how local voices contributed to the creation of value, we examined the empirical case of the World Health Organisation (WHO) digital health intervention, Be He@lthy, Be Mobile (BHBM) in Senegal and Sudan. This paper expands on the important role of civil society as a core actor within of the social system previously overlooked in terms of its contribution to the diffusion process. Our findings suggest that according civil society an active voice in value creation includes them in the decision making, enlarging and transforming collective views and co-creation of value.

Key words: diffusion of innovation, value creation, social system, social value

3.1 Introduction

Katz (1961): It is as unthinkable to study diffusion without some knowledge of the social structures in which potential adopters are located as it is to study blood circulation without adequate knowledge of the veins and arteries.

Institutions such as the World Health Organisation (WHO) and other experts are working to determine best practices for diffusing social innovations, such as the use of text messaging as a form of disease management and prevention. The dramatic increase of mobile phone use worldwide, growing from 1 billion in 2002 to over 7 billion users in 2015, presents mHealth with one of the most attractive areas for public health interventions. According to the WHO, 80% of diabetes and also 80% of heart diseases could be prevented through increased access to information on lifestyle changes, such as improved exercise frequency and adopting a healthy diet. It is also globally recognised that, in case of non-communicable-diseases (NCDs) especially in diabetes management, prevention through lifestyle changes is critical and cost-effective (WHO, 2016).

In Senegal and Sudan, the number of people affected by diabetes is above 7.7% of the population and expected to reach 10.8% by 2035. There is thus a pressing need to find innovative solutions to prevent and manage the disease and its effects across all parts of society. In the context of Africa, more than 60 % of the population live in rural areas with limited or no access to local healthcare services, while most local medical care depends on affordable drugs rather than the introduction of innovations to support prevention of disease (Sabatier et al., 2017). Most health innovations entering the markets in Senegal and Sudan are externally developed and introduced by the government and international development agencies. However, there is limited or almost no service available locally to take on these innovations, therefore most of them fail to diffuse due to financial resource reductions and lack of technical infrastructure (Seelos and Mair, 2017).

There are significant challenges associated with the diffusion process. These include lack of financial, human and technical resources, underdeveloped communication channels and processes, and lack of communicative transparency between social system actors. In particular, this last challenge has been identified by Sabatier et al., (2017) and Seelos and Mair (2017) as a key obstacle to successful diffusion. To overcome this, all actors require a clear and shared

understanding of the value of the innovation. In order for low and middle income countries (LMICs) (i.e. Senegal and Sudan) to diffuse innovations at a systemic level, externally developed social innovations (EDSIs) such as Be He@lthy, Be Mobile (BHBM) would need to bridge some important gaps in human and technical resources. Successful diffusion of these innovations could also lead to increased technical and financial capacity, improved communication processes and improved access to primary healthcare (Buse and Harmer, 2007).

These externally developed social innovations, whether of greater or lesser complexity, have long been proposed as solutions to developing economy challenges. Though home-grown innovations continue to offer the prospect of credible solutions to LMIC social challenges (Agarwal et al., 2017), the bottom up approach may not always be the most effective (Adams et al, 2016). Externally-developed innovations have the advantage of being able to provide access to leading-edge technological thinking not generally available in LMICs where home-grown innovations are potentially sub-optimal. Additionally, BoP innovators lack access to resources, communication channels and information pathways to scale up innovation. However, scholars' focus on the bottom-up approach has had the effect of de-emphasising the role of technology transfers and spillovers from developed economies (Agarwal et al., 2017), leaving large gaps in our knowledge concerning the processes for diffusing efficacious externally developed social innovations into LMICs which, for technical, economic, social and cultural reasons, have often encountered barriers to their widespread adoption and diffusion (Adams et al., 2016).

We define successful diffusion as the continued use of the innovation coupled with the development of new services and an increased level of technical capacity (Khavul and Bruton 2013). In order to find affordable solutions to manage and prevent NCDs, one-off technical solutions are insufficient unless coupled with social innovation and involving multiple actors in the diffusion process (Becker et al, 2016; Howitt et al, 2012). BHBM is a social innovation coupled with a digital platform using text messaging to help combat non-communicable diseases.

BHBM is the first UN initiative to use population-wide mHealth prevention services at scale and the largest scale mHealth initiative for non-communicable diseases (NCDs) in the world to date. This collaborative initiative brings together the public sector (WHO), and private sector (ITU), to address health issues associated with NCDs globally. In the cases examined by our

study, namely Senegal and Sudan, we illustrate the ways in which multiple social system actors harness BHBM as a tool to improve the management and prevention of diabetes on a country level. Specifically, we focus on the role of the social system in the creation of value through combining resources (Teece, 1997; Chesborough, 2013; Korsgaard, S., 2011), driven by a common purpose.

To develop a deeper insight to this phenomenon, we look at the diffusion of BHBM in Sudan and Senegal, with special focus on understanding *What role actors of the social system play in creating value from an externally developed social innovation in low and medium resource markets?* Our findings suggest that value is co-created by multiple social system actors, through the combination of resources (technical, financial and organizational) driven by a common purpose to enable large scale social impact.

3.2 Theoretical background

3.2.1 Systems view on the diffusion of innovation

The system-based view has its origins in Bertalanffy's (1972) work on General Systems Theory. Bertalanffy saw the systems perspective with its emphasis on relationship in somewhat revolutionary terms as a new scientific paradigm, with important interdisciplinary implications and applicability. Since his foundational work, a system-based view has been applied across the field of innovation management (Mumford, 2002; Dougherty, 2017) as well as disciplines including international development, market-based economics, and marketing, to name but a few. Building on his core principle of the system as non-linear, containing elements interacting with their environment, and resulting in new knowledge, we apply the social system concept to the process of diffusion. We are thus able to develop a deeper insight into the complex, multifaceted and dynamic nature of the diffusion process.

Traditionally, the diffusion of innovation refers to the spread or adoption of a specific technology into a social context. This view reinforces the reification of technological and market aspects of an innovation. Under the category of technological aspects, the literature refers to the diffuser/innovator and the technology itself including its characteristics, i.e., relative advantage, observability, combability, complexity and trialability. Under the category of market aspects, the literature refers to the adopter/end user and their characteristics based on innovativeness in adopting the new technology/innovation.

Rogers' (2003) influential conceptualisation of the diffusion of innovation, identified the process as a unidirectional approach, where the innovation travels from the technological side to the market side, from the diffusers to the adopters, represented through an S-curve, to the final end user adoption. To challenge the unidirectional approach to diffusion, recent literature has called for a more systemic view, in which diffusion is viewed as dynamic, inclusive and integrative in nature.

Our paper seeks to refine the general systems view of innovation diffusion, first by taking a fresh, unified approach to the social system, viewing it as one rather than two separate concepts (diffusers and adopters) as previously defined by Rogers (2003). In so doing, we build on current literature that looks at diffusion of innovation as an actor-to-actor process (Vargo et al., 2020). The importance of the social system has been recognised in later works of Rogers (2005). Acknowledging the social system as an important element in the diffusion process also foregrounds the dynamic, inclusive and interactive approach to diffusion where ecological configurations (Adner, 2017) and social context are acknowledged to influence the process. When a systemic view is applied to the diffusion of innovation, the latter is seen to be a multi-actor process in which information and knowledge are configured into a solution through continuous learning (Dougherty, 2016).

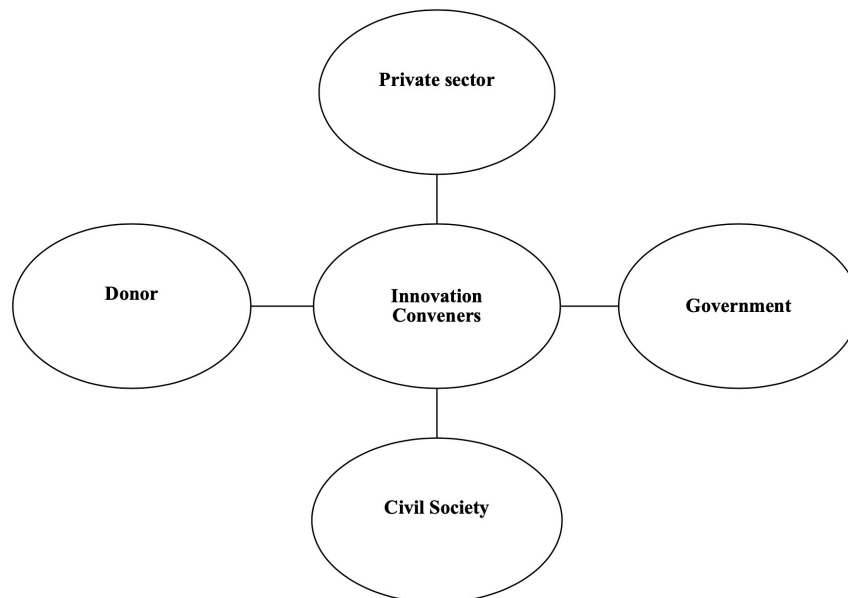
3.2.2 Social system in diffusion

Over the past twenty years, multi-actor collaborations have come to the fore in the context of solving complex social problems, such as the sustainable development goals (SDGs). The social system has been conceptualised by Rogers (2003) as interrelated units engaging in joint problem solving to accomplish a common goal. Surprisingly, despite its importance in the diffusion process, the social system receives negligible attention from Rogers. As Strang and Soul (1998) attest, Rogers fails to include in his analysis the dynamic nature of the communication processes where adopters' choices are uniformed by the activities or choices of others, especially local actors.

To support the dynamic nature of a social system as an important pillar in diffusion of innovation, we conceptualise the social system as a multi-actor, multi-sector phenomenon where all actors of the social system are aligned with a common purpose to address societal

needs. In the case of BHBM, the common purpose is to increase the efficiency for controlling and managing non-communicable disease by diffusing an mHealth intervention to the local system.

Figure 3-1 Actors of social system in BHBM



In early research on the topic, the social system was quite narrowly conceived despite its complex nature. In recent years however, concepts such as innovation ecosystems have emphasised all actors' input in the diffusion process, highlighting a need for the ultimate user to be more actively involved in the creation of value from the start (Vargo et al., 2020; de Jong et al., 2018). The role of a social system, in creating value from the use of the innovation, and the value derived from an externally developed social innovation, remain largely under researched. Recent studies highlight the growing case to see innovation as a creation, combination and recombination of information, which is not only generated by one actor but by a whole system (denoted by our study as the social system) (Doughery, 2007, 2017). It is therefore important to understand the role of social system actors in the diffusion process, especially in creating value from an EDSI.

3.2.2 Value creation process

Value creation is widely discussed in the innovation literature, especially with regard to social innovation (Austin *et al.* 2006; Mair and Marti 2006 ; Dacin *et al.* 2011). Social innovation's

main purpose is to solve pressing social needs, enable social transformation, meet common social goals and ultimately, to create impact on a societal level.

The creation of social value is mostly discussed from the perspective of creating value from the innovation *for* the customer (Vargo et al., 2020), rather than from the use of the innovation together *with* the customer. The innovation literature defines value creation as the way an organisation operates and how it creates value from an innovation. The value creation process has three different stages: (1) value generation, (2) value capture and (3) value sharing (Zott et al. 2011). Most of the literature is concerned with the creation of value within an organisation (Amit and Zott, 2001, Casadesus-Masanell and Ricart 2010, Zott et al., 2011) rather than within social system, especially in the context of LMIC.

To build on how value is created, we need to look at all three stages of this process, starting with value generation, followed by value sharing and finally value capture (Hlady-Rispal and Servantie, 2018). We begin by defining our understanding of value, particularly in a healthcare context, where it is a famously amorphous concept that is hard to quantify. In this study however, we use the term value to signify the tangible and intangible benefits that come from an exchange of organizational and technical resources and capabilities. How value is created in an organisation depends on its value creation logic, i.e., the ‘way it operates and creates value for its stakeholders’ (Casadesus-Masanell and Ricart 2010, p. 197). The literature on social innovation highlights the multiple actors involved in the value creation through continuous interactions (Seelos and Mair 2005). Through our in-depth case study, Be He@lthy, Be Mobile, we aim to develop more subtle insight into the role of each actor (Doherty et al., 2014) in the context of diffusing an externally developed social innovation.

3.2.2.1 Value generation

Value generation is often associated with the existing resources, skills, information and knowledge that determine the interaction between actors involved at the beginning of value creation. Occurring between individuals and organisations, in our study, value is generated through the exchange and combination of resources and knowledge (Zott et al., 2011) between multiple actors within a system. These activities are strongly connected with the overall mission or, as we refer to it, the purpose of the project (Covin et al, 2015).

3.2.2.2 Value capture

Value capture refers to the retention of economic value from all the exchange of resources and information between actors (Zott and Amit, 2010). One of the biggest challenges associated with social innovation value capture relates to how value is retained by a service which addresses social needs of beneficiaries limited in their resources to pay even a small percentage of the service cost (Seelos and Mair, 2017). Seelos and Mair (2005) shed light on the importance of efficiency rather than exclusive financial profitability to be considered a way to capture value. The social mission associated with the innovation is more concerned with creation of long term benefits for society rather than the creation of short term profit (Mair and Marti, 2006). To respond to these challenges, mobilising financial resources through multi-actor and cross-sectorial collaboration (Austin et al., 2006) has the potential to build a foundation for the innovation to become embedded in the local system.

3.2.2.3 Value sharing

Value sharing takes place within a system, through which the innovation travels in order to be adopted on a larger societal level (Emerson 2003; Zott and Amit 2007). Though these three stages may exist on their own with their own characteristics and defined role, (Austin et al., 2006; Dacin et al., 2011; Mair and Marti, 2006) in order to understand value creation as a process (Zott, 2011), we must first examine the overall interactions between all three dimensions. Through the case of BHBM, we highlight roles and interactions of the social system involved in the diffusion of an EDSI into Senegal and Sudan.

Looking at value creation through a systems perspective (Adner, 2006) highlights the importance of exchanges that occur between multiple actors in the social system. To understand value capture through a social system, we need to consider the ways in which value from new services and products are shared and contribute to the embeddedness of social innovations into local systems (Mair and Marti, 2006).

In the social innovation literature, there is little agreement on the co-creation of value between multiple actors that are interconnected (Hlady-Rispal, M. and Servantie, V., 2018). Amit and Zott's (2001) value creation process provides a framework for understanding how activities are associated with the flow of value (Amit and Zott 2001, Hlady-Rispal, M. and Servantie, V., 2018) and defines a way in which value is generated, captured and shared between social system actors (Amit and Zott 2001; Casadesus-Masanell and Ricart 2010, Zott *et al.* 2011).

Accordingly, value creation mechanisms bridge the boundaries between individual actors and the social system, however most research on value generation to date focuses on the organisation rather than on the social system. BHBM, being a social innovation, is associated with multi-sector inter-organisational relationships (Mulgan et al, 2000), as no single organisation has the resources and capabilities to find solutions to complex social problems such as the prevention and management of NCDs in LMICs. Most social innovation requires collective efforts between multiple actors to be diffused, therefore, the role of social system in the diffusion of an externally developed social innovation, such as BHBM, is essential. For successful diffusion to occur local knowledge and existing local practices are required. This also corresponds closely with the social innovation literature's foregrounding of community assets (Lawrence et al., 2014) as central to value creation.

The lack of common language, and specifically the lack of coherent definition of value and the dynamics of how co-creation of value contributes to diffusion are still problematic aspects requiring further research (Austin and Seitanidi 2012). Through our findings below we seek to contribute to these concerns in two significant ways. First, we highlight the roles held and interactions occurring within social system actors when creating value from an EDSI. Second, we illuminate the role of civil society and their active involvement to generate value.

3.3 Research Methodology

3.3.1 Empirical context

The Be He@lthy, Be Mobile (BHBM) initiative uses digital innovation to promote public health awareness. The universality of mobile phones has great potential, such as for collection of health-care information, provision of mobile diagnostic tests, and encouragement of healthy behaviours. There are more than 5.4 billion mobile subscriptions in the developing world, leading to 90.2 percent mobile penetration across low-income countries, and growth rates of use are higher in Africa than in any other continent (WHO, 2014).

The BHBM initiative operates in 11 countries, raising awareness of a diverse range of NCDs, such as diabetes, cervical cancer and illnesses associated with tobacco use. These diseases have become increasingly challenging, with expected 52 million deaths per annum across the world (BHBM, mDiabetes Handbook 2019), a sizable increase of 40%. According to the International Diabetes Federation estimates, in 2017, 425 million adults around the world had diabetes, with

around 90% being type 2 diabetes. In Africa that number is estimated at 15.5 million, with some 400,000 in Senegal and 3.7 million in Sudan.

Out of the 15 mHealth projects across 11 countries where the WHO operates, we have selected two specific country cases focused on diabetes management in Senegal and Sudan. Both cases were selected as examples for successful diffusion of BHBM, which meant the continued use of BHBM locally, and for their ability to highlight the role of civil society in the diffusion process. In each case study the social system was composed of multiple actors.

BHBM Conveners

- *The World Health Organization (WHO)* – its core mission is primarily to engage with government agencies and national governments, and also to work with health partnerships, foundations, non-governmental organisations, and civil society. The WHO operates on a regional level through country offices. These country offices report directly to the WHO directly and work closely with their country's Ministry of Health.
- *The International Telecommunication Union (ITU)* - its core mission is to improve ICTs access for underdeveloped and underserved markets. The ITU comprises the international network of telecommunication companies and ensures that networks and technologies seamlessly interconnect to ensure effective communication between all telecommunication companies working directly in the private sector. ITU also operates on a country level and works closely with the country's Ministry of Information Technology.

Private sector

The term 'private sector' refers to actors providing health services or products that are not owned or directly controlled by government. For the purposes of the present study, this includes:

- *Telecom companies* operating locally in all three countries.
- *Pharmaceutical companies*, working in close partnership with civil society to manage and control disease. Sanofi is a key partner in Senegal.
- *WhatsApp Business* – supporting digital transformation in Sudan.

Public sector

The public sector consists of all governments and government controlled and funded agencies. Specifically, in the context of this study, it refers to:

- *Ministry of Health* (Sudan, Senegal)
- *Ministry of Information and Communication Technology (ICT)* (Sudan, Senegal)

Civil society

“Civil society refers to the space for collective action around shared interest, purposes and values, generally distinct from government and commercial for-profit actors” (WHO, 2019). It includes charities, development NGOs, community groups, faith-based organisations, professional associations and advocacy groups. In the context of the present study, the term refers to:

- *Diabetes Patient Association Groups* (Senegal, Sudan)
- *The International Federation of Pharmaceutical Manufacturers & Associations* (IFPMA) – representing pharmaceutical companies around the world
- *Medical Societies*
- *Healthcare workers*
- *Youth volunteers*

Donor Organisations

- *The Italian Agency for Development Cooperation* - to support a national mDiabetes programme in Sudan
- *The African Development Bank Group* – to improve health access and strengthen the healthcare system in Sudan.
- *The WHO SEED fund*, a 6 month financial support to establish a digital platform for BHBM to be launched in Sudan and Senegal.

These varied actors are seen to have different positions in the diffusion process. Traditionally the public and private sector have a critical role in influencing the diffusion process and how the innovation gets adopted by the end user/beneficiary. In this research rather than applying a pure market / customer / BoP (Prahalad and Hart, 1999, 2002) perspective to diffusion we view these actors from a systems perspective (Vargo and Lusch, 2011) in which each actor plays an equal role in the diffusion process.

3.3.2 Case 1. Senegal

The BHBM initiative in collaboration with the Senegalese Ministry of Health with support from the private sector (pharmaceutical, telecoms), public sector (ITU, WHO, WHO country office, Ministry of Health, Ministry of Information Technology) and civil society (Diabetes Patient Association, health care workers, youth volunteers) launched BHBM with a focus on targeting diabetic patients through its first mHealth programme, Diabetes in 2014. Since its launch, mDiabetes has supported nearly 370 000 diabetic patients, their family members and health care providers.

mDiabetes consists of regular awareness-raising SMS (short messaging service) campaigns for people who have signed up for free to the programme known locally as *mDiabète*, enabled by a externally developed digital platform based in Geneva. *mDiabète* is a 6-week programme providing advice on ‘safe fasting’ including information on diabetes, glycemic control and nutrition during and after Ramadan.

According to a 2018 study, the biometric evaluation demonstrated that mDiabetes interventions were associated with improved glycemic control in people with type 2 diabetes. The study showed that health interventions through mobile phone technology facilitate exchanges among diabetics and health professionals (Wargny M., Kleinebreil L., Dio SN., et al. 2018). As text messaging services have high penetration, particularly in low- and middle-income countries where medical resources are scarce, they could potentially reduce diabetes-related complications.

As a health intervention using mobile phone technology to solve a social problem, BHBM has successfully facilitated exchanges of resources and knowledge across the social system. This collaborative effort between all actors led to an increased use of new services, which in turn resulted in a notable reduction in diabetes-related complications. Civil society in close collaboration with the public and private sector has identified patient groups - especially groups with high-risk in developing type 2 Diabetes - and provided personalised coaching to prevent severe complications through improved healthcare services.

3.3.3 Case 2. Sudan

In November 2017, the African Development Bank Group, the WHO and the Government of Sudan invested in a digital agenda to improve access to health care and to strengthen the health system. To tackle the rising cases of diabetes in the country, the Italian Agency for Development Cooperation entered into a partnership with BHBM initiative to support the launch of a national mDiabetes programme with the purpose of increasing awareness of prevention and management of the disease.

In 2017 the Ministry of Health, the Ministry of Information and Communication Technology, the WHO Country Office, external health experts from the International Diabetes Association and academics formed an alliance to develop an action plan for the diffusion of mDiabetes at the country level. In order to start this process, it was essential to strengthen the technical capacity of the Ministry of Health to take on BHBM. Through the implementation of an externally developed digital platform, the public sector has benefitted from an increased technical capacity, which enabled them to support the development of new digital health services beyond those developed in the initial programme.

In both Senegal and Sudan it would appear that BHBM's uptake was due to all social system actors aligning themselves with a social mission, namely, to improve access to health care and to strengthen the local health system. One major component of BHBM was to raise awareness about diabetes, train health workers, provide remote consultation services and provide management for diabetics. In both country cases the active role of the civil society has contributed to the successful diffusion of BHBM. To build a deep insight into this phenomenon, both cases were selected on the basis of their successful embeddedness into the local healthcare system and their ability to showcase the important role of civil society in the diffusion process (WHO report, 2018).

3.3.4 Data collection

The first set of interviews were collected between June 2019 and September 2019 followed by the second set of interviews between January 2020 and April 2020. The lead researcher conducted 24 semi-structured interviews, ranging from one to two hours, with multiple actors

involved in BHBM diffusion, starting with the first intervention mDiabetes in both Senegal and Sudan.

This included individuals from the public sector, ie., UN agencies (WHO, ITU), government (Ministry of Health, Ministry of Information and Communication Technology), academia (external health consultants), civil society (Diabetes Patient Groups, NCD Alliances, medical societies, IFPMA), and the private sector (pharmaceuticals, telecom companies, WhatsApp Business). The researcher attended meetings between various actors to examine how individuals and groups work together and manuals/notes taken from previous feedback (2012-2018) related to the selected BHBM cases were also examined, with specific focus on the rollout of mDiabetes.

The sample included all the key decision makers in the BHBM programmes in the two countries that were present at the introduction of BHBM in both country cases. The first BHBM programme introduced in Senegal and Sudan was mDiabetes. The lead researcher found in both cases that a large set of interviews does not necessarily follow from a wide diversity of actors involved at the launch of mDiabetes. Each respondent represented a different group making up the social system. Each respondents also identified as key decision-makers by the WHO, BHBM team or/and by local groups and actively contributed to the launch of BHBM in Senegal and Sudan. Consequently, while this number of interviews are smaller, they do represent all key actors actively involved in the diffusion of mDiabetes in Senegal and Sudan.

3.3.5 Data Analysis

Early on in the empirical fieldwork we realised that coding against a tight and pre-structured framework (Miles and Huberman, 1994) has certain limitations. Specifically, such an approach cannot avoid significant conceptual blind spots, while simultaneously limiting the potential for new information to emerge from the live data collection process. To respond to this observation, we applied an abductive approach to live data coding (Locke, Feldman and Golden-Biddle, 2016) in which we allow empirical data to inform innovation diffusion theory and vice versa (Grodal, Anteby and Holm, 2020). Abduction is about investigating the relationship between theoretical concepts and empirical insights from the case study. (Dubois and Gadde, 2002) To develop a deeper understanding to the characteristics of the social system and highlight the connection between various factors through the case of BHBM, using integrated approach

through abduction was the best suited for the analysis. It also illuminated the importance of co-creation in the diffusion process which could be further explored in future research and to develop new theoretical models.

This abductive coding technique, coupled with a dialectical approach to existing theory and the empirical work has deepened our understanding of the empirical phenomenon (Dubois & Gadde 2002). Throughout the data analysis process, we soon realised that collective action and value creation were both key to our empirical observations, despite their omission from literature on the diffusion of innovation. Traditionally, value creation was studied separately from the diffusion of innovation. The recent literature shift towards looking at diffusion as a co-creative process (Vargo et al., 2020), provides the foundation to bring value creation into the diffusion process. In addition, considering social system actors as resource integrators and diffusion as critical to the recursive innovation process (Vargo et al., 2020) also supports our conceptualisation of diffusion as a co-creative process. To continue with the coding process, we started to engage with systematic combining (Strauss and Corbin, 1990), which involved allowing our empirical data to direct us to key theoretical concepts such as value creation, while using the same data to redirect us to other theories such as co-creation of value, then applying this matching process to support theory building from our cases (Dubois and Gadde 2002).

Following our adoption of a systematic view to understand the exchange of resources as part of the diffusion process, the data called attention to the important role of civil society in this process. From these interviews with members of the civil society, including representatives of patient associations and medical groups, it became very clear that their interactions with other social system actors contributed greatly to BHBM's successful diffusion in Senegal. As the importance of civil society became clear through the data analysis, we focused our attention on understanding more deeply these interactions in which civil society engaged in the value creation process.

As a result of a rigorous and focused coding on the role of civil society along the value creation process, key constructs (Eisenhardt and Graebner, 2007) such as combining resources, searching for solution, replicating and manoeuvring emerged from our dataset. We applied these constructs along the three stages of the value creation process to gain a deeper insight to

our overall research question: *What role do actors of the social system play in creating value from an externally developed social innovation in LMICs?*

3.4 Findings

The overall findings of this paper support the successful diffusion of an externally developed innovation on two accounts: first, by looking at the role of the social system in the total value creation process and second, by illuminating the role of civil society to drive the diffusion process through its ability to manoeuvre and to actively search for innovative solutions. Ultimately, empowering civil society to take an active role in creating value from a social innovation could change existing governance structures to become more supportive to long term diffusion.

Value creation is most commonly associated with creating economic value, chiefly for the government and private sector. There are a lot of gaps in terms of the understanding and the incentives, motivations, roles and responsibilities (Seelos and Mair, 2017):

Health is always looking for free stuff, pro bono and subsidies... the ICT sector is very business orientated and they care less about the health outcomes than the business outcomes. Bridging the gap between these two sectors is challenging. (Interview#10)

One of the biggest challenges inherent to the process of diffusion is the lack of understanding on what needs to be done and who needs to be doing it. Just as an example, when multiple actors engage in a conversation on how digital health can improve the health sector, they are most likely talking about multiple solutions and multiple systems:

No one system can solve the problems, so you need to have a multitude of solutions, applications, services and data. (Interview#10)

The real problem is that each solution achieved through a social innovation is manageable on its own, however if our aim is to generate impact for the overall health sector, we need to start thinking how all of these solutions will work together and how to exchange data and information between social system actors in a coherent way. In order to generate value from the innovation through an exchange of resources, we need first to look into the various roles and interactions of the social system, otherwise known as stakeholders.

3.4.1 Roles and interactions of actors of the social system in diffusion

3.4.1.1 WHO

BHBM was originally set up as a collaboration between the United Nations (UN) agencies of health and information and communication technology, intended to complement each member's knowledge and resources. The WHO's role in the endeavour was twofold: to open access to the member states through their Ministry of Health and to provide the access to health experts building health messages around NCDs. In order to support successful communication of these messages, the WHO worked closely with its local office as well as local and international academics, and health experts i.e., doctors and nurses, to tailor the messages to the specific needs of the country. As a result of these discussions the team at WHO developed a handbook to guide the communication process locally.

The handbook consolidates the information, evidence and background necessary to successfully diffuse BHBM locally. Though the handbook is developed together with an informal expert group including health experts, academics and also with the involvement of the end users through organised local workshops, other actors such as private sector and civil society are not engaged in the process:

It is still WHO and the experts that add value to the handbooks so the partners probably feel less engaged. (Interview#3)

Despite their vested interest in NCD awareness raising through health messages, the respective Diabetes Patient Associations (DPA) of Sudan and Senegal together with medical experts soon identified a potential means to increase access to information, namely, through mobile messaging. In both Senegal and Sudan, mobile penetration of the country is above 90% (Senegal 94%, Sudan 104%). In order to increase access to information through mobile messaging private sector involvement was required. To find creative ways to bridge the gap between the WHO and the private sector, BHBM was designed as a social innovation owned by the WHO and the ITU. The overall aim of BHBM was to maximise efficient and increased access to information on disease control and management on a member state level.

BHBM was thus designed as a social innovation enabled by a technical platform to maximise access to relevant information. For this to happen the WHO had to call on another UN Agency

to provide the appropriate technical knowledge and expertise. The WHO's ability to collaborate with ITU has led to BHBM's unique positioning as the first UN initiative to use population-wide mHealth services at scale and also the first digital and mobile health initiative focusing predominantly on NCDs. To support the development of BHBM, the WHO showed agility and openness by actively seeking and leveraging the expertise and knowledge of the private sector through this collaboration with ITU.

BHBM is the first United Nations (UN) initiative on digital and mobile health that actively seeks to leverage the experiences of the private sector. (Interview#4)

3.4.1.2 ITU

ITU is the largest international telecommunications network, providing access to the internet globally and empowering the so-called mobile revolution. ITU consists of actors from both public and private sectors, including all telecom operators. ITU not only provides access to all these actors but also has the resources, technical expertise and knowledge to build a technology platform. In order to build a population scale social innovation enabled by a technology platform, ITU brings the technical expertise and also an understanding of how to generate economic value thereby enabling the programme to become self-sustaining. A key challenge associated with successful diffusion is building a shared understanding of the total value associated with BHBM.

ITU through its access to all telecom companies contributes greatly to the successful diffusion of BHBM, first by building local technical capacity through the development of the technical platform, and second by enabling actors of the private sector to form new alliances.

For example, in crises situation, such as the Ebola outbreak in 2014 or the current time of pandemic, if the country has the technical/digital capacity to use a technical platform like the platform in Senegal, it could make a significant difference in managing the disease. (Interview#10)

According to ITU, the value of a social innovation lies in the economies of scale, a perspective which prioritises economic value over social value. Without economies of scale, no social innovation can bring long term social impact. To achieve this, each actor in the social system

needs to align with the creation of both social and economic value, as, in the private sector, profit is still considered the key driving factor for guaranteed financial stability.

3.4.1.3 Private sector

The private sector (telecom companies and pharmaceuticals) was interested in finding ways to work with the public sector (WHO and governments). The former could offer financial support, know-how and also expertise and they were keen to do so:

When we sign a contract we expect outcomes, not only a business outcome but a social and environmental outcome as well... they don't consider us as a potential partner, only a money partner. They don't consider us as a body that could provide non-interested advice. (Interview#16).

Recognising the private sector's important role in bringing financial resources and expertise through a pharmaceutical company and providing free, country-wide access to the use of mobile services was vital to BHBM's successful diffusion. Free service models in LMICs are not new and only partially solve social innovation's core challenge of creating long term impact. To integrate new solutions within the social system (Chesbrough, 2003), diffusion should be viewed as a continuous process of co-creation (Vargo and Lusch, 2011) between actor and actor. We have observed the co-development of new services, such as online consultations offered to diabetic patients in Senegal, which we identify as crucial to the successful embedding of social innovation.

The core driver behind achieving large scale societal impact is mobile messages. ITU had access to reach out to all telecom companies globally and was able to communicate with ease and authority the economic benefits of BHBM to all of its members. Telecom companies, having resources and access to people who own mobile phones, could act as a catalyst to improve and manage access to healthcare information. The more they aligned with the common purpose, supporting access to healthcare, the more customers they gained. Their objective was no longer creating value *for* the customer but to start building value together *with* the customer. In Senegal, ITU played a key role in bringing together all three telecom operators (Orange-Sonatel, Tigo and Expresso, covering over 86% of Senegal population) to collectively support BHBM by joining their services through a digital platform:

Hidden value lies in the simplicity of the technology itself. Economy to scale lies in the simplicity and efficiency of the technology itself - invisible value that lies in the simplicity of the SMS messaging and also underlies the economic scalability. (Interview#10)

In Senegal, apart from the initial financial support from the WHO and technical support from ITU, other actors have joined the initiative including a large pharmaceutical company, Sanofi. The role of Sanofi was to bring financial resources to support the diffusion of BHBM and promote an awareness campaign to tackle diabetes. Beyond generating profit from supporting a digital intervention, Sanofi was also concerned with serving patients and taking part in a population-wide mHealth programme to increase access to primary healthcare.

Success is to show we have an impact in disease management...the more people who have been screened and controlled. I see digital health as an excellent enabler in those populations to reach out to more patients at a much lower cost. (Interview#16)

Moreover, the process of sharing and combining resources and expertise informed the plan for the project's sustainability. Most of the knowledge and resources on technology traditionally reside in the private sector. However, to build long term vision for diffusion, there is a need for the public sector to learn from these collaborations and to build a stronger, more resilient foundation to support the scaling of digital health interventions.

3.4.1.4 Public sector

From the start of the BHBM initiative, the role of government has been associated with the financial sustainability of the initiative, evidenced by governmental ownership of financial resource provision after the first 6 month technical and financial support from the WHO, both in Senegal and Sudan.

Our priority at the WHO was to bring in the money from external partners with the help of ITU's access to the private sector to fund this project. The money comes into ITU and 50% of it stays with ITU and 50% comes to the WHO to support the diffusion of BHBM at country level. (Interview #9)

Though the role of the government has been clearly identified, in both the case of Senegal and that of Sudan it remains inactive in the diffusion process, despite the fact its ultimate decision-making power in regard to the innovation's durability beyond the first 6 months.

Though the government bodies ie., Ministry of Health and Ministry of Information and Technology were identified as key actors in supporting the diffusion process, they had neither the financial resources nor the technical expertise and knowledge to take ownership of an mHealth initiative. Consequently, BHBM's diffusion faced significant delays. Therefore, in Senegal, to bridge this technical gap an externally developed digital platform was put in place with the help of the WHO and managed by an integrator (private sector).

We chose for Senegal to use one integrator as an interface between Ministry of Information and Technology and all three telecom operators. (Interview #6)

The inactivity of the public sector represents the biggest risk to the diffusion of externally developed innovations in LMICs. Without their active engagement in initiatives such as BHBM, the opportunity for large scale diffusion is also at risk.

BHBM with its unique, collaboration-based governance structure (ITU and WHO) also generated a dialogue between the Ministry of Health and Ministry of Information Technology in Senegal, where traditionally all ministries have been somewhat reluctant to exchange knowledge or their resource:

They don't have the organisational set-up to implement projects locally, unless they have a strong governance...They have to find a third party in order to deliver these projects. (Interview#9)

To build local technical capacity, simple, cost-effective and innovative communication strategies must be evaluated and implemented in collaboration with the private sector, while constantly driven by the needs of civil society.

One of the real success factors behind BHBM was the role of the civil society, the role of the well-established patient groups that hold the key to the success of the BHBM in Senegal. (Interview#14)

In Sudan meanwhile, the public sector with support from the WHO and the private sector played a key role in introducing BHBM as a potential solution to locally tackling NCDs. The Ministry of Health and the local WHO office together with civil society had already been working together to advance the medical practice for diabetes management, so to build on the already existing partnership, the Ministry of Health acquired BHBM, thus reinforcing the country's existing mobile infrastructure. Previously, health did not take advantage of the current mobile infrastructure, but by building a digital platform inside the Ministry of Health, an opportunity was created for open dialogue between the private and public sector to support BHBM's long term diffusion.

3.4.1.5 Civil society

Civil society, in the form of patient groups and patient associations, has detailed knowledge of local needs and is thus well-positioned to influence both patients and healthcare professionals. They also engage with the private sector. Despite their pivotal role in searching for an innovation to find new ways to solve problems locally, this vital contribution to diffusion is often overlooked:

One of the problems is when all these agencies are working with a specific budget and timeline, all the creativity coming from local knowledge and practices gets undervalued. You miss out inviting potentially key partners, such as patient groups. (Interview#17)

The fact that civil society is so often overlooked in this way derives from their lack of financial resources or technical skills. Their power however lies in their ability to actively bring new alliances on board by *manoeuvring*, by which we mean the ability of civil society to creatively identify resources across sectors and align each actor with the creation of social value.

Patient associations and patient groups have played an important role in the diffusion of BHBM in Senegal. They were involved in activities to improve the management and control of diabetes patients by actively searching for solutions to raise awareness of the disease through connecting healthcare professionals and health experts in the last 10 years. As a result of their “*active searching*” for solutions and their ability to manoeuvre across the private and public sector, they created the first specialised hospital unit for treating diabetes patients paid by the patients themselves.

One of the biggest challenges in diffusing BHBM to Senegal was to bring all social system actors together to create a partnership aligned with a large societal challenge and able to bring a solution for improved disease management, especially through prevention. To achieve this, patient groups were involved in the active search, both for the innovation and most importantly, for relevant new actors, whom they brought together through the act of manoeuvring.

The Diabetic Patient Association successfully identified BHBM as an appropriate social innovation, and approached the WHO for collaboration. The unique WHO-ITU collaboration directly facilitated the patient association's dialogue across sectors with counterparts including the Ministry of Health, the Ministry of Communication and the Ministry of Education and Research, universities, telecom operators, pharma, NGOs. To build sustainability into the project from its beginning, the local WHO office through the patient association engaged with young diabetes patients to develop their advocacy skills, then conveying their experience and insight to health professionals:

Empowering civil society is very important. We also need to focus on sustainability for the sake of sustainability and by giving voice to civil society is an effective way to do that. (Interview#17)

On the other hand, despite Sudan's WHO office collaboration with medical societies, they failed to develop a strong link with patient societies. With hindsight, after the first four years of the project, the government together with the WHO local office and medical experts identified the lack of engagement with patient groups as a missed opportunity. After learning from Senegal, all actors agreed that the role of patient associations and local communities and their perspective and commitment to generating value from the innovation through advocacy is indispensable:

While missions may be set in a relatively top down way, policy instruments should be chosen to foster bottom up exploration for creative experimentation in the innovative process. (Interview#15)

Table 3-1 Key resources to combine within the BHBM initiative (based on Amit and Zott, 2001; Austin and Seitanidi, 2012)

Actors	Resources					
	Human		Technical		Organizational	
	<i>Knowledge</i>	<i>Information</i>	<i>Technology</i>	<i>Finance</i>	<i>Access to market</i>	<i>Access to other organizations</i>
<i>Public-Private ITU</i>	Technical /building digital platform		Digital architecture and digital, platform			All telecoms, and other network organisations such as IFPMA, Ministry of Information and Communication Technology
<i>Public WHO, Ministry of Health, Ministry of ICT</i>	Health expertise	Educational content		Financial resources (short term 6 month support)		Ministry of Health , local office WHO , patient groups
<i>Private-Pharma WhatsApp Business</i>	Health expertise, market understanding	Science/ Technology		Financial resources (long term)	Access to private sector	Private sector, Patient groups, network organisations (IFPMA) Ministry of Health
<i>Private Telecommu nication companies,</i>	Technical /building digital platform, market understanding		Digital architecture and digital, platform		Access to private sector	Access to private sector
<i>Civil society Diabetes Patient Association Groups</i>	Local existing knowledge of needs	Disease management			Access to patients	Access to pharmaceutical companies and the WHO

Our findings indicate that building an overall digital architecture enabled by a technical platform hosting all telecom operators, irrespective of market positioning, supports the emergence of new services as a diffusion process outcome. Building an alignment with a purpose-led mission across the mobile operators shifted the system's power dynamics and resulted in a flatter governance structure. This in turn has resulted in an increased actor transparency throughout the communication processes.

3.4.2 Role of civil society in value creation

3.4.2.1 Generating value through ‘searching’ and ‘manoeuvring’

BHBM is a social innovation with the mission to save lives and improve health through digital content diffusion to prevent and manage NCDs globally. To support this mission, the initiative was set up from the outset as a collaboration between two UN agencies (WHO and ITU) to combine resources from both organisations.

In the cases of both Senegal and Sudan, though the project was designed by social system actors together, not all engaged actively with this process. Despite both governments’ strong incentive to find sustainable solutions for diabetes management, the Sudanese Ministry of Health’s reticence resulted in severe delays for the country’s overall diffusion process compared to that of Senegal.

Despite its traditional top down approach to generating value from an innovation, Senegal exhibited a perspective change regarding how value is generated from an externally developed social innovation. This was achieved by actively engaging with civil society, including patient associations, from the beginning of the diffusion process. There is a long stated argument in the literature associating value generation with pure profit. This has been particularly evident in primary healthcare, where value is mostly associated with short term goals to reach near financial targets set by governments in support of the private sector’s customary agenda (Mazzucato, 2016).

Private sector actors are often conceptually linked to the generation of economic and/or monetary value with often a short-term focus on maximising profit as part of an exchange. By contrast, in the case of Senegal, actors of the private sector were more aligned with the generation of public value and took a long-term view on addressing a broader societal challenge (Montes and Machando, 2013). The Diabetic Patient Association had a long-standing desire to

increase accessibility to primary healthcare through promoting prevention and management of the disease:

Since 1995, we have been working together with Sanofi to de-centralise care and prevention work around diabetes by starting with the training of healthcare workers. We have trained over 1000 healthcare workers in the past 10 years. (Interview #21)

Patient groups have been working together with health workers, medical experts and academics for years to address the risk associated with NCDs and to improve the overall health of Senegalese people. By actively searching for a social innovation they took a leading role in bringing BHBM to Senegal through multi-actor collaboration. Their success contrasts sharply with the majority of cases, where externally developed innovation is identified and acquired by the government.

Having actively searched for an innovation, civil society actors identified BHBM as a suitable solution to tackle NCDs locally and approached the Ministry of Health for support. Despite their efforts to locate a solution, they have received no support from the Ministry of Health. As BHBM is owned by the WHO, support from the government seemed essential to further progress. After various failed attempts to secure support from the government, either in the form of financial or human resources, these civil society actors pivoted and enlisted the private sector's help. They were also adept in identifying and activating the private sector with whom to collaborate, a strategy we refer to as 'manoeuvring'.

The role of civil society in actively searching for an innovation and manoeuvring across sectors has led to the successful introduction and implementation of a digital platform and the launch of mDiabetes in Senegal. Having a digital platform built in the country has not only increased patient access to primary healthcare information through digital messaging but also, through strengthened national technical capacity, has improved access to primary healthcare services.

Through the active involvement of patient groups, healthcare workers from the outset took ownership of BHBM and contributed to generating value from digital platform use, resulting in its embeddedness in the local healthcare system within a shorter time frame than that of previously piloted EDSIs which sought to solve similar challenges.

3.4.2.2 Capturing value through social mission/social purpose

This paper locates BHBM's core merit and worth in the way it creates value through an actor-actor collaboration to offer an innovative solution to disease control and management. In the case of BHBM, having a digital platform in place supports new service development in order to integrate mHealth programmes into the larger healthcare system. The real value of BHBM derives from the emergence of new services, rather than from the core attributes of the digital platform, and how these services meet customer needs.

Capturing value refers to the retention of value from all the exchange of resources and information between actors and its logic for earning profit (Zott and Amit, 2010). Traditionally this 'transactional value' derived from the exchange of economic benefits, generally driven by economic growth. This exchange also includes other intangible forms of benefits such as 'access to market' (Bocken et al., 2014), and benefits associated with the attributes of the innovation, the need of the customer, and the time in which the economic benefit of the innovation is communicated to the end users.

To capture value from BHBM, all actors have aligned themselves with a social mission to address a large societal challenge - the control and management of NCDs - by improving the overall access to primary healthcare services:

We're talking about profound partnerships where everyone feels that they are contributing something higher value or purpose rather than only money. (Interview#11)

In both Senegal and Sudan, all actors engaged in resource and information exchange in order to generate value from a digital platform sending primary health information on Diabetes prevention and management to all patients. They all aligned with a social mission (Mazucatto, 2016) with the intention to create long term sustainable value by stimulating social change (Mair & Marti 2006; Austin et al., 2006) through a digital health intervention designed to prevent and manage NCD related illnesses. Maintaining a long term view led by a social mission to improve the health of Senegalese and Sudanese people created opportunities for new services to develop and improve the overall healthcare system.

When it comes to health everyone wants to contribute to the health of the Sudanese people. If we mention that - this is a population based project, targeting all the Sudanese population, to raise the awareness to decrease the prevalence of diabetes and also increase the healthier lifestyle for those who are at risk - everyone wants to contribute to the initiative. (Interview#17)

To capture value from this social innovation, all actors were involved in the exchange of resources (see Table 3-1) to build financial stability into the diffusion process instead of looking for external funding (Hlady-Rispal and Servantie 2018; Covin *et al.* 2015). In LMICs where financial resources are relatively low and customer demands high, where social systems are not equally powerful due to lack of access to resources, knowledge and skills, it is difficult for each actor to allocate their own resources to support the reduction of NCDs locally. The diffusion of BHBM was made possible because all actors in the social system brought a commitment to a social mission, expressed by one interviewee thus:

The aim is to create partnership and share knowledge where the public health outcome is in the heart of everything. (Interview#9)

For civil society to have as much power as the private sector, a high level of commitment towards a unifying goal is required. In the next few paragraphs we illuminate the role of replication as a key activity to support the embeddedness of the innovation locally creating local sources for a revenue stream.

3.4.2.3 Sharing value through new service development

To diffuse a digital health intervention, such as BHBM, first there is a need for an overall digital infrastructure:

You build up your intra-probability failure and you build up your digital platforms (Interview#10).

The building of such a technical infrastructure is associated with the upfront cost of social innovation and is often overlooked by the public sector. In most cases there is a lack of understanding as to where to invest and how to create an environment for a digital intervention

to sustain itself. This leads to small scale, isolated and fragmented applications which prevent the innovation's from becoming diffused.

The successful diffusion of BHBM in Senegal is in large part attributable to the ways in which local health professionals and local patient associations found creative ways to exploit value from the diversity of the BHBM partnerships enabled by a digital platform. In order to maximise value from the use of BHBM and to sustain the innovation long term, it was vital to empower civil society to start developing new services to sustain other mHealth initiatives using the same digital platform across the country.

To maximise the value from having a digital platform in place, millions of text messages were sent out on how to prevent and manage the population level spread throughout the 2014 Ebola epidemic in Senegal. Everyone who enrolled on the mDiabetes programme, including all healthcare workers and health centres, received these messages directly within the first 24 hours of the breakout. Having both a digital platform in place and experience in previous use of an mHealth initiative had significantly lowered the number of Ebola cases and reduced the timeframe for the country's recovery:

Senegal built a separate technology platform as part of BHBM to help spread the messages. In 2014 throughout the Ebola outbreak, by utilising the existing platform they have managed to switch the services within 24 hours to communicate messages and share information about prevention and management of Ebola. This has significantly reduced the number of cases in the country and the time the country dealt with the crises. It helped the government to act more collectively and efficiently in a situation of crisis. (Interviews #12, 16)

The digital platform also enabled already existing services to be redesigned for better access to primary healthcare across Sudan:

Previously the Ministry of Health lacked efficiency to use local technical infrastructure. There were only a few messages going out but not very systematically. Having a digital platform in place created an opportunity for the health sector in Sudan to develop new services from the use of the technology. (Interview#17)

To help diabetic patients to manage their diseases at the start of the COVID-19 outbreak, the private and public sector as a collaborative response developed a new service offering virtual facility visits to patients enrolled on BHBM. WhatsApp Business together with the local representation of the WHO started to use the digital platform to provide access to virtual medical consultation.

The development of new services, such as WhatsApp Business for practitioners, introduced a change in patient behaviour and contributed to the overall management of NCD related illnesses across the country. Empowering civil society to actively work with the private and public sector in this way could lead to the development of new or upgraded services for patient care and an overall upgrade to the local healthcare system. Involving primary healthcare centres, diabetic healthcare centres across the states of Sudan has become the critical step for BHBM's sustainability:

I personally think that it's a project that can make things move forward a lot in Sudan that doesn't have all of the means to care for patients. (Interview#17)

In both Sudan and Senegal, capturing value from a digital platform enabled social system actors to use the digital platform more widely and start introducing new mHealth programmes to address other non-communicable diseases, such as cancer, through mCervical Cancer, and the decline of intrinsic capacity by age through mAging. More widespread use of the digital platform could also address other health problems and support the formation of new services to upgrade and equip local healthcare systems to prevent and manage NCDs locally. Placing civil society at the heart of the value creation process contributes significantly to the sustainability of social innovations such as BHBM.

The key activities associated with BHBM's successful diffusion in Senegal and Sudan were focused on the successful integration and combination of resources between all actors, including civil society's active searching role for a solution to an important social need. Through searching and manoeuvring across sectors they opened up discussions between the public and private sector, leading to a collaborative approach to integrate BHBM into the local healthcare systems. This happened in two ways, first through building local technical capacity, and second by developing new services on the established digital platform. In both Senegal and Sudan, developing new services, such as online consultations through WhatsApp, led to the

continued use of BHBM and the emergence of an innovation ecosystem to support BHBM's integration into the local healthcare system.

Table 3-2 Civil society's key role in the creation of value

Value creation process	Activity	Examples
<i>Value generation</i>	<p>Searching for innovation</p> <p>Manoeuvring</p>	<p>Successfully located BHBM as a social innovation to address diabetes-related health conditions</p> <p>Approached WHO and ITU for a collaboration to tackle NCDs</p> <p>Initiated conversation with the private sector to join the BHBM initiative</p> <p>Actively lobbied with the public sector to support the BHBM initiative</p>
<i>Value capture</i>	Integrating and combining resources	<p>Digital platform in place to host BHBM</p> <p>Increased technical capacity and support to introduce similar health initiatives.</p> <p>Mobile companies offered free services through their networks to increase access to information and knowledge</p> <p>Private sector offered financial support to sustain the innovation</p>
<i>Value sharing</i>	Developing new services	<p>Developed a new service offering virtual facility visits to patients enrolled on BHBM.</p> <p>WhatsApp Business, together with the local representation of the WHO, started to use the digital platform to provide access to virtual medical consultation.</p>

In Table 3-2 we outline civil society's active role in value creation through selecting and applying an externally developed social innovation to solve a social need. In both Senegal and Sudan, civil society has played a significant role in identifying a solution and, through continuous feedback loops, bringing social system actors together to initiate the innovation in the country. Through combining and integrating resources, new services have emerged to

support the continuous use of the innovation and to support the local embeddedness of BHBM into the local healthcare system. In Chapter 4 we aim to highlight the importance of each activity and how they contributed to the integration of BHBM into the local healthcare system both in Senegal and Sudan.

3.5 Discussion

Diffusion encompasses not only a rate at which the innovation is adopted but also a direction in which value is created from the innovation to address societal challenges (Oeij. et al, 2019). The rate of adoption is often associated with the perceived attributes of the innovation and the communication channels through which information is delivered to the customer about the innovation. While these variables are important in explaining why an innovation is adopted from a product perspective, they fail to capture the value created from the use of the innovation to address social needs and enable long term societal impact. Through the in-depth case of BHBM, we have looked at how social system actors actively engage in the value creation process by exchanging and combining resources (Barney, 1986; Eisenhardt, 2000) to diffuse a social innovation that becomes embedded into the local system.

In considering the diffusion of BHBM in Senegal and Sudan, we contribute to the literature on the diffusion of innovation theory in two important ways. First, we examined the role of social system in the value creation process and second, we illuminated the role of civil society in the diffusion process through its ability to manoeuvre and to actively search for an innovation.

3.5.1 Co-creating value from a social innovation

BHBM was designed to tackle NCDs globally with the help of an externally developed digital platform to increase the efficiency of already existing communication processes. Placing public health outcomes at the heart of BHBM's social mission has enabled social system actors to galvanise around the pressing need to raise public awareness and promotion of primary healthcare messages to prevent and manage NCDs. The social innovation process uses and combines resources in an innovative way to address pressing social needs (Mair and Marti, 2006), and, through various social arrangements, leads to the sustainable transformation of outdated service models (Alvord, Brown, and Letts, 2004).

BHBM as a social innovation coupled with an enabling technology created opportunities within the social system to maximise value from the use of the digital platform (Vargo, 2020) by developing new services to sustain the innovation. Launching BHBM in Senegal and Sudan generated new ways through which value was co-created within the social system through defined activities to meet a common purpose (Mumford et al., 2002). All actors saw intrinsic value in the use of digital technology to improve efficiency for delivering public health messages.

We also add to the literature on creating value from an externally developed social innovation with the development of new products to address social challenges. According to our findings, new healthcare services were developed from the digital platform, together in consultation with local patient groups. This supports Mazzucato's (2016, 2017, 2019) view on value being an all-sector collaborative approach with a long-term vision to create value for society. We support this premise, which challenges the notion of value as a top down, pure profit phenomenon, constructing it instead as a co-creative process.

Moreover, our views on value creation correspond with and are inspired by the imaginative work of Edith Penrose (1959), who highlights the role of the manager in deploying scarce resources to the best opportunities rather than the profit maximisation found in Milton Friedman's work on Capitalism and Freedom (1962). Taking an actor-actor approach to diffusion as a part of the recursive innovation process (Vargo and Lusch, 2011), while seeing value creation as an integration and recombination of resources aligns our views with diffusion being a recursive process where value is co-created within the social system. By bringing the diffusion process into the innovation process rather than a separate one that follows innovation, supports Vargo and Lusch's service-based view. Without innovation diffusion, innovation as a process could not be conceptualized as institutional change (Vargo and Lusch, 2020). Further research on the role of co-creation in innovation diffusion could contribute to a deeper understanding of the actor-actor (Vargo and Lusch 2011) view of innovation diffusion by conceptualizing diffusion as an emergent and co-creative process where actors of the social system are involved in the combination of new resources and altering institutional arrangements.

In the context of social innovation, value is seen when a social agenda has been delivered or a social problem has been improved or solved. The challenge with social value creation (Caldwell et al, 2017) is that while in the private sector generating profits acts as a mechanism

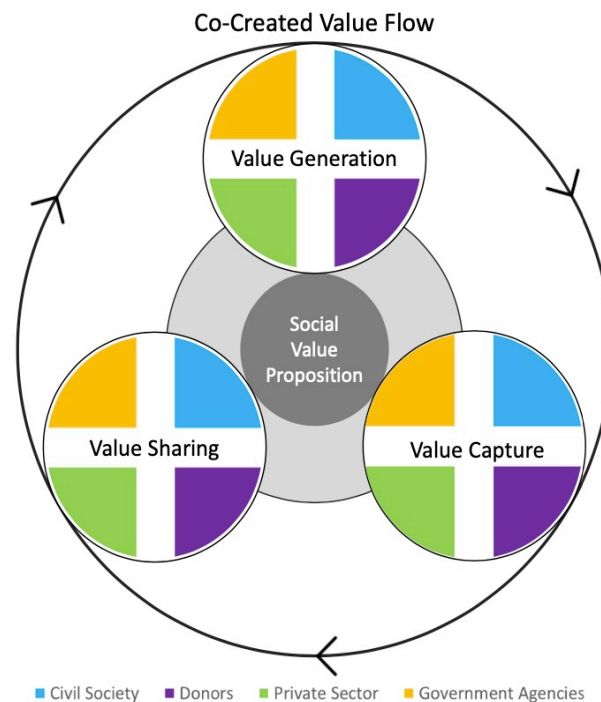
for sustaining the innovation, generating social impact is much harder due to the lack of understanding on how social gains might bring financial stability for the diffusion process. Instead of privileging the known metric of profit which can be measured in the short term, we could look at a more diverse set of metrics around public health outcomes which can only be known over longer terms (Mazzucato and Roy, 2019).

Hence we advocate for a new direction from which to promote, adopt and measure social innovation. Rather than differentiating between innovators/diffusers and adopters/users, we look at the diffusion as an actor-actor process (Vargo et al., 2020), in which all actors of the social system engage in activities aligned with a mission-orientated goal, thereby shifting the view of diffusion from a uni-directional to a recursive dynamic process that involves multiple actors engage in the co-creation of value by integrating new resources. On this premise, co-creation of value becomes an integrated part of the diffusion process. Moreover, illuminating the ways in which social value is created amongst these actors provides a practical overview of the role of the social system in the diffusion process. (Fig. 3-2)

In the context of BHBM , the co-creation of value was mostly concerned with the creation of public/social value from a digital platform concerned with NCD type illnesses, especially with diabetes. In this diagram social value proposition is aligning the process of value creation with a purpose-led mission which in the context of BHBM is to provide universal access to healthcare starting with disease prevention. Care, quality of life, prevention and disease management are all indicators of the tangible and intangible benefits of successful healthcare system. Simply put social value is associated with the co-creation of positive social outcome, which in the context of BHBM is increased societal wealth and wellbeing.

Both social value and sustainable value are interlinked as to be framed as purpose-led with a long term view where value is created not only from an economic exchange but from an exchange between all actors in the social system and their relations to society as a whole. Sustainable value is interlinked with social value that "incorporates economic, social and environmental benefits conceptualised as value forms" (Evans et al., 2017, p.601). In which social value refers to the benefits created for society such as health and wellbeing.

Figure 3-2 Co-created Value Flow in the context of BHBM



3.5.2 Social value creation

Using technology for use rather than technology for sale corresponds with the current literature on health economics, which highlights the role of prevention as part of value creation (Mazzucato, 2017). Digital could place prevention to the forefront of primary healthcare, creating long term sustainable value. Value is no longer considered to be the economic value associated with the technology itself but the value associated with public wellbeing, and public value is changing the way we perceive multi-actor partnerships.

Social value and sustainable value are interlinked, especially the context of social innovation. Both can be re-framed in terms of a social mission or being purpose-led, where value creation is aimed at increased societal wealth and wellbeing rather than disproportionately rewarding actors of the private sector for short term economic gain or profit maximisation (Mazzucato, 2017). Aligning the process of social value creation with a social mission or purpose (Mumford et al., 2002), such as improved access to primary healthcare, would equally support the creation of social value from a health innovation.

The historic economic view on value to maximise profit and to achieve economic growth is no longer sustainable, for significant reasons. One is associated with the direction of value

creation, while another links its overall purpose. Especially in healthcare, value has mostly been associated with short term goals to reach near financial targets set by governments in support of the private sector agenda. Yet healthcare's primary purpose is surely to provide equitable access to disease prevention and treatment, the care of illness and injuries and the preservation of life across the whole of society. Care, quality of life, rehabilitation, and disease management strategies are all indicators of the tangible and intangible benefits of successful healthcare systems. Therefore, value in the healthcare context is almost impossible to quantify in narrowly monetary terms. Consequently, we support the new direction for value creation driven by a purpose-led mission (Mazzucato 2016). To support this new line of thought on social value creation, we call for further empirical evidence on diffusing social innovations into LMICs.

3.5.3 Moving civil society to the forefront of value creation

Ultimately, by shifting the focus from profit to welfare (Hart & Zingales 2017) we also empower civil society to take an active role in co-creating value from an EDSI. This shift would also support the overall wellbeing of society and bring a change to existing governance structures that are no longer suitable for creating social value.

Acquiring an externally developed innovation must be informed by society's real needs and bring in solutions to generate social value. We observed that when civil society takes an active role in searching for innovation, it opens up a dialogue between sectors. Placing civil society at the heart of the value creation process supports the formation of an ecosystem by choice and not by design. Meaning, empowering civil society to take an active role in the innovation process could contribute to the sustainability of the innovation. In most cases, the power of civil society is overlooked. Our research allowed us to illuminate the important role they play in value generation (Soppe 2004).

Despite civil society's complexity, its mobilisation is essential to give expression to the marginalised and those not often heard in the diffusion process. Civil society actors can enhance the participation of communities at the start of value creation by actively engaging in generating value from the innovation. Empowering civil society to drive the diffusion process rather than allowing it to be shaped by commercial interests alone, should be the standpoint of public organisations actively supporting this change. This concords with the increasing number of scholars engaging with the role of government and public organisations in a digitally

transformed world (Prabhu, 2021) and what they can do to support the diffusion of technologically-enabled social innovations.

In both cases, civil society played a key role in the successful diffusion. The biggest difference between the two countries were at the point in the time when civil society has entered to the diffusion process. In Senegal, from the beginning of introducing BHBM as a possible solution for NCDs, civil society, especially the Diabetes Patient Association was actively involved in searching for a solution that could not only raise awareness of NCDs but increase accessibility to primary healthcare services to manage patients illnesses locally. By doing so, they took a leading role in bringing BHBM to Senegal through building a collaboration between the public and private sector. While in Sudan, the search for a solution was initiated by the WHO local office by directly sending the signal to civil society to join the call. Empowering civil society to work in collaboration with the public and private sector has resulted in new and also upgraded services for patient care, such as the development of online consultation via WhatsApp Business. In summary, the main difference between these cases; was the time in which they have entered to the diffusion process.

Our paper brings together views from health economics (Mazzucato 2016) social innovation management (Seelos and Mair, 2017; Alvord et al., 2004; Mair and Marti, 2006; Mumford et al., 2002) and ecosystems (Vargo, 2020; Vargo et al., 2018; de Jong et al., 2018) together with our findings to shift the focus of value creation towards a collaborative process where members of the social system align themselves with the creation of a social value to improve the overall wellbeing of society catalysed by a digital technology. Digital is a highly appropriate platform to build overall technical capacity, however building ownership behind that platform requires a collaborative effort from all actors in the social system to equally take part in the diffusion process and adopt a long-term view to accomplish a social mission.

3.6 Conclusion

Our findings of this paper highlighted (1) how multiple actors of the social system engage in the co-creation of value as part of the diffusion process, therefore suggesting that the definition of diffusion can include co-creation simultaneously with communication and (2) how the private, public sector and civil society work towards a mission orientated goal by aligning with the overall purpose of BHBM. Placing the adopter community at the forefront of the value creation process provides a new dimension to user involvement in the diffusion process.

The BHBM health initiative was set up in 2013 by the World Health Organisation (WHO) in collaboration with the International Telecommunications Unit (ITU) with the aim to augment and multiply mHealth services for non-communicable diseases (NCDs). It was structured as a multi-sector and multi-partner initiative to accelerate digital and mobile health uptake and build global evidence for best practices. Most innovations designed and developed outside the country of subsequent diffusion are associated with a top down governmental approach influenced by short term economic agendas rather than long term social mission. The role of government is to meet its short term financial objectives, which are mostly driven by the private sector's agenda.

However, when social system actors actively engage in the diffusion process, there is an opportunity to change the vantage point regarding how value is created from a social innovation and instead to align their roles and activities with the creation of social value, that we use to denote increased level of wellbeing, equal access to information, and universal access to healthcare. The creation of social value requires multiple actors engaging in collaboration where resources are combined and aligned with larger societal needs to support transparency of the diffusion process. In both the case of Sudan and of Senegal, we observed the importance of alignment with a purpose-led mission in order to develop a strong collaboration between all social system actors and a long term vision for diffusion.

As long as the public sector continues to incentivise the role of curative healthcare rather than the role of prevention in primary care, bringing longevity to social value creation remains a challenge. Our findings highlight the important role of civil society in challenging these old preconceptions associated with healthcare delivery and healthcare services. It does so by taking a lead role in identifying a long term solution in tandem with the private sector. One of the biggest barriers with understanding values associated with primary healthcare is people's own conceptualisation of health and how they internalise their own needs around it. Bringing an externally developed social innovation enabled by a digital platform was a great example for creating social value and tackling a pressing social need.

The role of social system in the diffusion of externally developed social innovations is to build new partnerships aligned with values, such as public value, prevention, and wellbeing, referred to as intangible benefits. To develop access to healthcare for all calls for a new formation of partnership and communication between the public and private sector is needed. In order to

achieve this, national and local governments should reevaluate the benefits the private sector could bring. However, there is still difficulty in aligning different interests and values in such partnerships.

The experiences of Sudan and Senegal highlight the importance of alignment with a larger set of goals, such as public value, and support the repositioning of actors as stake *owners* rather than stakeholders (Ahen, 2019). They moreover demonstrate the desirability of creating joint ownership of a social problem, de-prioritising the immediate economic gains and benefits by which impact is still measured, and moving instead towards a shared value aligned with the interest of the public and local communities. Empowering civil society to take a lead role in partnerships would create new power dynamics between partners and flat governance structures aligned behind public value.

On the basis of these findings, we advocate a radical change in assumptions around what constitutes value, consistent with Mazzucato's ground-breaking mission economy concept. This would entail a move away from a profit or financial set of metrics to metrics predicated on human welfare and societal well-being. We moreover submit that those outdated metrics affected historical understandings of diffusion, and instead call for its reconceptualization as a dynamic co-creative process which places at the centre those most in need of the innovation itself. This potentially rich seam of research will require further focus and investigation.

3.7 References to chapter 3

- Adner, R. (2017) 'Ecosystem as Structure: An Actionable Construct for Strategy', *Journal of Management*, 43(1), pp. 39–58.
- Ahen, F., (2019). Making Resource Democracy Radically Meaningful for Stakeowners: Our World, Our Rules?. *Sustainability*, 11(19), p.5150.
- Al Humaidan, S. and Sabatier, V., (2017). Strategic renewal in times of environmental scarcity. *Journal of Organizational Change Management*.
- Allee, V. (2011), "Value Networks and the true nature of collaboration" Online Edi., Value NetWorks and Verna Allee Associates, available at: <http://www.valuenetworksandcollaboration.com/> (accessed November 2020).
- Alvord, S. H., L. D. Brown, C. W. Letts., (2004). Social entrepreneurship and societal transformation: An exploratory study. *Journal of Applied Behavioral Science* 40(3) pp.260–282.
- Amit, R. and Zott, C., (2001). Value creation in e-business. *Strategic management journal*, 22(6-7), pp.493-520.
- Austin, J. E., Leonard, H. B., Reficco, E., & Wei-Skillern, J. (2006). Social entrepreneurship: It's for corporations, too. In A. Nicholls (Ed.), *Social entrepreneurship: New models of sustainable social change* (pp. 169-180). Oxford, UK: Oxford University Press.
- Austin, J.E. and Seitanidi, M.M., (2012). Collaborative value creation: A review of partnering between nonprofits and businesses: Part I. Value creation spectrum and collaboration stages. *Nonprofit and voluntary sector quarterly*, 41(5), pp.726-758.
- Austin, J.E. and Seitanidi, M.M., (2012). Collaborative value creation: A review of partnering between nonprofits and businesses. Part 2: Partnership processes and outcomes. *Nonprofit and Voluntary Sector Quarterly*, 41(6), pp.929-968.
- Barney, J.B., (1986). Organizational culture: can it be a source of sustained competitive advantage?. *Academy of management review*, 11(3), pp.656-665.
- Becker, S.O., Hsiao, Y., Pfaff, S. and Rubin, J., (2020). Multiplex Network Ties and the Spatial Diffusion of Radical Innovations: Martin Luther's Leadership in the Early Reformation. *American Sociological Review*, 85(5), pp.857-894.
- Botti, A. and Monda, A., (2020). Sustainable value co-creation and digital health: The case of Trentino eHealth ecosystem. *Sustainability*, 12(13), p.5263.
- Buse, K. and Harmer, A.M., (2007). Seven habits of highly effective global public-private health partnerships: practice and potential. *Social science & medicine*, 64(2), pp.259-271.
- Bocken, N. Short, S.W., Rana, P., Evans, S. (2014) A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, Volume 65, pp. 42-56

- Caldwell, N.D., Roehrich, J.K., George, G., (2017) Social Value Creation and Relational Coordination in Public-Private Collaborations. *Journal of Management Studies* 54/6
- Casadesus-Masanell, R. and Ricart, J.E., 2010. From strategy to business models and onto tactics. *Long range planning*, 43(2-3), pp.195-215.
- Chesbrough, H.W., (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.
- Chesbrough, H., Lettl, C. and Ritter, T., (2018). Value creation and value capture in open innovation. *Journal of Product Innovation Management*, 35(6), pp.930-938.
- Covin, J.G., Garrett Jr, R.P., Kuratko, D.F. and Shepherd, D.A., (2015). Value proposition evolution and the performance of internal corporate ventures. *Journal of Business Venturing*, 30(5), pp.749-774.
- de Jong, J.P., Gillert, N.L. and Stock, R.M., (2018). First adoption of consumer innovations: Exploring market failure and alleviating factors. *Research Policy* 47(2) pp.487-497
- Dubois, A. and Gadde, L.E., (2002). Systematic combining: an abductive approach to case research. *Journal of business research*, 55(7), pp.553-560.
- Dougherty, D., (1992). A practice-centred model of organizational renewal through product innovation. *Strategic management journal*, 13(S1), pp.77-92.
- Dougherty, D., (2017). Taking advantage of emergence for complex innovation eco-systems. *Journal of Open Innovation: Technology, Market, and Complexity*, 3(3), p.14.
- Eisenhardt, K.M. and Martin, J.A., (2000). Dynamic capabilities: what are they?. *Strategic management journal*, 21(10-11), pp.1105-1121.
- Emerson, J. (2003) 'The Blended Value Proposition: Integrating Social and Financial Returns', *California Management Review*, 45(4), pp. 35–51.
- Fatemi, A. and Fooladi, I., (2020). A primer on sustainable value creation. *Review of Financial Economics*, 38(3), pp.452-473.
- Fliegel, F.C. and Kivlin, J.E., (1966). Attributes of innovations as factors in diffusion. *American journal of sociology*, 72(3), pp.235-248.
- Friedman, M. (1962). *Capitalism and freedom*. Chicago: University of Chicago Press.
- Grant, R.M., (1996). Toward a knowledge-based theory of the firm. *Strategic management journal*, 17(S2), pp.109-122.
- Grodal, S., Anteby, M. and Holm, A.L., (2020). Achieving rigor in qualitative analysis: The role of active categorization in theory building. *Academy of Management Review*,
- Hart, O. and Zingales, L., (2017). Companies should maximize shareholder welfare not market value. *ECGI-Finance Working Paper*, (521).

- Hlady-Rispal, M. and Servantie, V., (2018). Deconstructing the way in which value is created in the context of social entrepreneurship. *International Journal of Management Reviews*, 20(1), pp.62-80.
- Howitt, P., Darzi, A., Yang, G.Z., Ashrafian, H., Atun, R., Barlow, J., Blakemore, A., Bull, A.M., Car, J., Conteh, L. and Cooke, G.S., (2012). Technologies for global health. *The Lancet*, 380(9840), pp.507-535.
- Katz, E., (1961). The social itinerary of technical change: two studies on the diffusion of innovation. *Human Organization*, 20(2), pp.70-82.
- Khavul, S. and Bruton, G.D., (2013). Harnessing innovation for change: Sustainability and poverty in developing countries. *Journal of Management Studies*, 50(2), pp.285-306.
- Korsgaard, S. and Anderson, A.R., (2011). Enacting entrepreneurship as social value creation. *International Small Business Journal*, 29(2), pp.135-151.
- Lawrence, T.B., Dover, G. and Gallagher, B., (2014). Managing social innovation. *The Oxford handbook of innovation management*, pp.316-334.
- Locke, K., Feldman, M. and Golden-Biddle, K., (2020). Coding Practices and Iterativity: Beyond Templates for Analyzing Qualitative Data. *Organizational Research Methods*
- Mair, J. and Marti, I., (2006). Social entrepreneurship research: A source of explanation, prediction, and delight. *Journal of world business*, 41(1), pp.36-44.
- Lusch, R.F. and Vargo, S.L., (2011). Service-dominant logic: a necessary step. *European Journal of Marketing*.
- Mazzucato, M. and Roy, V., (2019). Rethinking value in health innovation: from mystifications towards prescriptions. *Journal of Economic Policy Reform*, 22(2), pp.101-119.
- Moore, J.F., (1993). Predators and prey: a new ecology of competition. *Harvard business review*, 71(3), pp.75-86.
- Miles, M.B. and Huberman, A.M., (1994). *Qualitative data analysis: An expanded sourcebook*. sage.
- Mulgan, R., (2000). Comparing accountability in the public and private sectors. *Australian Journal of Public Administration*, 59(1), pp.87-97.
- Mumford, M.D., (2002). Social innovation: ten cases from Benjamin Franklin. *Creativity research journal*, 14(2), pp.253-266.
- Montes, G.C. and Machado, C.C., (2013). Credibility and the credit channel transmission of monetary policy theoretical model and econometric analysis for Brazil. *Journal of Economic Studies*.
- Nancy, B., Samuel, S., Padmakshi, R., & Steve, E. (2013). A value mapping tool for sustainable business modelling. *Corporate Governance*, 13(5), 482–497.

- Oeij, P.R., van der Torre, W., Vaas, F. and Dhondt, S., (2019). Understanding social innovation as an innovation process: Applying the innovation journey model. *Journal of Business Research*, 101, pp.243-254.
- Penrose, E. (1959). *The Theory of the Growth of the Firm*. (4th edition) Oxford University Press, USA
- Pisano, G.P., (1994). Knowledge, integration, and the locus of learning: An empirical analysis of process development. *Strategic management journal*, 15(S1), pp.85-100.
- Plum, A., Tanniru, M. and Khuntia, J., (2020). An innovation platform for diffusing public health practices across a global network. *Health Policy and Technology*.
- Prabhu, J. (2021). *How Should A Government Be? The new leavers of state power*. (Main edition) London: Profile Books
- Rogers, E. M. (2003). *Diffusion of Innovations* (5th edition). New York: Free Press.
- Sabatier V., Medah, I., Augsdorfer P., Maduekwe, A. (2017). Social business model design and implementation in developing countries: Learning from an affordable medicine developed in Burkina Faso. *Journal of Management Development*, Vol. 36 Issue: 1, pp.48-57
- Seelos, C. and Mair, J., (2005). Social entrepreneurship: Creating new business models to serve the poor. *Business horizons*, 48(3), pp.241-246.
- Seelos, C. and Mair, J., (2017). *Innovation and Scaling for Impact: How Effective Social Enterprise Do It*. (Illustrated edition) Stanford University Press
- Soppe, A., (2004). Sustainable corporate finance. *Journal of Business Ethics*, 53(1-2), pp.213-224.
- Strang, D. and Soule, S.A., (1998). Diffusion in organizations and social movements: From hybrid corn to poison pills. *Annual review of sociology*, 24(1), pp.265-290.
- Strauss, A. and Corbin, J., (1990). *Basics of qualitative research*. Sage publications.
- Teece, D.J., Pisano, G. and Shuen, A., (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), pp.509-533.
- Vargo, S.L., Maglio, P.P. and Akaka, M.A., (2008). On value and value co-creation: A service systems and service logic perspective. *European management journal*, 26(3), pp.145-152.
- Vargo, S.L., Akaka, M.A. and Wieland, H., (2020). Rethinking the process of diffusion in innovation: A service-ecosystems and institutional perspective. *Journal of Business Research*, Vol. 116, pp.526-534.
- Von Bertalanffy, L. (1972). *General systems theory: Foundations, developments, applications*, New York, Braziller

- Villani, E., Greco, L. and Phillips, N., (2017). Understanding value creation in public-private partnerships: A comparative case study. *Journal of Management Studies*, 54(6), pp.876-905
- Vladimirova, D., (2019). Building Sustainable Value Propositions for Multiple Stakeholders: A Practical Tool. *Journal of Business Models*, 7(1), pp.1-8.
- Wargny M., Kleinebreil L., Dio SN., et al. (2018). SMS-based intervention in type 2 diabetes: clinical trial in Senegal *BMJ Innovation* (4) 142-146.
- Wernerfelt, B., (1984). A resource-based view of the firm. *Strategic management journal*, 5(2), pp.171-180.
- World Health Organization, 2019. Be he@ lthy, be mobile: annual report 2018.
- Zott, C., Amit, R. and Massa, L., (2011). The business model: recent developments and future research. *Journal of management*, 37(4), pp.1019-1042.

4 SOCIAL SYSTEM ACTIVITIES TO SUPPORT THE DIFFUSION PROCESS: THE CASE OF BE HE@LTHY, BE MOBILE

ABSTRACT

Diffusing complex social innovations to address long-standing and emergent health care problems in low to middle income countries (LMICs) can be challenging as initiatives are frequently met with resistance and innovations often fail to stick. In LMICs, the cost of innovation adoption failure can be significant both in terms of sunk resources and continuing health care challenges. Innovation activities designed to address global challenges in LMIC represent a somewhat different challenge to those of developed countries. Further, the factors underpinning the successful diffusion of these innovations is poorly understood. Challenges affecting the diffusion include: limited access to resources (financial, technical, human); and poorly developed local infrastructure. Of particular concern are the missing networks for sustaining let alone upscaling these innovations. In the absence of the highly networked nature of diffusion without building local ecosystems, the diffusion of complex social innovations will continue to disappoint in making an impact on a societal level. To better understand the *activities that underpin the diffusion of externally developed social innovation in LMICs*, we report on an in-depth case study of the World Health Organisation's Be He@lthy Be Mobile (BHBM) initiative in Senegal, India and Sudan. In doing so we first illustrate how multiple actors come together to perform a set of activities along the innovation journey and second, we elucidate the ways in which a digital platform acts as a catalyst for these actors to engage in developing new services and ensures the continuous use of a social innovation and its integration into the wider user community.

Key words: diffusion process, social innovation, social system, civil society, low to middle income

4.1 Introduction

Non Communicable Diseases (NCDs), diseases are not transmissible directly from one person to another and include heart disease, some cancers and respiratory conditions, diabetes, osteoarthritis and osteoporosis. They account for approximately 60% of deaths worldwide, and the figure is rising (Bloom et al., 2011): NCDs represent a major social and economic challenge for individuals and nation states. So significant a problem are NCDs that they feature as a specific goal – Goal #3: Good Health and Wellbeing - in the UN's Sustainable Development Goals (UN, 2015). While a large proportion of the burden is currently borne by developed countries, as their populations and economies grow, developing countries are expected to assume a greater and disproportionate share (Clar et al., 2011): an estimated 84% of all deaths in Egypt are NCD-related (Zaid et al., 2019).

NCDs stem from a combination of modifiable (e.g. poor diet, physical inactivity, tobacco use, and harmful alcohol use), non-modifiable (e.g. age, sex, and genetic make-up), and contextual (e.g. the built and social environment, political, economic and legal systems, the policy environment, culture and education) risk factors (Bloom et al., 2011). Complex organisational and technological health care and medical innovations (including screening, devices, diagnostics, telemedicine and education) which involve multi-actor relationships among health care professionals and scientists, technologists, researchers, local and national governments and the local civil population, offer a range of short-, medium- and long-term solutions to address the challenge of NCDs (Dutta et al., 2019).

However, low to middle income country (LMIC) markets face unique difficulties in adopting such health-related innovations and sustaining them to the extent that they widely diffuse and address the challenge of NCDs at scale (Hart and Christensen, 2002). Previous research has identified a variety of factors that hamper the widespread adoption of externally developed innovations (EDSI), in particular those innovations originating from developed country contexts (Hammond and Prahalad, 2002, Tukker, 2005). In the context of sanitation, for example, the paid-for provision of toilet facilities can encounter resistance in the form of cultural norms and free-to-use alternatives such as open pit latrines or 'flying toilet' methods, i.e., the surreptitious discarding of packages of excrement (e.g. usually by throwing onto neighbours' roofs) (Franceys and Weitz, 2003). Ramani et al. (2012) attribute the failure of such innovations to diffuse into LMICs to a combination of four general causes: technology

design; product design; delivery design; and missing institutions, capabilities or linkages. With such a number and variety of factors influencing diffusion in low income markets, strategies to promote the uptake of health related innovations such as those addressing NCDs need to take account both of local exigencies of culture, context and resource constraints (Ray and Ray, 2011, Zeschky et al., 2011, Radjou et al., 2012) and of structural, economic, social and institutional factors - the innovation ecosystem that allows development and diffusion to happen (Zanello et al., 2016). Further, several barriers affecting the diffusion of social innovation are highlighted in the literature, including: limited access to resources (financial, technical, or human), limited infrastructure, lack of best practice for scaling social innovations, and the absence of networks for sustaining let alone upscaling these innovations (Khan, Mulgan, Pulford and Vasconcelos 2010; Dhont, Oiej and Schroder, 2018; Howalt, 2018).

Despite the magnitude of the challenges of bringing innovative solutions to combat NCDs in LMIC markets, surprisingly little prior research exists. Our purpose in this paper is to shed light on the phenomenon. In particular, we address the question of how multiple actors within a social system engage in activities to support the diffusion of an externally developed social innovation, in this case a digital healthcare initiative, and to integrate it into the wider user community.

Our study focuses on the diffusion of a digital healthcare initiative, or mHealth initiative, Be He@lthy, Be Mobile (BHBM) established by the World Health Organisation (WHO) and the International Telecommunication Union (ITU) in 2013. BHBM exploits the affordances of mobile phones to address NCD risk factors by educating people to make healthier lifestyle choices. It does this through the provision of disease prevention and management information directly to mobile phone users. BHBM was set up to support the scale-up of mHealth services by adopting a multisectoral approach to increase the potential of long term impact through building collaboration between private and public sectors. As a collaboration between UN agencies of health and information and communication technology, it also encourages various actors such as the respective countries Ministries of Health, Information and Communication Technologies, and local NGOs to work in partnership with the private sector on promoting information and technology for development including digital healthcare.

Further, BHBM uses mobile phone technology to strengthen local and national health provision by providing training to health workers (WHO-ITU, 2014). There are reportedly more than 7

billion mobile subscribers around the world, over 70% of which are in low-or middle income countries. Non-communicable diseases kill around 41 million people each year. Preventing diseases is one of the most sustainable ways of improving population health and the increased accessibility of mobile subscriptions has helped mHealth solutions to emerge as a promising means through which to increase access to information and services.

Mobile phones have been widely adopted in developing economies and low and middle income countries with >90% penetration and some 5.4billion subscriptions (OECD, 2017), and are used for a wide range of functions from education to communications to mobile banking (Kamel, 2005). Mobile phones also serve a developmental role, for example by bridging the rural-urban divide (Kliner, Knight, Mamvura, Wright, and Walley, 2013) and improving people's overall wellbeing (Mpogole, Usangaz, and Tedre, 2008). Asongu's (2018) study looking at the adoption of a platform technology to improve agricultural activities in Tanzania highlights how increased access to mobile phones and financial inclusion considerably mitigate the probability of a household's becoming poor. The use of mobile phones also enables complementary innovations in application sectors (Teece, 2018) such as digital platforms on which new innovations could be developed for tackling large societal challenges.

To track the diffusion of BHBM within three LMICs, we conceptualise the diffusion process into three phases through which the externally developed social innovation (EDSI) travels. In the first initial phase the innovation gets introduced to the local context, followed by the developmental phase, in which resources and knowledge are exchanged between diffusers and adopters. Finally comes the scaling phase, in which the its gets adopted and also sustained in the local system. As part of the BHBM case, we look at activities along the diffusion process and identify how they underpin the introduction, development and continuous use of an externally developed social innovation. In particular, we highlight the activities each actor support the continuous use of the innovation within the local healthcare system.

The paper is organised as follows: first we survey the early innovation literature emphasising the role of the social system in diffusion, with specific interest in the role of the 'diffuser' and 'adopter' concepts which historically have been treated as separate communities (Schumpeter, 1934; Rogers, 2003). We view the social system as a set of actors rather than diffusers and adopters (Vargo and Lusch, 2011, Vargo et al., 2020) working closely together (Chesbrough, 2003) to diffuse an externally developed social innovation into LMICs. BHBM, being a social

innovation enabled by a digital platform, provides us with an insight into how social system actors engage in activities by deploying a digital platform to successfully diffuse an EDSI.

To respond to the challenges associated with the diffusion of an EDSI we have worked closely with the WHO in three countries, Senegal, Sudan and India, in which BHBM was successfully diffused locally. Each of these countries are classified as low to middle income countries, and each of them represents an example for successful diffusion of one social innovation. To illuminate the activities supporting the diffusion of BHBM on a case by case basis, we have applied a qualitative approach to our research. The lead researcher conducted semi-constructed interviews with actors making up the social system actively involved in the diffusion process, in order to understand their behaviours along the three phases.

Our findings suggest that; creating purpose-led alignment, combining knowledge and resources, exploiting local knowledge, mobilising communities and collectively developing new services were key activities along the diffusion journey. Our findings also highlight the important role of a digital platform as catalyst for successful diffusion. The paper concludes with reflections and implications for theory and practice in the field of innovation management in the context of LMICs and suggests a reconceptualisation of the diffusion process into three phases where actors are engaged in dynamic communication through continuous feedback loops.

4.2 Theoretical background

4.2.1 Innovation diffusion as a process

Innovation diffusion can be understood as the process in which an innovation gets communicated through certain channels over time amongst the social system (Rogers, 2003). Traditionally, the diffusion process has been studied through the lens of the innovation and how the innovation's attributes affect the rate and scale of the diffusion process. Rogers' diffusion of innovation theory also emphasises the relative 'speed' at which the innovation is embraced by the adopter community. The adoption life cycle or so called S-shaped curve (Rogers, 2003) has been the centre of the diffusion of innovation research for decades. The rate of adoption was also recognised to be affected by a product's attributes, the innovativeness of the adopter community and also by the characteristics of the social system to enable the adoption of the innovation. Innovation is mostly associated with the creation of an opportunity,

therefore the innovation itself has become the central focus through which the diffusion process has historically been conceptualised and understood.

Recent scholars call for reconsidering the position of diffusion in the innovation process, through more detailed examination and understanding of the social processes that support it (Akaka and Vargo, 2013; Vargo et al, 2020). These scholars call for a more systemic perspective, moving away from the unidirectional view of diffusion to better understand the role of social influences (Geels, 2004; Rogers, 2005) and systems (Adner, 2007) in the diffusion process. Diffusion is rarely a linear process and, consistent with current social innovation views, also includes multiple actors coming together to address a social need and catalyse social change (Mair and Marti, 2006).

Applying a more systematic perspective to the innovation diffusion process calls for a deeper understanding of the factors associated with the activities of the social system. Johannessen (2013), Robertson and Choi (2010) look at diffusion through the lens of systems and networks, conceptualised in the literature in terms of ecosystems (Adner and Kapoor, 2010). Looking at social system actor interaction permits us to explore diffusion as a dynamic process in which actors engage in continuous feedback loops through which both knowledge and new innovation emerge Chandler et. al. (2019). While applying an ecosystem view to diffusion highlights the collaborating actors of the ecosystem and their connection within the system, it fails to consider the components of artifacts, such as the technology, resources and products/services as core part of the process.

Conversely, Vargo et al., (2017) adopt an service-ecosystem and institutional lens to diffusion and conceptualize it as an extended innovation process in which diffusion is not only a process of adopting a product by a single actor but it is an institutional change process in which economic exchange is best understood in terms of service-for-service rather an exchange of product-for-products or products-for-money. According to Vargo and Lusch (2004a, 2004b) the source of value of an economic exchange comes from services and applied abilities in which value is co-created and subsequently delivered. They posit that all actors involved in the diffusion process work in collaboration to create value by integrating resources and providing services. Since activities such as resource integration and value creation take place between actors in the social system as part of the diffusion process, diffusion can also be conceptualised as an emergent and co-creative process.

Through considering diffusion as an extended innovation process, we view diffusion as a process not only related to the introduction and development of the innovation but also integral to the ongoing innovation delivery. We moreover focus on the activities that are associated with our re-conceptualisation of the three phases of the diffusion journey – initiation, development and scaling.

4.2.2 Challenges with diffusing social innovation

In recent years, a sub-stream of the innovation literature has turned its attention to the so-called ‘Bottom of the Pyramid’ (BoP) (Ramani et al., 2012; Pansera and Owen, 2015), the one-sixth of the planet’s population surviving on little over around one US dollar a day but who, nonetheless, represent a market opportunity (Hart and Christensen, 2002). Much of the BoP innovation scholarship has focused either on ‘home-grown’, bottom up innovation processes, such as *jugaad* (Prabhu and Radjou, 2012), resource constrained (Immelt et al., 2009) and frugal (Ray and Ray, 2011, Prabhu and Radjou, 2015) innovation or the BoP as a source of innovations for developed markets (Prahalad, 2012). Scholars mostly observe the ways in which culture and religion, ethnicity, level of literacy, needs and geographical proximity influence the adoption rate of BoP innovations (Prahalad, 2004, 2012; Radjou and Prabhu, 2015; Zanello et al. 2016, Acheampong and Esposito 2014).

Though home-grown innovations continue to offer the prospect of credible solutions to social challenges (Agarwal and Brem, 2017), the bottom up approach may not always be the most effective approach (Adams et al, 2016). Most importantly, externally developed innovations have the advantage of being able to provide access to leading-edge technological thinking not generally available in low to middle income context rendering home-grown innovations potentially suboptimal. In addition, innovators wishing to diffuse externally developed innovations have often encountered barriers for technical, economic, social and cultural reasons (Adams et al., 2016).

To address these barriers, recent scholars (Oh et al., 2019; Vargo et al., 2020, Granstrand and Holgersson, 2020) have begun to emphasise the importance of multi-actor collaborations including private sector organisations, NGOs, community representatives and governments in addressing the complex social challenges in LMICs. To look at diffusion as a diverse multi-

actor process aligns with recent literature's application of a systems perspective to the diffusion process and alludes to the causal link between social system actors, interactions and the emergence of new innovations as an outcome (Dougherty, 2017; Accard, 2019; Oh et al., 2019; Chandler et. al., 2019). These ideas suggest that innovation involves both emergence and diffusion of these solutions; as these innovations are adopted by many people, the outcome of diffusion (Rogers, 2003) is associated with the evolution of new structures to support the growth and embeddedness of these innovations (Vargo et al., 2020).

However, so far research that has examined the role of social system in the diffusion of innovation has tended to do so in a rather narrow way. Rogers (2013) refers to social system as a set of interrelated units engaged in joint problem solving to accomplish a common goal. Typically, Rogers distinguishes between the innovator and the adopter and emphasises both innovator-adopter communications as a major mechanism underpinning successful diffusion. Consequently, social system has been quite narrowly defined, resulting in a lack of understanding on how a social system works together to diffuse an innovation and which set of actors and types of activities are present in the diffusion. According to the literature, understanding activities and artifacts, including complementary relations between multiple actors, is crucial to improving the diffusion process efficiency (Granstrand & Holgersson, 2020).

To support successful diffusion, actors involved in the diffusion process have to find collaborative ways to turn innovations into a customer-facing coherent solution (Adner, 2006). To do this there is a need for actors to engage in activities that are collaborative or/and complementary (Granstrand & Holgersson, 2020) and design innovations with a long term view for diffusion. For actors to maximise diffusion process efficiency, they require continuous interactions (Klein, Sayama, Faratin and Bar-Yam, 2002) and feedback loops. To date, these interactions and actions between multiple-actors are poorly understood and require deeper exploration. Understanding more precisely these interactions and actions along the diffusion process could significantly contribute to the long term adoption of social innovations.

4.2.3 Actors in innovation diffusion

In innovation diffusion, innovator and adopter have historically been treated separately. The early work of Rogers (1962) differentiates between the innovators and adopters, who both play

an important role in the diffusion process. The term ‘adopters’ refers mostly to the end user or consumer whose role is to use and spread the innovation across society. ‘Innovators’ refers to actors involved in the idea and its development to a product or service. To address complex social problems with the diffusion of externally developed social innovations however requires a more systemic and integrative perspective.

Recent scholars (Vargo et al., 2015, 2020; Lusch 2017; Adner, 2017) call for a systemic actor-actor perspective of the diffusion process, dismantling the historic reification of innovators and adopters by focusing on activities that are based on collaboration, co-creation and continuous experimentation. Considering the interrelatedness of actors both “drivers and riders” along the innovation process (Vargo et al., 2020), we build on Vargo’s argument for the adoption of a systemic and integrative perspective regarding actors in the social system (Adner, 2017) and the activities they undertake in order to support embedding social innovations into a local and national systems. Given our observation of the co-creative nature of the diffusion process, the adoption of an actor-actor perspective in this regard has the potential to contribute to models of how best to scale social innovation.

Ecosystems have received much interdisciplinary attention, particularly in innovation, marketing, evolutionary economics, and policy over the past 15 years (Adner, 2016; Adner & Kapoor, 2010; Ritala, 2013) and have been considered through both micro and macro lenses, providing deeper insight into the diffusion of innovation. Applying a system perspective transforms our view and leads us to see diffusion as a multi-actor interaction creating value from the innovation across systems. We build on more recent work that views diffusion as a social process, whereby the innovation is applied across multiple purposes, perspectives and solutions emerge from the integration and exchange of resources to co-create value (Vargo et.al, 2015, Vargo et al, 2020).

4.3 Research Methodology

4.3.1 Empirical context

Be He@lthy, Be Mobile – A Global UN Initiative on Digital Health

To address the question of the nature of the activities underpinning the diffusion and continued use of complex social innovation in LMICs, we closely examine the activities carried out within the social system with support the successful diffusion of Be He@lthy, Be Mobile (BHBM) in

India, Senegal and Sudan. Under the auspices of two UN agencies, the World Health Organization (WHO) and Institute of Telecommunication Unit (ITU), and working closely with national governments, BHBM was established in 2013 to address the specific problem to reduce the global burden of non-communicable diseases using an innovation based on mobile device technology (WHO, 2016). BHBM is the first UN initiative to use population-wide mHealth prevention services at scale, and is the largest mHealth initiative for NCDs in the world.

The initiative is unique for its development to ensure that the design and delivery of the innovation are both collaborative in their nature. To facilitate the introduction and implementation of BHBM, it was designed with a multi-actor and multi-sectoral approach starting with a collaboration between the Ministries of Health, Ministries of Information and Communication Technology (ICT). An mHealth programme is designed with the user in mind; therefore having support from various international organizations such as The International Federation of Pharmaceutical Manufacturers & Associations (IFPMA), NCD Alliance to represent the end user is key. BHBM is also unique from its collaboration with ITU, in which it receives support from the private sector on ICT for development and digital health.

Since 2013, BHBM has made great progress and has been diffused in 11 countries (2 high income, 9 low to middle income) from a range of regions, tackling issues as diverse as obesity, cervical cancer, tobacco use and age-related health conditions. In total more than 3 million people have received messages through BHBM since its existence. Though continued use has been identified as one of the key objectives for BHBM, not all countries have yet been able to meet these expectations. In each country a needs assessment was carried out by the WHO to identify gaps in knowledge and help to design a plan for introducing the innovation to each country. The impact of each intervention is measured by a group of experts from the public and third sector nominated by the WHO through a robust monitoring and evaluation plan.

The overall aim of this paper was to look at activities along the diffusion process and how these activities contribute to the successful diffusion of BHBM. Under successful diffusion we refer to the local embeddedness of BHBM into the local healthcare system. At the time of data collection, only three countries - Senegal, Sudan and India- were able to embed the digital platform into their local healthcare system. In the case of the other six countries - Costa Rica, Egypt, Tunisia, Philippines, Burkina Faso, Zambia - diffusion was considered as unsuccessful

from the research point of view as they have failed to create ways to embed BHBM into their local healthcare systems and most projects have stopped after the initial stage.

In order to understand multiple actor activities that support a successful diffusion process, we have chosen two programmes (mTobacco and mDiabetes) and three geographical locations where BHBM has been successfully diffused. By the term ‘successful diffusion’ we refer to innovations that are ongoing, financially sustainable and contributing to the creation of large scale social impact. Out of the 9 mHealth initiatives operating in an LMIC context, we have found such criteria present only in India, Senegal and Sudan. We therefore based our work on these three geographical locations. In India, the evaluation showed a self-reported overall quit rate of 19% among sampled participants in the mTobaccoCessation (Ramachandran et al., 2018). In Senegal, the mDiabetes was associated with improved glycemic control for disease management among subscribers (Wargny, Kleinebreil, Diop, 2018). In addition to tackling NCDs and their risk factors, new initiatives under BHBM also contributed to the fight against the 2014 Senegalese Ebola epidemic, and to the current Covid-19 in both Sudan, Senegal and India.

In contrast to the research on innovation diffusion, which looks at the diffusion process mostly through an institutional lens (Lawrence and Suddaby, 2016) we have looked at diffusion through the lens of the social system and the activities carried out by social system actors in order to support the successful adoption of an innovation. To gain a deeper insight to these activities, we have looked at the diffusion of an externally developed social innovation – BHBM - in which multiple actors were actively involved along the diffusion process.

The selection criteria for the EDSI were as follows:

1. An EDSI was selected to represent the diversity of sectors including the actors from the private, public and third sector.
2. Capacity to represent the diffusion of EDSIs into LMICs as it is the chosen context of this research.
3. Ongoing status of the initiative in all three selected cases, with the diffusion largely successful in terms of financial sustainability and contribution to solving the local NCD problem.

The selection criteria for three countries were as follows;

1. Capacity to provide sufficient variety in the manner and approaches adopted by multiple social system actors in relation to the diffusion process.
2. Ability, through the study of one type of innovation in three different geographical locations, to examine similarities and differences in the mechanisms of innovation diffusion.
3. Possibility to investigate, by looking at the diffusion of one EDSI into three different countries, the ways in which the different economic, social and cultural contexts influence the diffusion process.

The WHO's BIBM represented an excellent case through which to evaluate and observe the diffusion of one social innovation designed to tackle a social problem in three countries. We knew this case would be important to understand the diffusion of a complex social innovation from a systems perspective rather than a product perspective due to its multi-actor and multi-sectoral approach. In investigating BIBM's diffusion into three countries we test the received knowledge that externally developed social innovations have the advantage of providing access to leading-edge technological thinking not generally available in low to middle income contexts (Agarwal et al., 2017) and are remained well placed to address the technical, economic, social and cultural challenges associated with the innovation designed for the bottom of the pyramid. (Adams et al., 2016)

4.3.2 Data collection

Data was selected from 3 different sources: interviews, observations and secondary sources. Having access to three different sources of data permitted data triangulation (Eisenhardt, 1989, 2007) and mitigation of participant bias emerging from conducting interviews with a retrospective orientation to the facts investigated and narrated. Data was collected through semi-structured interviews with social system actors involved in the introduction of BIBM in Senegal, Sudan and India. This included individuals from the public sector, i.e., UN agencies (WHO, ITU), the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA), government (Ministry of Health, Ministry of Information Technology), academia (external health consultants), civil society (Diabetes Patient Groups, NCD Alliances) and the private sector (pharmaceuticals, telecom companies). Data was collected in two phases.

The first phase took place between June 2019 and September 2019 when the researcher spent time with the BHBM team at the WHO headquarter followed by the second phase of data collection between January 2020 and April 2020 included interviews over the phone and WhatsApp with members of civil society involved in the setting up BHBM in Senegal, Sudan and India. Due to the Covid-19 pandemic the possibility for the researcher to visit all three countries has currently come to a halt. At the end of the data collection process, 27 semi-structured interviews were conducted, comprising around 150 pages ranging from one to two hours, with multiple actors involved in these particular BHBM initiatives. Though the 27 interviews appear to be a small sample, this is sufficient to establish data saturation using a grounded theory approach (Creswell, 1998; Marshall et al., 2013; Boddy, 2016) while also constituting an adequate number from which to reconstruct a case study-informed theoretical concept (Marshall et al., 2013; Boddy, 2016).

To ensure BHBM's status as a tightly defined context (Bock and Sergeant, 2002) in which we observed the diffusion process, all 27 respondents identified by the WHO were recognised as key actors to the introduction and implementation of BHBM. Indeed, in this research, the 27 interviews represent 90% of the total population of social system actors actively involved in the diffusion of BHBM into Senegal, Sudan and India (Trotter, 2012; Boddy, 2016). Despite the logistical impossibility of local visits due to pandemic restrictions, the lead researcher had the opportunity to gain insight through interviews using WhatsApp and mobile phone with local actors, thus ascertaining the ways in which these local actors engaged to support the successful diffusion of BHBM in their own country.

Alongside the interviews, the researcher attended meetings at the WHO headquarters in Geneva as an observer in order to develop a deeper understanding of how individuals had worked together and the activities carried out by each actor to support the introduction and development of BHBM locally (Gehman et al., 2018). During this time, the researcher also attended meetings where the BHBM team shared best practice and insights from each project and reflected on the challenges associated with diffusion into an LMIC context. As a secondary data source the researcher received access to previous country reports and handbooks developed by the WHO between 2012-2018 to provide guidance on how to establish and scale up an mHealth programme into a national service. These handbooks contain around 300 pages

of additional information related to the selected BHBM cases with specific focus on the diffusion of two types of mHealth interventions mDiabetes and mTobacco.

Despite BHBM's ongoing status in all three countries, all actors who were interviewed are still involved in BHBM. Being a retrospective study, all interviews followed Langley's process approach to understanding events and activities that happened over time (Langley 1999) in order to discern the role of social system actors engaged in diffusion activities. To mitigate the challenges rising from individual bias, and also from the different cultural contexts, the interviews have been carried out in the manner subsequently described in order to ensure the trustworthiness of our findings.

Although retrospective interviews are frequently used in process research, it is important to acknowledge that due to memory biases retrospective recollections should be taken with care (Gehman et al., 2018). To minimise the risk of retrospective rationalisation (Eisenhardt, 1989) the lead researcher interviewed diverse actors actively engaging in BHBM and also triangulated multiple data sources along the data collection process. The 27 interviews, lasting 60 minutes on average, were recorded and transcribed. A full list of respondents is provided in Table 4.1. Interviews were started face to face and then due to the pandemic the second phase of interviews was carried out by using WhatsApp and telephone.

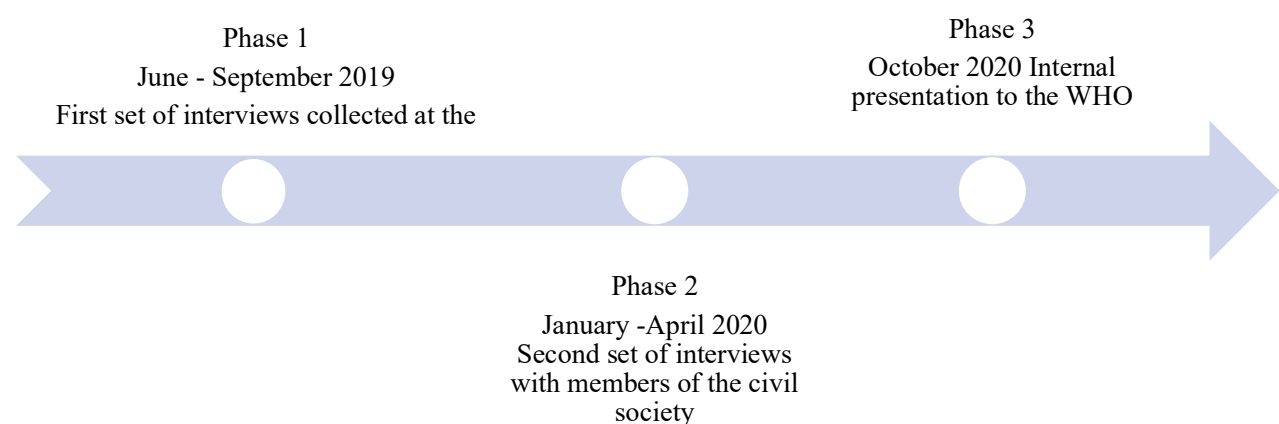
Table 4-1 List of actors making up the BHBM social system

Case	Initiatives	Organisation	Position	Sector
India	BHBM	WHO (HQ)	Co-Founder BHBM, Vice Chair ITU-WHO Focus Group	Public
India	mCessation, mDiabetes	WHO (HQ)	Technical Officer, Lead country implementation digital health	Public
India	mCessation, mDiabetes	WHO (India)	Technical Officer - digital health	Public
India	mCessation, mDiabetes	WHO (India)	Technical Officer - NCDs	Civil society
India, Senegal, Sudan	BHBM	WHO (HQ)	Co-founder BHBM, NCD Global ambassador project	Public
India, Senegal, Sudan	mCessation, mDiabetes	WHO (HQ)	Director, WHO's Prevention of NCDs	Public
India, Senegal, Sudan	mCessation, mDiabetes	WHO (HQ)	Toolkits Officer, BHBM	Public
India, Senegal, Sudan	BHBM	ITU (HQ)	Director for mHealth for NCDs	Private
Senegal	mDiabetes	Sanofi	Global health programme head for NCDs	Private
Senegal	mDiabetes	WHO, World Digital Francophone University (UNFM)	WHO lead country officer, UNFM Vice President	Public
Senegal	mDiabetes	Diabetes Patient Group	Medical doctor	Civil society
Senegal	mDiabetes	Diabetes Patient Group	Medical doctor	Civil society
Senegal	mDiabetes	Ministry of Health	Technical Officer NCDs	Public

Senegal	mDiabetes	Telecom	Area Representative	
Senegal, Sudan	BHBM	International Federation of Pharmaceutical Manufacturers & Associations (IFPMA)	Senior Manager, Prevention of NCDs	Public
Sudan	mDiabetes	Ministry of Health	Technical officer NCDs	Public
Sudan	mDiabetes	Medical Association for NCDs	Medical doctor	Civil society
Sudan	mDiabetes	WHO (Sudan)	Technical Officer - Lead country implementation digital health	Public
Sudan	BHBM	WHO (HQ)	WHO Consultant, BHBM	Public
Sudan	mDiabetes	WHO (HQ)	Technical Officer - Lead country mHealth	Public
Sudan	mDiabetes	Ministry of Health	Technical officer NCDs	Public
Sudan	BHBM	ITU	Technical Officer	Private
Sudan BF	mCessation, mDiabetes	WHO (Sudan)	Technical Officer - NCDs	Civil society
Sudan	BHBM	Telecom	Area Representative	Private
not country specific	BHBM	ARM		Private
not country specific	BHBM	Amplio	CEO	Private
not country specific	BHBM	Amplio	Programme Head	Private

To validate the findings and to form conclusions, the research was presented by the lead researcher at an internal WHO meeting a year after data collection. The aim of the meeting was to check interview data and interpretations with members of the core BHBM group at the WHO in order to augment the quality of our data analysis and the accuracy of our findings (Langley, 2007; Creswell and Miller, 2000). Presenting the research findings proved to be of interest to the team at the WHO and the lead researcher was asked to develop a section as part of the BHBM handbook on lessons learnt from BHBM engagement with the private sector. BHBM handbooks consolidate information, evidence and the background necessary to implement an mHealth initiative for NCDs and present the information to be used by all actors involved in the diffusion.

Figure 4-1 Data collection timeline 2019-2020



4.3.3 Case approach

To build rigour into our analysis, and enhance opportunity for theoretical development and clarity of activities supporting the innovation diffusion, the lead researcher adopted a replicative case study approach (Graebner and Eisenhardt, 2004; Eisenhardt and Graebner, 2007) in which activities undertaken by all actors were examined in three distinct social systems supporting the successful diffusion of BHBM. One inherent limitation of observing contrasting patterns in the data through the inclusion of polar types (Eisenhardt and Graebner, 2007) through the case by case approach. In the case of India, diffusion was led by a top-down, government approach, in contrast to the case of Senegal and Sudan where diffusion was led by

civil society through a bottom-up approach. While these opposing approaches add breadth to our exploration of social system actors' diffusion activities, the dichotomy, along with social, economic and technical disparities in each country, also compromises the ability to generalise findings.

Data analysis took place in an iterative fashion, whereby the researcher moved between data collection, analysis, and existing literature to generate insights and to organise findings around existing concepts in the literature, with the aim to observe, explore and understand activities supporting the successful diffusion of an EDSI into LMIC countries. In order to map findings onto theoretical concepts (Gehman et al., 2018) the researcher used an abductive approach (Dubois and Gadde, 2002), analysing the data focused on the activities carried out by social actors involved in the innovation process. To do this, the researcher adopted and slightly modified the 'innovation journey' model, underpinning these activities with the innovation pathology models of Van de Ven (1999,2017) and Seelos and Mair (2017).

Van der Van's (1999, 2017) 'innovation journey' model was traditionally developed to reflect the various stages of product/technological innovation in which the development phase is mostly concerned with the development of the technology/product. However, social innovation differs from a technological innovation in number of ways, such as; (1)their goals and values (public value vs economic value) , (2) actors of the social system (public-private-third) and (3) their infrastructure. In the context of a social innovation and its diffusion, the development phase focuses more on the design of local capabilities and relations within the social system and it may not involve pilots which mostly in Van der Van's model exist part of the implementing stage.

To respond to this change, we have modified the innovation journey based on the latest literature on social innovation for impact by Seelos and Mair (2017) in which social innovation is viewed as an investment to enable long term societal impact. To capture the activities of social system actors along diffusion process, we have reconceptualised the development and implementing phases under one 'development phase' and added scaling as the third phase of diffusion. While the diffusion process is associated with the communication of the innovation, it fails to consider the types of impact-creating activities that are associated with scaling, which still remains and underdeveloped phase in innovation management.

We adopted a refined version of Van de Ven's (1999) model for technological innovation to reflect our present research context of considering the diffusion of an EDSI enabled by a digital platform. The innovation journey identifies three phases, specifically, initiating, development and implementation (Van de Ven, 2017,1999). Most recently, this model was also applied by Oeij et al. (2019) to identify a set of combinations to result in the highest adoption of a social innovation. The innovation activities associated with the implementation phase are interlinked with those associated with the developmental phase and set the foundation for an innovation to become embedded into the local system. To reflect on this overlap we have reconstructed these two phases into one, labelled the development phase. To expand on the innovation journey the researcher looked at previously suggested models on social innovation (Mulgan 2006; Seelos and Mair, 2017) and identified scaling as key to achieving long term societal impact through systems change.

After reviewing a set of innovation process models in the literature specifically focused on social innovations, we identified three distinct phases - initiation, development, scaling - which we then applied to diffusion as core process within innovation (Van de Ven, 1999; Seelos and Mair, 2017). The initiation phase involves the creation, communication and evaluation of new ideas triggered by a social need and the requirement to obtain external and internal resources. Followed by the development phase where ideas are brought to materialise through concentrated efforts and continuous experimentation of new ideas, which may not include a real pilot project. The final or scaling phase considers the innovation to be successfully adopted through continuous use and eventually to be embedded into the local system. To elaborate on this schema, all activities identified as part of the coding process within all three cases were mapped against the three phases - initiation, development and scaling - of the reconstructed diffusion journey.

4.3.4 Data Analysis

An abductive approach was applied to live data coding (Locke, Feldman and Golden-Biddle, 2015), thus supporting the process of theoretical development through empirically-derived inspiration reflecting theory and vice versa (Grodal, Anteby and Holm, 2020). Adopting an abductive approach to coding, moving back and forth between innovation diffusion theory and the empirical data (Dubois and Gadde 2002) presented the opportunity to better understand the activities carried out by all actors in the social system to support successful diffusion of BHBM.

Guided by existing literature, the data were coded using NVivo for each case to 1st order concepts (Gioia, Corley and Hamilton, 2012) reflecting on the different activities carried out by the actors of the social system to support the diffusion. These 1st order concepts from each case were subsequently compared and consolidated across all three cases and aggregated into 2nd order themes which are presented in Figure 4-2. By comparing and contrasting existing theory on innovation diffusion with our empirical data we identified conceptual similarities and differences (Strauss and Corbin, 1990; Boyer, 2020), resulting in the identification of permanent activities such as: create purpose-led alignment, combine knowledge and resources, deploy digital platform, exploit local knowledge, search for solution, mobilise communities, develop new services, replicate existing services.

After all three cases were completed the final set of 2nd order themes under each heading was further developed into aggregate dimensions (Gioia, Corley and Hamilton, 2012). Using matching as a key process to confront theory with the empirical data, the three unique dimensions, (2) purpose-led value creation, (2) civil society engagement and (3) continuous use of innovation through new service development were identified. Drawing on current theories of actor-actor partnership (Vargo et al., 2020), diffusion is reconstructed as an actor-actor process. Viewing diffusion as an actor-actor process brings each actor, including those in civil society, to the forefront of the diffusion process, and rectifies an earlier conceptual blindspot in Rogers' work in which he treats the adopter and diffuser community separately. This has particular relevance for the continuous use of the innovation and its embeddedness in the local systems and the role of civil society to enable this.

4.3.5 Ensuring Trustworthiness of data analysis

Throughout the research, in order to mitigate the challenges of qualitative data analysis, decisive measures were taken to support the validity of the findings. First to increase the diversity of data, the researcher interviewed respondents across all sectors and collected multiple sources of data for each case. This provided the opportunity to triangulate findings across multiple measures of the same phenomenon (Eisenhardt, 1989). The evidence supporting the triangulation process included transcripts, handbooks, original documents, and NVivo projects. To ensure trustworthiness of presenting findings, the lead researcher repeatedly shared the emergent analysis with informants and colleagues at the WHO to augment the quality and accuracy of the data (Langley, 1999). An initial cross-sector analysis

was presented to the digital group at the WHO's headquarters for members who were interested, including representatives from the BHBM group, with the feedback then incorporated into the findings.

Finally, the researcher's interpretation of the data was regularly discussed with her academic supervisors as well as during formal review sessions and as part of academic conferences and submission reviews. While the researcher remains mindful that all these steps might not offer a comprehensive solution to all qualitative research-related challenges, such as individual bias (Eisenhardt, 1989) towards the data and limitation of existing templates to follow (Strauss and Corbin, 1990), the process described above is intended to provide a reflexive and transparent approach to data collection and analysis.

Figure 4-2 Coding structure on activities to support diffusion of BHBM into Senegal, Sudan and India

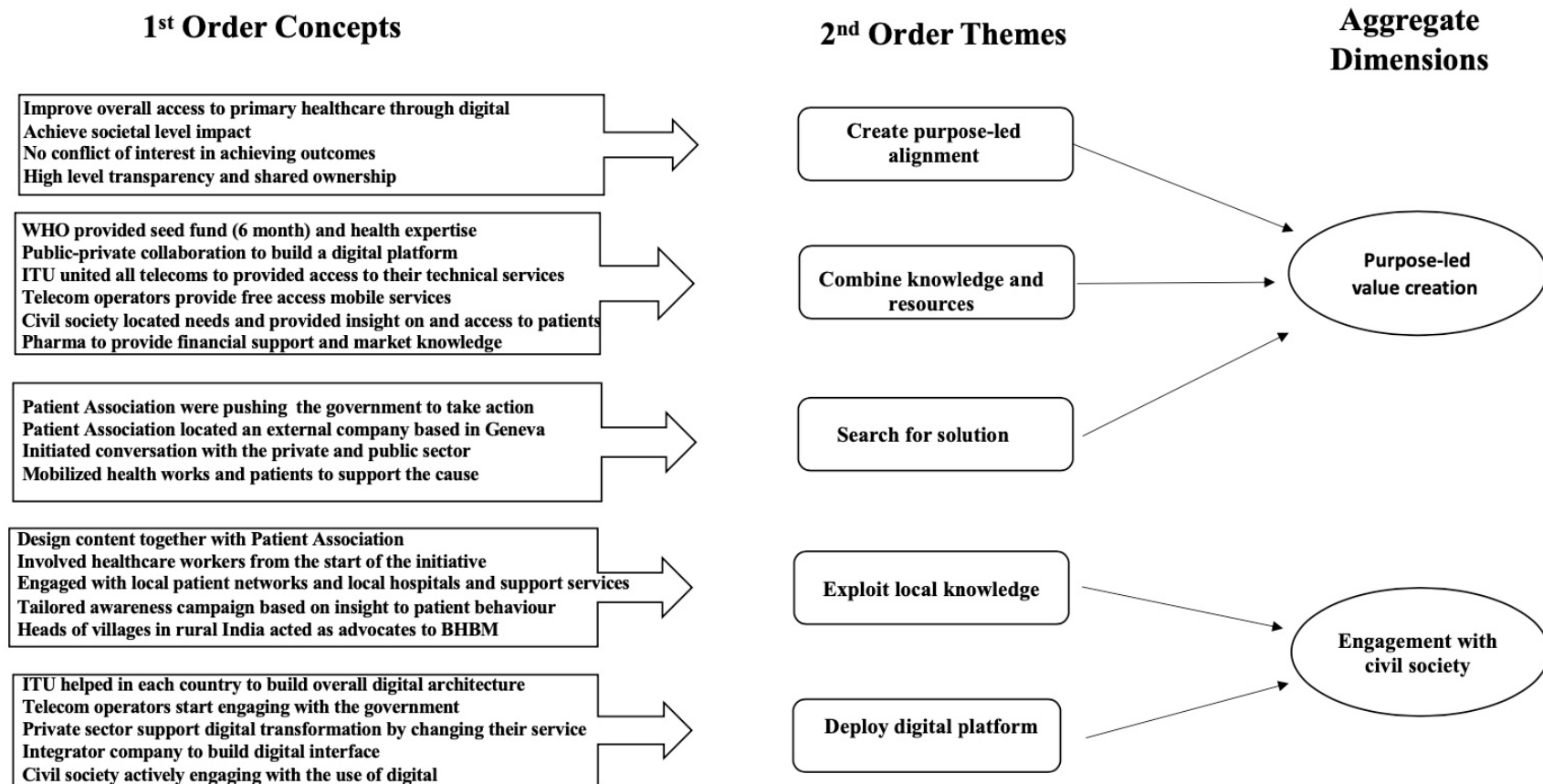
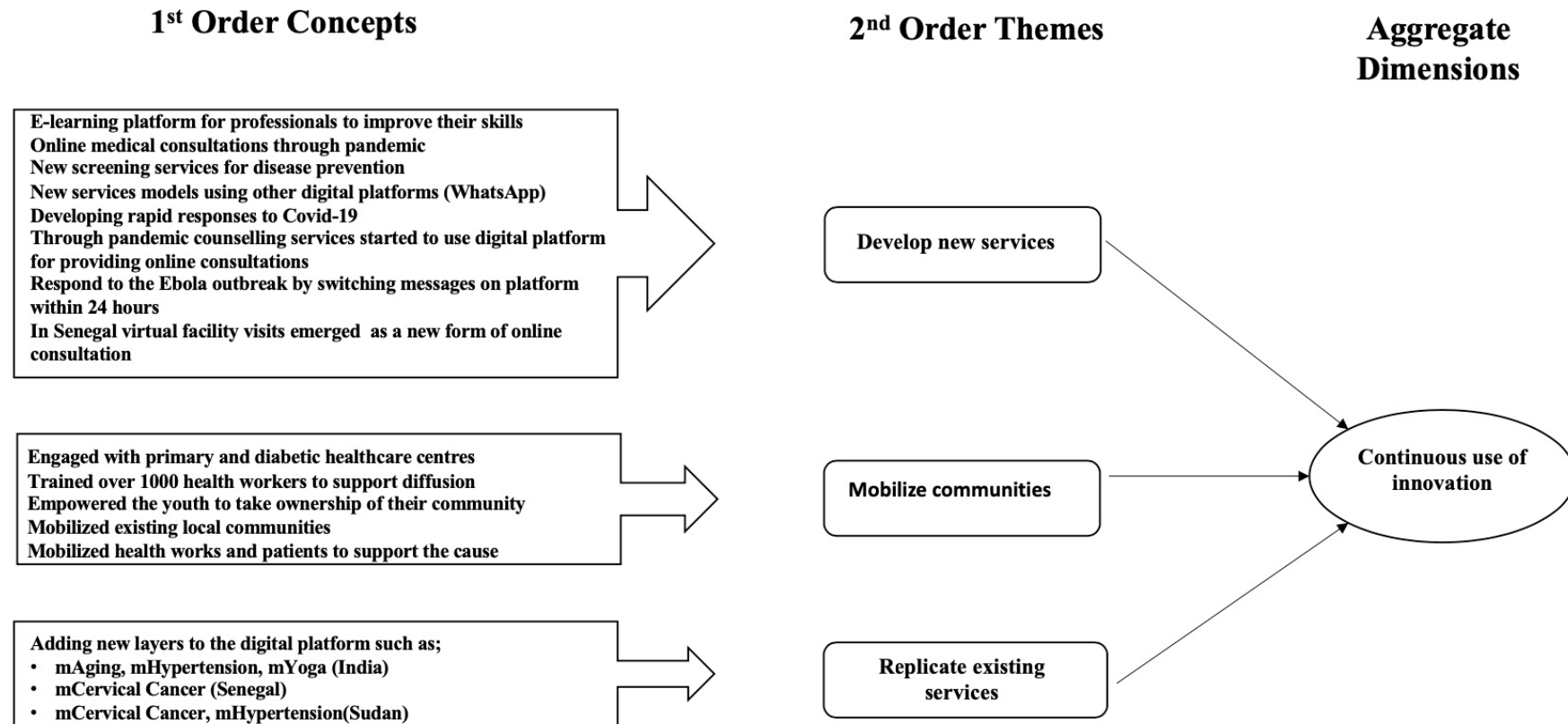


Figure 4-2 Coding structure on activities to support diffusion of BHBM into Senegal, Sudan and India (continued)



4.4 Findings

4.4.1 Initiation phase of Be He@lthy, Be Mobile – Purpose-led value creation

The initiation phase begins with the creation of new ideas triggered by a social need, followed by the communication and evaluation of the requirement to obtain external and internal resources to introduce the innovation to the local context. Prevention of diseases such as NCDs is one of the most efficient ways of improving population health, and the rising numbers of mobile phone subscriptions have helped mHealth solutions become a promising pathway for increased access to information and services locally. One of the challenges involved in successfully diffusing mHealth services such as BHBM relates to the scarce financial resources for the innovation's local introduction and implementation.

The second challenge relates to the lack of technical infrastructure and support in each country. To address this gap, BHBM was designed to disseminate information on diabetes control and management through the use of mobile phones. Using mobile phones as a vehicle to introduce an innovation to a population requires a digital platform from which the service could operate. Building an appropriate digital platform is thus the first step in introducing BHBM to each of these three countries.

The third challenge is associated with the short term project planning for the diffusion of EDSIs into an LMIC. For an EDSI to become embedded into the local system a long term vision is prerequisite. Without adequate responses to the financial and technical challenges inherent in an LMIC context these innovations risk arriving at an impasse (Seelos and Mair, 2017). In this section, presentation of findings focuses on the activities undertaken in each of the three cases to support the diffusion of BHBM.

These activities (Fig. 4.3) include; creating purpose-led alignment between all actors of the social system by robustly cohering and coalescing around the social purpose of the initiative and, additionally, by combining resources and knowledge all actors of the social system become involved in an exchange of resources to bridge financial and technical gaps along the initial phase of the diffusion of BHBM. To present our empirical data, we provide an overview of findings from each of the 3 countries relating to each phase along the diffusion journey,

followed by supporting evidence to illustrate the activities undertaken by actors of the social system.

4.4.1.1 Create Purpose-led Alignment

Crucially, through a series of activities such as engaging in ongoing conversation, combining technical and financial resources, telecom partners, government and civil society each aligned with deep commitment to the BHBM mission. This deep commitment to a greater purpose created a strong inter-actor alliance and enhanced trust, which we refer to as “purpose-led alignment”. This overall mission was inspired by previous WHO initiatives including building healthcare infrastructure through hospitals and primary health services in LMICs. In 2013 both UN agencies (the ITU and the WHO) engaged in a partnership to promote mHealth’s tangible contribution to a healthier world (WHO, 2015). Setting a mission orientated goal at the start of the initiative was crucial to identifying a clearer role for each actor along the innovation process.

BHBM is great example to understand how digital technology can be applied for new communities to deliver social and economic impact through thinking and designing in a completely new different way (Public servant, WHO #9).

In order to successfully introduce BHBM, actors from all sectors (public, private and third sector) cooperated with the overall mission of the initiative, namely, to provide access to primary healthcare by introducing an mHealth initiative – BHBM- enabled by a digital platform. All actors involved in the diffusion of BHBM agreed to align with a long term vision to tackle non-communicable diseases globally. By strongly focussing around a mission orientated goal, all actors engaged in an exchange of resources to raise public awareness around disease control and management.

Senegal

To tackle NCDs locally, members of the civil society including representatives of the Diabetic and Patient Association (DPA) have been actively searching for an innovative solution to tackle the country’s rising number of diabetes cases for years. During this time, they have been continuously asking for support from the Ministry of Health to find ways to improve the access to information and access to primary healthcare services to diabetic patients. (WHO mDiabetes

report 2018) For years the government has shown resistance to the ongoing campaign from the DPA. Prior to the introduction of BHBM, members of the DPA and health experts established a long standing collaboration to find innovative ways for improving the control and management of diabetes in the country. As part of this collaboration they have established the first specialised hospital unit for diabetes prevention and treatment in Senegal. Members of the DPA agreed to use the mHealth initiative for decentralising diabetes care by strengthening local primary healthcare services.

We [WHO country office] agreed that BHBM is a great vehicle to create partnership where the public health outcome is at the heart of everything...with the intention to leverage digital technology to achieve better health outcomes. (Public servant interview#14)

In 2013 BHBM was brought to the Ministry of Health's attention by members of the DPA. Members of the DPA engaged in a conversation with the WHO and ITU, with a view to bringing BHBM to Senegal. Through these continuous, all-sector conversations, actors realised the importance of the overall mission of BHBM and the Ministry of Information Technology, Ministry of Health, the DPA, the three telecom operators, ITU, WHO and large pharmaceuticals formed a purpose-led alignment to control and manage diabetes locally. The multisectoral design of BHBM created the opportunity for all telecom operators to support BHBM's diffusion. Aligning with a mission orientated goal to improve universal access to healthcare through the use of mobile phones was key to this collaboration. In particular, as the following excerpts from ITU and civil society representatives illustrate:

We [ITU] engaged with all three telecom operators in the country to join the initiative. They have all agreed with the overall mission of BHBM, which was to improve universal access to healthcare through the use of mobile phones. (Head of ITU Interview#)

For a bigger purpose, to reach development goals on a national level, we observed how the private sector has united their services and felt proud of it. (Diabetes expert interview#12)

We [WHO local office] have invited all partners from the beginning and ask for their inputs. And each of the partners had a point to be the link on this project and this is how we started. (Public servant interview#14)

The aim to provide equal access to diabetes management through the use of mobile massaging to all Senegalese people has created a solid ground for introducing BHBM locally. To achieve this aim, all three mobile providers active in Senegal agreed to provide free mobile services across their networks to all citizens so that information on how to manage and control diabetes would be available to everyone.

Since 2013 over 230,000 people joined the digital platform and are using the services developed as an outcome of the diffusion of mDiabetes. (WHO, 2019) BHBM showed that *everyone could be on the same page and have no conflict of interest in achieving outcomes without any contention. (Senior manager - Interview #11)*

Sudan

BHBM was also introduced to Sudan by the WHO as an open invitation to introduce mHealth with the overall mission to tackle NCD related illnesses globally, starting with diabetes. To cover the economic cost of building a technical infrastructure to host BHBM, the African Development Bank (ADB) invested 5 million USD over 5 years with a long term vision to strengthen the overall health infrastructure in Sudan, with particular focus on disease prevention and management especially for diabetes and cancer. The ADB agreed to provide the financial resources for the first 5 years while the local government builds up its internal resources to continue with the diffusion of other health initiatives as part of a long term vision. To support this call, the WHO's country office formed an alliance with the Ministry of Health and the Telecommunication Regulatory Authority to introduce mHealth initiatives as a potential solution to disease control and management across Sudan. All social system actors were vigorously involved in exchanging resources and knowledge from the very first day of the partnership. Meanwhile, the Ministry of Health together with the WHO local office and ITU exchanged financial resources and technical knowledge in order to build the digital platform.

We [Ministry of Health] made sure to engage each actor in every decision about implementing mDiabetes...we established a WhatsApp group from day one to bring a high level of transparency into the project through shared ownership. (Public servant Interview#17)

To support the introduction of BHBM locally through the building of the digital platform, members of the Sudanese DPA reached out to members of the Senegalese DPA to learn from best practice on how active DPA involvement contributes to successful local BHBM diffusion. Members of the ITU offered technical expertise and access to telecom operators, while the WHO's members included health experts and had access to the Ministry of Health in both countries to support the introduction of BHBM locally.

We [ITU] adopted a holistic approach to discuss all health related interventions in collaboration with the local governments with the aim to achieve societal level impact. (Programme Head Interview #10)

We looked at BHBM as an opportunity to launch a national awareness campaign and build digital capacity at the same time. (Public servant, interview #17)

ITU engaged in a successful exchange with all telecom operators in Sudan to join the initiative by providing mobile services with the mission to tackle NCDs free of charge to the end user. At the start of the initiative,

All three telecom operators agreed to send free messages to people to encourage them to take part of the programme. (Public servant, WHO, interview #7)

Building a digital platform inside the Ministry of Health has led to an improved technical capacity and opened up possibilities for other supporting health services to emerge from the introduction of the initiative. At the introduction of BHBM, all actors in the social system aligned with a purpose-led mission stating that information is power, and everyone has the right to receive information on their own health, as substantiated by this statement from the WHO:

When we [WHO local office] mentioned that BHBM is a population wide intervention to raise awareness on the prevalence of diabetes and to increase a healthier lifestyle for

those who are at risk people representing all three sectors in the room felt they are ready to contribute to the initiative and offered their resources and knowledge in support of the initiative. (Public servant, WHO, interview #7)

India

In 2015, the Government of India (GOI) introduced its strategy for digital transformation, 'Digital India', with the aim to invite into the country externally developed innovations that are cost effective, light on human resources and accessible to all individuals. In recent years mobile phones have become an important pathway for communication and business transactions across the country. Therefore, innovations enabled by the use of mobile phones were a priority on the government's agenda. GOI was calling for collaboration with actors from the private and public sector to align with the vision of 'Digital India. Launching BHBM to tackle NCDs such as diabetes supported the overall mission of the government's digital agenda.

[The] Ministry of Health was looking at the quit rate and the behaviour change in mDiabetes and to increase the rate of screening amongst diabetic patients." (Public servant Interview20#)

In a country where health is governed by the state, the government took a key role to coalesce with various actors from the public sector and the private sector. At the national launch of BHBM, the WHO, WHO country office, the Ministry of Health, Ministry of Information and Technology, Ministry of Science and Technology through the National Information Centre and the Telecom Regulatory cohered with the government's digital agenda to bring an externally developed, non-communicable disease focused innovation into the country. To support this mission, telecom operators across the country agreed to operate on a reduced service charge of only 0.02 cent (20 rupees per message per person) to increase accessibility to the services for all.

We [ITU] adopted a holistic approach to discuss all health related interventions in collaboration with the local government with the aim to achieve societal level impact." (Programme Head Interview #10)

From the beginning of the project, we [Government of India] agreed with the WHO and the private sector to launch BHBM as part of a greater mission and contribute to a bigger vision, which was to improve overall access to primary healthcare through the power of digital.” (Public servant Interview #19)

In 2015 the first BHBM initiative was introduced to tackle the use of tobacco - mCessation (Tobacco Cessation). Building a platform to host the first mHealth program created the opportunity to develop continuous feedback loops between innovators and adopters, leading to the replication of another mHealth programme on diabetes control - mDiabetes. Since upfront cost was identified as one of the biggest obstacles to introducing at the local level an externally developed innovation, the WHO provided financial resources through its seed fund for the first 6 months.

Purpose-led alignment in all three cases was achieved by each actor agreeing with the overall mission of the initiative, namely, to improve the control and management of NCDs such as diabetes and cervical cancer locally. Aligning with a purpose-led mission enabled each actor to also engage in the combination of financial and technical resources and the development of a digital platform through which to share information within the social system.

4.4.1.2 Combine knowledge and resources

To respond to the challenges that are associated with the lack of financial and technical resources, actors in the social system have actively participated in and shaped the combination of resources and knowledge as part of the initial phase of the diffusion of BHBM. ITU being one of the key actors in the diffusion of mHealth invited all telecom operators to engage in an open conversation about the best way to support the distribution of messages across all parts of society. All actors in the social system contributed their internal resources and knowledge to support the development phase of BHBM for eventual successful diffusion. Civil society, in addition to pooling technical and financial resources and knowledge as part of the initiation phase, played an active role in activating these resources.

Senegal

Two significant challenges were associated with the introduction of BHBM in Senegal. First, the lack of technical infrastructure capable of hosting the digital platform to enable direct communication with all diabetic patients; second the cost of building such a platform. To tackle the upfront cost, members of the DPA searched for external resources to provide financial support to BHBM's introduction into Senegal. Through a long standing relationship working with pharmaceuticals, the DPA successfully cohered with Sanofi to this end. As with the case of Sudan, the WHO also allocated its financial resources in the form of a seed fund for the first 6 months of the project. Moreover, Sanofi had developed a strong collaboration with the DPA through actively engaging with medical experts and health experts, in addition to providing further financial support.

We (pharmaceutical company) provided financial resources but also knowledge and expertise to support the diffusion of BHBM.” (Programme Head Interview #16)

To ensure access to information on mDiabetes all three mobile operators have decided to share their databases with the WHO and DPA and also offer their services for free. In Senegal members of the telecom operators led by example, choosing to collaborate rather than compete with each other in order to reach a population-wide impact through the use of mobile technology. The Ministry of Health together with the WHO decided to combine their technical knowledge and expertise, resulting in an alliance with an external company in Geneva to build the digital interface so messages could be catalysed via an externally deployed digital platform.

We Ministry of Health together with WHO have chosen an integrator company for Senegal to build the digital interface between Ministry of ICT and telecom operators. (Senior manager - Interview #11)

This alliance, through the combination of technical resources and knowledge, has led to the engagement of other actors, such as the IFPMA, with the mHealth initiative by offering further access to health experts and knowledge on how best manage and control diabetes in LICMs.

For us [IFPMA] it was important that a digital platform was in place to support the diffusion of BHBM, as we are very interested in seeing impact not just on new treatments but

on technologies and devices, that can improve NCD outcomes particularly in the low and middle income countries... digital health is in interest to many of our member companies to be engaged with. (Senior manager - Interview #11)

The DPA together with local healthcare workers “have been working for years to build a foundation to provide equal access to healthcare services to all” (*Diabetes expert interview#12*). Combining resources between the government, private sector and DPA has led to mDiabetes to be distributed equally across the country which has made a significant difference to disease management and control.

Sudan

In Sudan, a dialogue started between the Federal Ministry of Health and ITU-WHO with the intention that ITU would provide the technical resources and access to telecom operators and WHO would provide the first 6 month financial support and access to health experts for knowledge-sharing on disease management and control. To respond to the ongoing change in the country’s political state the WHO were in constant conversation with both ministries involved in the knowledge exchange, i.e., the Ministry of Health and the Ministry of Information and Communication Technologies.

To respond to the ongoing change in the country’s political state, high level discussions between us [WHO country office], the Ministry of Health and the Ministry of Information and Communication Technologies were important from the start. The project also received financial support from the African Development Bank. (WHO official Interview#7)

To ensure access to the mDiabetes services, as in the case of India and Senegal, Sudanese mobile operators have agreed to offer their services for free to increase access to information across the population. In Sudan telecom operators equally showed great commitment by choosing to collaborate rather than compete, offering their services free of charge and also sharing their data with the WHO and Ministry of Health to increase access to users.

At the start of the partnership all three telecom operators agreed to send free messages to people to encourage them to enrol on the programme. (Public servant Interview#17)

The Ministry of Health together with the WHO decided to combine their technical knowledge and expertise and build the digital interface internally inside the Ministry of Health so messages could be catalysed via an internally used digital platform.

We [WHO country office] are all working in collaboration with all telecom operators and the Ministry of Health to maximise value from the use of a digital platform and to build a strong digital infrastructure which could lift up the country's overall healthcare system...we also worked together with ITU to bring their technical support. (WHO official Interview#3-4)

India

In order to combine resources and knowledge to support the introduction of mHealth initiatives, the Ministry of Health teamed up with DELL and Tata and combined mobile services at a national level to provide screening processes so that everyone connected to these technical services could enrol on the screening programme. This was the first time that the private sector in partnership with the government has engaged in the exchange of knowledge through new services offering content developed by health experts to every health centre.

We [WHO country office] formed a strong partnership with the Ministry of Health, Ministry of Information and Technology, Ministry of Science and Technology through the National Information Centre and the Telecom Regulatory to build a digital platform to raise awareness about NCDs locally. (Public servant Interview#190#)

To provide financial resources to introduce mHealth initiative on a country level, the Government of India created a long term plan to provide BHBM with ongoing financial support. BHBM is only receiving technical support from the WHO in the form of health content, and the programme is fully embedded in the country's eHealth budget. In India, as this study's interviews bear out, health is heavily controlled and administered by the state.

In India BHBM was centralised and financially resourced by the Government of India from the start. (Public servant Interview#20)

The two main activities observed through the initiation phase of diffusion were the creation of purpose-led alignment and the combination of resources and knowledge between all social system actors. Though alignment with a common goal is widely discussed in stakeholder theory and collective value creation, the nature of the common goal is often associated with a short term outcome and financial gain. In the case of BHBM, the common goal is aligned with a social purpose which is to tackle NCDs globally. In all three BHBM country case studies, the emphasis is on the combination of resources and knowledge to build long term support for the diffusion process. In the initiation phase, activities were carried out collaboratively by the actors in the social system to create a broad set of tangible and intangible benefits driven by a purpose-led mission.

4.4.1.3 Searching for innovations

Senegal

In Senegal, Patient Associations have for years been lobbying the government for resources to raise awareness of diabetes and better services to control and manage diabetes patients. The strong will and active searching for innovative solutions around diabetes management have opened up opportunities to build a strong network between the private sector and civil society. The strong connectivity and active searching role of civil society has led to building the first specialised hospital unit for diabetes for treating patients, paid by patients, 15 years ago. Since then civil society has built up strong social capital inside and outside of Senegal. Drawing on the solid links with the private sector and entities such as the WHO, BHBM was introduced to Senegal in 2013 as a potential solution for increased population level awareness of diabetes:

We [WHO country office] with the support of the Diabetic Patient Group located an external company based in Geneva to develop a digital platform to host mDiabetes in the country. (WHO official Interview#)

Table 4 – 2 Activities through the *initiation phase* to support successful adoption of BHBM in India, Senegal and Sudan

BHBM mHealth Initiative		
Initial phase	Activities	Illustrative quotation
India	Create purpose-led alignment: actors robustly cohere and coalesce around the social purpose of the initiative.	<p>From the beginning of the project, we [<i>Government of India</i>] agreed with the WHO and the private sector to launch BHBM as part of a greater mission and contribution to a bigger vision, which was to improve overall access to primary healthcare through the power of digital. (<i>Public servant Interview19#</i>)</p> <p>We [ITU] adopted a holistic approach to discuss all health related interventions in collaboration with the local government with the aim to achieve societal level impact. (<i>Programme Head Interview #10</i>)</p> <p>Ministry of Health was looking at the quit rate and the behaviour change in mDiabetes and to increase the rate of screening amongst diabetic patients. (<i>Public servant Interview20#</i>)</p>
	Combine knowledge and resources: actors engage in conversation and combine knowledge, technical and financial resources to support launch of the initiative.	In India all cost was included in the eHealth budget structured around tackling diabetes and tobacco through the use of digital. (<i>WHO official, interview #15</i>)
Senegal	Create purpose-led alignment: actors robustly cohere and coalesce around the social purpose of the initiative. Actors engage in conversation and combine knowledge, technical and financial resources to support launch of the initiative.	<p>BHBM showed that everyone could be ‘on the same page’ and have no conflict of interest in achieving outcomes without any contention. (<i>Senior manager - Interview #11</i>)</p> <p>For a bigger purpose, to reach development goals on a national level, we observed how the private sector has united their services and felt proud of it. (<i>Diabetes expert interview#12</i>)</p> <p>We [WHO local office] have invited all partners from the beginning and ask for their inputs. And each of the partners had a point to be the link on this project and this is how we started. (<i>Public servant interview#14</i>)</p>

	<p>Searching for solution: civil society actively involved in the search for a solution by identifying key actors and bringing them together to start a conversation.</p> <p>Combine knowledge and resources: actors engage in conversation and combine knowledge, technical and financial resources to support launch of the initiative.</p>	<p>We [ITU] engaged with all three telecom operators in the country to join the initiative. They have all agreed with the overall mission of BHBM, which was to improve universal access to healthcare through the use of mobile phones. (<i>Head of ITU Interview#</i>)</p> <p>We [WHO country office] agreed that BHBM is a great vehicle to create partnership where the public health outcome is in the heart of everything...with the intention to leverage digital technology to achieve better health outcomes. (<i>Public servant interview#14</i>)</p> <p>To support the overall mission of BHBM, we [WHO country office] joined together with ITU and ITU reached out to Alcatel as the host of the platform and provided technical support to the project. (<i>Public servant interview#14</i>)</p> <p>In Senegal Patient Associations have been pushing the government to do something for a long time. They (the patients themselves) established the first specialised hospital unit for diabetes for treating patients paid by patients 15 years ago. (<i>Diabetes expert interview#12</i>)</p> <p>We [WHO country office] with the support of the Diabetic Patient Group located an external company based in Geneva to develop a digital platform to host mDiabetes in the country. (<i>WHO official Interview#</i>)</p>
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4.4.2 Development phase of Be He@lthy, Be Mobile – Engagement with civil society

In this section, presentation of findings focuses on the activities undertaken in each of the three cases relating to the development phase (Van de Ven, 1990,2017; Seelos and Mair 2017) where ideas are brought to materialise through concentrated efforts and continuous experimentation of new ideas to support the diffusion and continued use of BHBM.

Fundamental to BHBM is the combination of a digital platform and the use of mobile phones, which facilitate the project's unprecedented reach. The analysis reveals important findings, first that by deploying the digital platform, actors in the social system were able to respond creatively to manage crisis situations and were able to develop a palette of additional health-related services, thus attracting a critical mass of sustaining users. Second, by exploiting local knowledge, actors within the social system were able not only to respond effectively to the needs of diabetic patients but also to tailor new services and uplift current health services. In the following section, we develop these ideas further, present evidence from the three cases and provide indications of previously unreported factors that support adoption and continued use of EDSIs.

4.4.2.1 Exploit local knowledge

In the development phase of the diffusion of BHBM, members of local communities, such as local healthcare centres, local hospitals and DPAs have provided insight into patient behaviour by providing continuous feedback and sharing local knowledge from engaging with and using previous healthcare services. In order to build transparency and continuity to the diffusion process it is also important to include local experts, health experts, and medical experts, as well as patients to guide the adaptation process. Examples of relevant modifications to emerge from such a collaborative approach include translation of messages to all languages to increase access and changing the content of the initiative to reflect on the cultural context and behaviour habits of the end users.

Senegal

In Senegal members of the DPA have been involved in finding solutions to manage and control diabetes across the country. They have been working together with health experts and health professionals from the public sector for years to improve current practices to prevent and also to manage diabetes across the country.

In Senegal Patient Associations have been pushing the government to do something for a long time. They (the patients themselves) established the first specialised hospital unit for diabetes for treating patients paid by patients 15 years ago. (Diabetes expert interview#12)

DPA's have been pushing the Ministry of Health for years to take action in finding new and innovative ways to increase patient awareness. Despite their ongoing efforts to locate innovative solutions, they have received no support from local governments. To overcome this hurdle, they started to look for externally developed innovations as a solution and identified BHBM as a possible option.

We [WHO country office] with the support of the Diabetic Patient Group located an external company based in Geneva to develop a digital platform to host mDiabetes in the country. (WHO official Interview#)

In response to the DPA's call for efficient ways to improve awareness for managing diabetes across local patient groups, the WHO engaged with local hospitals and support services in order to tailor the mHealth messages as part of the first awareness campaign based on insight from local services and from existing patients.

We learnt from local practices that we [WHO local office] need to send the message to patients with diabetes and health professionals who are treating diabetic patients. Also learning from local knowledge on patients, we launched mDiabetes close to Ramadan to maximize our outreach. (Diabetes expert interview#12)

As a result of this continuous engagement with members of the DPA, with local hospitals and health experts, the release of the messages was timed with the start of the Ramadan in Senegal,

leading to an increase in the number of users within a short amount of time. In order to maximise the impact of mDiabetes, the initiative was launched with the help of the WHO, ITU and DPA close to Ramadan. In Senegal 94% of the population are Muslim, thus, when:

Imam - Imam means God - says, if you want to fast through Ramadan, join mDiabetes, people will follow” (Public servant interview#14)

Connecting the launch of mDiabetes with the start of Ramadan led to a large uptake of the service between diabetes patients as the message was encouragingly and persuasively communicated by Muslim clerics. To support this creative call to action, all three telecoms sent directed health messages to all of their clients through the digital platform. If clients wanted to join mDiabetes through Ramadan they had to respond to the targeted message which was free of charge. To support the overall mission of BHBM,

we [WHO country office] joined together with ITU to provide the technical support for the initiative through its connection to Alcatel, being the key mobile provider in the country. (Public servant interview#14)

Sudan

To reach national level diffusion for BHBM in Sudan, the involvement of patient groups and healthcare workers was key. Their commitment to become advocates for BHBM to be introduced to all patients proved pivotal to the success of the initiative. The WHO connected with primary healthcare centres and diabetic healthcare centres and appointed them focal points for the dissemination of mHealth messages to patients. Their active involvement in the communication led to increased uptake of users for mDiabetes across the country.

The Diabetes Association here in Sudan has also had a big voice in the diffusion of this initiative. They have taken an active role in the technical advisory group and have also contributed to the advocacy of the project to their patients through their clinics and local services. (Public servant, interview #7)

We [WHO local office] build partnerships with the primary healthcare centres... we reach the centres - primary healthcare centres, diabetic healthcare centres- and we have focal points working with us all over the states of Sudan. (Public servant, interview #7)

Civil society's crucial role in the successful diffusion of mDiabetes soon became obvious. Members from this category were thus asked to take on further responsibilities in the diffusion process.

So instead of considering only the medical society in Sudan [WHO country office] should also consider engaging with patient societies. So, for future improvement on the programme we will look for such partners and their engagement with the initiative. (WHO official Interview#3-4)

India

In India, heads of local communities have contributed greatly to the increased number of BIBM subscribers, in contrast to the official view which constructs civil society as less influential and less active within the social system. Close connections with community members and their families were built by village heads, thus ensuring access to relevant information on disease management and control when these demographic groups were subsequently recruited to BIBM:

All the recruitment and introduction of BIBM was done by the health workers. Also the heads of villages in rural India played a key part in delivering the messages to the people who had no access to technology. Community engagement played a key in reaching all parts of society. (WHO official, interview #15)

Civil societal organisations could also contribute to the increased access to information and to developing continuous feedback loops to exploit opportunities from the digital infrastructure and strengthen local healthcare services:

Patients [BIBM users] suggested the inclusion of an interactive voice response system to improve the rate for registration and increased level of motivation for using the

services...this recommendation resulted in an increased number of self-registered users. (Interview19#)

In order to increase the uptake of BHBm across the country, the WHO local office together with local health experts, doctors, nurses and patients made the content available in 17 languages. Having a service based on a digital platform makes mHealth services accessible to all who are signed up on the platform.

4.4.2.2. Digital platform deployment

BHBm mHealth initiative has widened access to information on health prevention and access to primary healthcare services across the all three countries through the use of a digital platform. The digital platforms operated in response to Senegal's 2014 Ebola outbreak and provided an excellent precedent for digital's applicability and relevance to health management at the largest scale. This was achieved through SMS messaging and content adaptation, tailored to prevention and control of virally-transmitted health conditions in a time-pressured, rapidly changing context. In the case of BHBm, using the digital platform, actors in the social system were able to develop a palette of new services both to enable a significant increase in user numbers to support the successful diffusion of mHealth initiatives in all three countries.

Senegal

As a consequence of building the digital platform, local technical capacity strengthened within the Ministry of Health, which in turn presented opportunities through increased technical support for new services to emerge. At the start of the initiative only 2000 people engaged with BHBm. However, with the successful development of the digital platform now more than 230,000 people are signed up to use mDiabetes to control and manage their own health. In 2014 the WHO, with the help of mobile operators, agreed to switch the content of the digital platform within 24 hours from diabetes management to prevent and manage patient health in case of Ebola. The Ministry of Health together with the WHO have also deployed the digital platform for existing services to be redesigned for better access to primary healthcare and as a rapid response to crisis situations such as a pandemic.

In 2014 throughout the Ebola outbreak, by utilising the existing platform we [WHO country office together with telecom operators] have managed to switch the services within 24

hours to communicate messages and share information about prevention and management of Ebola. This has significantly reduced the number of cases in the country and the time the country dealt with recovering from the crises. (WHO official Interview#14)

Sudan

The Sudanese BHBM platform was developed inside the Ministry of Health to increase national awareness about NCDs. The WHO local office together with ITU decided to upgrade an already existing technical platform inside the Ministry of Health with the intention to increase technical support with assistance from telecom companies. The biggest challenge in the development phase was to deploy the digital platform, built inside the Ministry of Health and based on an already existing platform originally designed for receiving data from surveys. Building the digital platform provided the required infrastructure, leading in turn to increased knowledge and technical skills within the public sector. Meanwhile having the digital platform in place not only strengthened local technical capacity but also enabled new services to emerge. It also enabled already existing services to be redesigned for better access to primary healthcare across Sudan, such as the development of new online services for consultations.

The knowledge created through using the digital platform to manage NCDs also increased the Ministry of Health's efficiency to manage future crisis situations. Findings from later interviews showed how private and public sector actors responded to Covid-19 by switching the context of the messages delivered on the platform from informing patients on diabetes-related issues to how to manage their own health during the pandemic. All patients who were subscribed to the mDiabetes initiative received instant messages on the prevention and management of Covid-19.

We [WHO local office] wanted to help the NCD patients and reduce the facility visits, as they are at risk of developing complications easier from Covid-19. I am currently negotiating with a third party company on how to do this virtual facility visits as a new form of online consultation. (Public servant, WHO, interview #7)

India

Having a digital platform developed resulted in an improved rate of awareness on diabetes and an increased level of use of health services across the country. BHBM initiatives including

mTobacco and mDiabetes in India were never designed to replace routine health services but rather to raise awareness about preventing and managing health related conditions to raise awareness about preventing and managing health related conditions as an add-on effect through both the cessation services and diabetes services across the country. During the current pandemic when routine healthcare services, including counselling services, have been suspended, the Ministry of Health in collaboration with the private sector illustrated in the quote below has started to deploy the digital platform for providing online consultations to many. The BHBM platform's embeddedness in routine services created opportunities for new services to be added to the platform.

We [Ministry of Health] teamed up with DELL and Tata and connected BHBM mobile services to diabetes screening services through combining technical and health expertise. (Public servant Interview19#)

To deploy the digital platform for improving the overall access to primary healthcare was key on the government's agenda, as this allusion from an interview makes plain:

"BHBM became the fourth biggest digital initiative that was launched on the platform to support the mission to build digital capacity for more efficient disease control." (Public servant Interview20#)

The two main activities associated with the development phase were deploying a digital platform and exploiting local knowledge through continuous engagement with civil society as part of the diffusion process. The active involvement of civil society in the search for an external innovation is new to the literature. Moreover, digital technology and its role in contributing to large scale diffusion has only been looked at as a potential pathway to reach to the end customer; the role of digital technology to enable the development of new services has not been discussed in such detail. During the third or scaling phase of the diffusion process, activities were directed towards engaging with civil society and exploiting the potential of the digital platform which in turn generated a critical mass of users.

Table 4 – 3 Activities through the *development phase* to support successful adoption of BHBM in India, Senegal and Sudan

BHBM mHealth Initiative		
Developmental phase	Activities	Illustrative quotations
India	<p>Deploy digital platform by using existing infrastructure to harness the power of connectivity or introduce an externally developed digital architecture to provide a foundation for sending messages to control and manage disease.</p> <p>Exploit local knowledge: actors within the collaboration recognise the need to learn from local existing practices to increase adoption.</p>	<p>We [<i>Ministry of Health</i>] teamed up with DELL and Tata and connected BHBM mobile services to diabetes screening services through combining technical and health expertise. (<i>Public servant Interview19#</i>)</p> <p>Using digital to improve overall access to primary healthcare was key on the government's agenda and BHBM became the fourth biggest digital initiative that was launched to support this mission by building local digital capacity for more efficient disease control. (<i>Public servant Interview20#</i>)</p> <p>We [<i>WHO country office</i>] formed a strong partnership with the Ministry of Health, Ministry of Information and Technology, Ministry of Science and Technology through the National Information Centre and the Telecom Regulatory to build a digital platform to raise awareness about NCDs locally. (<i>Public servant Interview190#</i>)</p> <p>Patients [<i>BHBM users</i>] suggested the inclusion of an interactive voice response system to improve the rate for registration and increased level of motivation for using the services...this recommendation resulted in an increased number of self-registered users. (<i>Interview19#</i>)</p> <p>All the recruitment and introduction of BHBM was done by the health workers. Also the heads of villages in rural India played a key part in delivering the messages to the people who had no access to technology. Community engagement played a key part in reaching all parts of society. (<i>WHO official, interview #15</i>)</p> <p>During the current pandemic when the system, by which I mean your routine healthcare services has been suspended, the counselling</p>

		services and other services started to use the digital platform for providing online consultations. (<i>WHO official Interview#21</i>)
Senegal	Deploy digital platform by using existing infrastructure to harness the power of connectivity or introduce an externally developed digital architecture to provide a foundation for sending messages to control and manage disease.	<p>When we [<i>WHO country office and Diabetic Patient Group</i>] started, only 2000 people joined the programme, last time we checked we had 230,000 people. It is still not the whole population. The trust in the messages has carried out a great deal of work in reaching all parts of society. (<i>BHBM programme head of the Diabetic Patient Association Interview#</i>)</p> <p>...taking into account the mobile penetration, particularly in Senegal, where that mobile penetration is higher than anywhere else in Sub-Saharan Africa, we knew this is an opportunity. (<i>Public servant interview#14</i>)</p> <p>We [<i>Diabetic Patient Group</i>] started to engage with the Ministry of Information Technology through ITU and all three telecom operators to build technical capacity through an externally developed digital platform to support diffusion of BHBM. <i>BHBM programme head of the Diabetic Patient Association Interview#</i>)</p> <p>We Ministry of Health together with WHO have chosen an integrator company for Senegal to build the digital interface between Ministry of ICT and telecom operators.</p> <p>For us [<i>IFPMA</i>] it was important that a digital platform was in place to support the diffusion of BHBM, as we are very interested in seeing impact not just on new treatments but on technologies and devices that can improve NCD outcomes, particularly in the low and middle income countries... digital health is of interest to many of our member companies to be engaged with. (<i>Senior manager - Interview #11</i>)</p> <p>We [<i>Diabetic Patient Group</i>] together with local health workers have been working for years to build a foundation to provide equal access to healthcare services to all. (<i>Diabetes expert interview#12</i>)</p>

	<p>Exploit local knowledge: actors within the collaboration recognise the need to learn from local existing practices to increase adoption.</p>	<p>We (pharmaceutical company) provided financial resources but also knowledge and expertise to support the diffusion of BHBM. <i>(Programme Head Interview #16)</i></p> <p>From this collaboration between the government, private sector and Patient Associations, for the first time an intervention had the resources to be distributed equally across the country. This has made a big difference. <i>(Diabetes expert interview#12)</i></p> <p>We learnt from local practices that we [WHO local office] need to send the message to patients with diabetes and health professionals who are treating diabetic patients. Also learning from local knowledge on patients, we launched mDiabetes close to Ramadan to maximize our outreach. <i>(Diabetes expert interview#12)</i></p> <p>We [<i>Diabetic Patient Group</i>] sending messages to people who are not registered as diabetics to raise awareness of diabetes is different when you send sms to patients with diabetes. The national campaign was therefore launched close to Ramada, as 94% of Senegal's population are Muslim. <i>(Diabetes expert interview#12#)</i></p> <p>In 2014 throughout the Ebola outbreak, by utilizing the existing platform we [<i>WHO country office together with telecom operators</i>] have managed to switch the services within 24 hours to communicate messages and share information about prevention and management of Ebola. This has significantly reduced the number of cases in the country and the time the country dealt with recovering from the crises. <i>(WHO official Interview#14)</i></p>
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Sudan	<p>Deploy digital platform by using existing infrastructure to harness the power of connectivity or introduce an externally developed digital architecture to provide a foundation for sending messages to control and manage disease.</p>	<p>28 million people out of the 40 million have access to mobile phones. We [<i>WHO country office</i>] wanted to reach people living in rural areas who are unreachable by facilities and health services and have very limited access to health education, using mobile phones to inform people was a great opportunity. (<i>WHO official Interview#7</i>)</p> <p>Using a digital platform as a very innovative approach... despite Sudan being a developing country, there is excellent mobile coverage in Sudan. (<i>Public servant Interview#17</i>)</p> <p>Having the digital platform in place not only strengthened the local technical capacity but enabled new services to emerge from the use of a digital platform. It also enabled already existing services to be redesigned for better access to primary healthcare across Sudan. (<i>Public servant Interview#17</i>)</p> <p>We [<i>WHO country office</i>] are all working in collaboration with all telecom operators and the Ministry of Health to maximise value from the use of a digital platform and to build a strong digital infrastructure which could lift up the country's overall healthcare system...we also worked together with ITU to bring their technical support. (<i>WHO official Interview#3-4</i>)</p> <p>At the start of the partnership all three telecom operators agreed to send free messages to people to encourage them to enrol on the programme. (<i>Public servant Interview#17</i>)</p> <p>To respond to the ongoing change in the country's political state, high level discussions between us [<i>WHO country office</i>] the Ministry of Health and the Ministry of Information and Communication Technologies were important from the start. The project also received financial support from the African Development Bank. (<i>WHO official Interview#7</i>)</p> <p>The Diabetes Association here in Sudan has also had a big voice in the diffusion of this initiative. They have taken an active role in the</p>
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	<p>Exploit local knowledge: actors within the collaboration recognise the need to learn from local existing practices to increase adoption.</p>	<p>technical advisory group and have also contributed to the advocacy of the project to their patients through their clinics and local services. (<i>Public servant, interview #7</i>)</p> <p>We [WHO local office] build partnerships with the primary healthcare centres... we reach the centres - primary healthcare centres, diabetic healthcare centres - and we have focal points working with us all over the states of Sudan. (<i>Public servant, interview #7</i>)</p> <p>So instead of considering only the medical society in Sudan we [<i>WHO country office</i>] should also consider engaging with patient societies. So, for future improvement on the programme we will look for such partners and their engagement with the initiative.” (<i>WHO official Interview#3-4</i>)</p> <p>We [WHO local office] wanted to help the NCD patients and reduce the facility visits, as they are at risk of developing complications more easily from Covid-19. I am currently negotiating with a third party company on how to do these virtual facility visits as a new form of online consultation. (<i>Public servant, WHO, interview #7</i>)</p>
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4.4.3 Scaling phase of Be He@lthy, Be Mobile – Continuous use of innovation

The scaling phase involves the innovation being successfully adopted through continuous use and eventually embedded into the local system. In this section, presentation of findings focuses on the activities undertaken in each of the three cases relating to the scaling phase to support the continued use of BHBM. The analysis reveals important findings, first that by mobilising communities, actors of the social system provided opportunities for civil society and local communities to continuously engage with the diffusion process. Second, by continuously using the innovation, actors within the social system were able to develop new services and/or replicate to uplift current health services, resulting in the formation of an innovation ecosystem. Third, we develop these ideas further, present evidence from the three cases and provide indications of previously unreported factors that support adoption and continued use of EDSIs.

4.4.3.1 Mobilise communities

To support the continuous use of the BHBM health initiative, local communities have participated in activities provided by the public sector to develop new skills and knowledge, resulting in the development of new services to improve the overall healthcare system.

Senegal

To support this endeavour, the local representation of the WHO is working closely with the DPA to train young leaders of diabetes patients through a weeklong programme designed and delivered by local health professionals. As part of this training they learn how to deal with the disease on an individual basis, followed by another week long training to develop their advocacy skills and empower them to develop a sense of ownership and responsibility over the disease. Due to the long-standing relationship between actors of the civil society to support the decentralisation of care and prevention, members of the DPA were already mobilising healthcare workers, doctors and medical experts, years before taking on BHBM. To build capacity for a change that digital health could bring on a country level, they also mobilised the private sector to help train over 1,000 doctors with the support of Sanofi.

We [WHO local office and Ministry of Health] have been working with the Diabetes Patients Associations to make them aware of their power. We even had a programme for training young leaders in diabetes to support the initiative. (Public servant interview#14)

The DPA in collaboration with the WHO also successfully mobilised other DPAs around NCD type diseases, such as cervical cancer and hypertension. This has resulted in negotiations with international organisations such as NCD Alliances to build an alliance for Senegal especially.

Sudan

There are also existing community structures that are working to serve the community but not for health-related issues. After the 2019 youth uprising, Sudan built resistance committees and community committees to support people through increased access to education. These committees consist of mostly young people volunteering to serve the population. Therefore, to maximise value from BHBM and to build a long-term view to tackle NCDs, mobilising partnership with youth has been highlighted in our interviews.

We [WHO country office] engaged with the youth...they have the power to motivate and encourage the rest of the population, they know how to talk to elderly and convince them why mHealth is important to their own health management. (WHO official Interview#7)

There are already existing community structures working to serve the community such as the resistance committees. So working with the existing local communities will be of a great benefit to us to reach large scale adoption. (Public servant, WHO, interview #7)

India

In India health workers, doctors and nurses were deeply involved in sharing information with their patients and as part of BHBM, the Ministry of Health also delivered training programmes to mobilize communities locally such as the heads of villages. In rural India, the heads of villages were involved in the diffusion of BHBM to their own communities where there was limited or no access to technology, which resulted in a significant use of the services in rural areas. Since the illiteracy rate in India is around 20% (Public servant, WHO, interview #19) training other members of the family directly related with the illiterate patient proved a successful strategy in increasing the use of BHBM across the nation.

4.4.3.2 Develop new services

By continuously using the digital platform actors in the social system have co-developed new services on the strength of BHBM's success, and through ongoing collaboration created a service-based model to support continuous use of BHBM and its embeddedness into the local healthcare system.

Senegal

The DPA together with the WHO, private sector and government are now developing new services connecting the data on nutrition, linking it to the management and control of diabetes and obesity. In addition, an e-learning platform for professionals to improve their skills and knowledge on disease management was developed recently by the Ministry of Health:

We the [Ministry of Health] introduced a training programme for young diabetic patients to develop their advocacy skills and empower them to develop a sense of ownership and responsibility over the disease...empowering the youth to partake is very important. (Public servant Interview#14)

A new proposal has meanwhile been developed by the Ministry of ICT together with the private sector to improve satellite connection to rural areas:

All the different programs are trying to get to know each other to see how best they can work with together.” (Diabetes expert interview#12)

Sudan

During the start of the current pandemic, using the digital platform for rapid response helped the local health system to deal with the crisis with efficiency. As a result of this multi-actor collaboration, telecom operators have contributed to the management of the pandemic by providing hotlines, codes and access to data. They have also initiated and promoted awareness raising media campaigns which broadcast educational content through mobile phones. To help patients manage their diabetes throughout the pandemic the private and public sector joined forces to respond to the difficulties associated with the limited services on face-to-face visits by developing a new service offering virtual facility visits to patients enrolled on BHBM.

WhatsApp Business together with the local representation of the WHO are now using the digital platform to provide access to virtual medical consultation:.

...all telecom operators are contributing to the fight against covid-19 without any obligation from the Ministry of Health. They [Telecom operators] showed initiative to contribute to the management of the crises by providing hotlines, codes and access to data. They have also initiated promotion and awareness raising media campaigns including broadcasting educational content through mobile phones. (Public servant Interview#17)

Through this digital platform we [WHO local office] now have enabled the health sector in Sudan to use this platform for developing new services for primary healthcare. (Public servant, WHO, interview #17)

India

Due to the current pandemic, routine healthcare services and counselling services were suspended and eventually shut down. The local WHO together with the private sector and medical doctors introduced an online consultation service to continue providing medical support to patients with diabetes throughout the pandemic:

India has over 32 million people and providing face-to-face health services is a big challenge...to respond to this challenge building new services such as online consultations could help to ease the strain of the system...we hope as the time passes that mHealth becomes one of the prominent pillars in the digital health initiative of India. (WHO official, interview #15)

4.4.3.3 Replicate existing services

By replicating existing services from the use of the digital platform, actors in the social system have introduced various mHealth programmes to tackle all types of NCDs, thus supporting continuous use of BHBM to tackle NCDs globally and to upgrade existing healthcare services.

Senegal

Through the process of replication, other mHealth initiatives, such as mCervical Cancer, have been introduced in collaboration with the WHO and ITU as a new service using the digital platform.

Sudan

The successful diffusion of mDiabetes supported by social system actors working in alliance has also led to increased interest from civil society regarding the introduction of further mHealth initiatives to Sudan.

Actually there was a lot of interest to use the platform for other services. The Hypertension and Cardiovascular Association is committed to develop new services for hypertension as it is one of the highest NCDs in Sudan. Also there is a drive from oncology hospitals to start prevention and awareness campaigns for cervical and breast cancer. (Public servant, WHO, interview #7)

India

Through the process of replication, other mHealth initiatives such as mAging and mCervical Cancer have been introduced by the Government of India in collaboration with the WHO and ITU as new services using the digital platform.

The three main activities associated with the scaling phase were mobilising communities, building new services and/or replicating existing ones. Though mobilising communities is presented in our *a priori* framework as an important factor for large scale diffusion and increased levels of adoption, it is mostly observed from the adopters' point of view. Mobilising communities to support the continuous use of innovation and providing them with opportunities to get involved in the development of new services moved communities from taking the adopter role into actively engaging with the continuous use of the innovation and the development of new services. New service development has occurred either through identifying a new need or by replicating existing services to better serve end users. In the scaling phase, activities were directed toward the continuous use of an EDSI, allowing actors in the social system to develop new services and/or replicate to uplift current health services, resulting in the formation of an innovation ecosystem.

Table 4 – 4 Activities through the *scaling phase* to support successful adoption of BHBM in India, Senegal and Sudan

BHBM mHealth Initiative		
Scaling phase	Activities	Illustrative quotations
India	<p>Develop new services: Actors collaboratively develop new services to support the continuous use of the initiative by the local healthcare system.</p> <p>Replicate existing services: Actors introduce new services through replicating current initiative.</p> <p>Mobilise communities: to empower civil society and local communities to actively engage with the diffusion process.</p>	<p>We [<i>Ministry of Health</i>] have counted over 2 million people using the services provided by mTobaccoCessation and 170, 000 self-registered users on mDiabetes. (<i>WHO official, interview #15</i>)</p> <p>The use of digital in the prevention of diabetes showed a 36% reduction of relative risk compared to standard care within 2 years of launching mDiabetes in India. (<i>Civil society Interview#</i>)</p> <p>In India health is a stage subject... therefore the programme was centralised and financially resourced by the Government of India from the start. (<i>Public servant Interview#20</i>)</p> <p>India has over 32 million people and providing face to face health services is a big challenge...to respond to this challenge building new services such as online consultations could help to ease the strain of the system...we hope as the time passes that mHealth becomes one of the prominent pillars in the digital health initiative of India. (<i>WHO official, interview #15</i>)</p> <p>...adding more layers to the digital platform, including mAging, mHypertension, mYoga could support the use of digital agenda to promote prevention as part of disease management. (<i>WHO official Interview#15</i>)</p>
Senegal	<p>Develop new services: Actors collaboratively develop new services to support the continuous use of the initiative to the local healthcare system.</p>	<p>We [<i>Ministry of Health</i>] introduced a training programme for young diabetic patients to develop their advocacy skills and empower them to develop a sense of ownership and responsibility over the</p>

	<p>Mobilise communities: to empower civil society and local communities to actively engage with the diffusion process.</p> <p>Replicate existing services: Actors introduce new services through replicating current initiative.</p>	<p>disease...empowering the youth to partake is very important. (<i>Public servant Interview#14</i>)</p> <p>We [WHO local office and Ministry of Health] have been working with the Diabetes Patients Associations to make them aware of their power. We even had a programme for training young leaders in diabetes to support the initiative. (<i>Public servant interview#14</i>)</p> <p>You would need to engage with healthcare professionals and with civil society. The project only supported by Ministry of Health won't sustain itself...we [<i>WHO country office and Diabetic Patient Group</i>] need to build impact from the ground rather than from the top down. BHBM provided a new pathway to decentralise care for diabetes so we [<i>WHO country office and Diabetic Patient Group</i>] had the interest of the private sector from the start, playing an equal role in this partnership. (<i>BHBM programme head of the Diabetic Patient Association Interview#</i>)</p> <p>BHBM will be linked to other programmes: one on nutrition linking to diabetes and obesity; an e-learning platform for professionals to improve their skills and knowledge on disease management; and a programme to improve satellite connection to rural areas. All the programmes are trying to get to know each other to see how best they can work together. (<i>Diabetes expert interview#12</i>)</p>
Sudan	Develop new services: Actors collaboratively develop new services to support the continuous use of the initiative to the local healthcare system.	<p>...all telecom operators are contributing to the fight against Covid-19 without any obligation from the Ministry of Health. They [<i>Telecom operators</i>] showed initiative to contribute to the management of the crisis by providing hotlines, codes and access to data. They have also initiated promotion and awareness raising media campaigns including broadcasting educational content through mobile phones. (<i>Public servant Interview#17</i>)</p>

	<p>Mobilise communities: to empower civil society and local communities to actively engage with the diffusion process.</p> <p>Replicate existing services: Actors introduce new services through replicating current initiative.</p>	<p>Through this digital platform we [WHO local office] now have enabled the health sector in Sudan to use this platform for developing new services for primary healthcare. (<i>Public servant, WHO, interview #17</i>)</p> <p>We [<i>Ministry of Health</i>] engaged with primary healthcare centres; diabetic healthcare centres across the states of Sudan have become key to embed the innovation into the local healthcare system. (<i>Public servant Interview#17</i>)</p> <p>We [WHO local office] spoke with Senegal a few weeks ago and we understood that one of the main drivers for the country for running BHBM Diabetes alongside Ramadan was initiated and planned by the Patient Associations. For future improvement the programme will look for such partners in Sudan too. (<i>Public servant, WHO, interview #17</i>)</p> <p>We [<i>WHO country office</i>] engaged with the youth...they have the power to motivate and encourage the rest of the population, they know how to talk to elderly and convince them why mHealth is important to their own health management. (<i>WHO official Interview#7</i>)</p> <p>There are already existing community structures working to serve the community such as the resistance committees. So working with the existing local communities will be of a great benefit to us to reach large scale adoption. (<i>Public servant, WHO, interview #7</i>)</p> <p>Actually there was a lot of interest to use the platform for other services. The hypertension and cardiovascular associations are committed to develop new services for hypertension as it is one of the highest NCDs in Sudan. Also there is a drive from oncology hospitals to start prevention and awareness campaigns for cervical and breast cancer. (<i>Public servant, WHO, interview #7</i>)</p>
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Table 4 – 5 Core activities by actors through the diffusion journey to support successful adoption of BHBM

Diffusion phases	BHBM mHealth Initiative		
	India	Senegal	Sudan
Initial	<p>Public and private sector intimately align with a purpose /mission-orientated goal</p> <p>Generate a shared value from the launch of BHBM</p>	<p>Public and private sector intimately align with a purpose/mission-orientated goal</p> <p>Generate a shared value from the launch of BHBM</p> <p>Civil society actively search for a solution</p> <p>Civil society initiate the conversation with the public and private sector</p>	<p>Public and private sector intimately align with a purpose /mission-orientated goal</p> <p>Generate a shared value from the launch of BHBM</p>
Development	<p>Public sector forms a partnership with private sector to harness the power of mobile phones for individual health management.</p> <p>Build a digital architecture to support diffusion inside the Government</p> <p>Public and private sector combine knowledge, technical and financial resources to support diffusion</p> <p>Public sector exploits local knowledge and practices to increase adoption</p> <p>Public sector together with civil society respond creatively to the change in economic and social needs</p>	<p>Public sector forms a partnership to harness the power of mobile phones for individual health management.</p> <p>Build a digital architecture to support diffusion through an external provider</p> <p>Public and private sector combine knowledge, technical and financial resources to support diffusion</p> <p>Public sector together with civil society exploit local knowledge and practices to increase adoption</p> <p>Public sector together with civil society respond creatively to the change in economic and social needs</p>	<p>Public sector forms a partnership to harness the power of mobile phones for individual health management.</p> <p>Build a digital architecture to support diffusion through an external provider</p> <p>Public and private sector combine knowledge, technical and financial resources to support diffusion</p> <p>Public sector together with civil society exploit local knowledge and practices to increase adoption</p> <p>Public sector together with civil society respond creatively to the change in economic and social needs</p>

Scaling	<p>Utilise existing infrastructure for providing population wide access to information to raise awareness</p> <p>Utilise the digital platform to increase awareness of disease management</p> <p>Collaboratively build new service models to embed BHBM into local healthcare system</p> <p>Introduce new services through replication</p>	<p>Collaboratively build new service models to embed BHBM into local healthcare system</p> <p>Empower civil society to support the adoption</p> <p>Introduce new services through replication</p>	<p>Collaboratively build new service models to embed BHBM into local healthcare system</p> <p>Empower civil society to support the adoption</p> <p>Introduce new services through replication</p>
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4.5 Discussion

Digital technology has already proven disruptive to the traditional ways in which innovation has been diffused and adopted in LMICs (Gawer and Cusumano, 2014), leading to both economic benefits and social impact. Two pertinent examples are mobile phone based money transfer services and micro-financing services in developing countries, illustrated by the well-researched case of Mpesa (Jack & Suri, 2011; Kingiri & Fu, 2020). Digital platforms and mobile telephony have also been identified as enabling technologies supporting the ongoing technical improvement of innovation for healthcare services and for education. The use of digital platforms to promote health prevention and to address social problems associated with the SDGs is considered an emerging field in the innovation literature (Gawer and Cusumano, 2014). BHBM as a global health initiative based on a digital platform and particularly the use of text messaging to help combat NCDs such as diabetes, cancer, cardiovascular diseases and chronic respiratory diseases constitutes a flourishing example of this phenomenon.

BHBM's successful diffusion has contributed to diabetes prevention, with a 36% reduction in relative risk (as compared to standard care in India) within 2 years, while additionally demonstrating that mobile messaging about diabetes management significantly helped to improve healthcare outcomes of those enrolled in BHBM. This bears out and extends Ramachandran et al.'s (2006; 2013) and Shetty et al.'s (2011) research on digitally supported lifestyle modifications for improved diabetic healthcare. In Senegal, using mobile messaging has not only raised awareness about diabetes, but has also resulted in training over 1000 healthcare workers and developing remote consultation services and management support for diabetes patients. In all three cases BHBM has helped to create the foundation of each country to develop their own national mDiabetes programme.

This initiative's uniqueness derives from the complementary use of resources and knowledge between these two UN agencies, namely, combining the WHO's expertise on health with the ITU's digital expertise, to solve a pressing social problem.

Our findings highlighted activities such as creating purpose-led alignment, combining resources, deploying a digital platform, exploiting local knowledge, and developing new services as examples of how actors in the social system engage in activities that not only

support the introduction but also the diffusion and eventual scaling of the innovation in all three countries.

4.5.1 Initial phase – Purpose-led alignment

Each case shows the pivotal role of health care professionals, telecom operators, local governments together with local civil society including patient associations, local hospitals and committees, aligning behind a mission-oriented (Mazucatto and Roy, 2019) goal and working collaboratively (Dutta et al., 2019). To address resource constraints - one of the factors affecting the diffusion and preventing the scaling of complex social innovations in LMICs - (Mulgan et al., 2010; Oiej et al., 2019; Howalt, 2018), actors in the social system have engaged in activities to tackle lack of technical resources by combining their resources and knowledge at the start of the diffusion process. First, the private sector, i.e., telecom operators joined together behind a common purpose and offered their services by sending millions of messages for free (Senegal, Sudan) or at a reduced rate (India) to everyone, followed by the pharmaceutical industry providing financial resources and expert knowledge to support the diffusion process. Our illumination of the ways in which actors in the social system combine their resources and knowledge to support the diffusion of the innovation strongly supports the co-evolving and emergent nature of the innovation ecosystem (Dougherty, 2017).

The two main activities associated with the initial phase were creating purpose-led alignment by robustly cohering and coalescing around a social purpose and combining resources and knowledge across all actors in the social system. Though alignment with a common goal is widely discussed in stakeholder theory and collective value creation, the nature of the common goal is often associated with a short term outcome and financial gain. In the case of an EDSI the common goal is aligned with a social purpose, a non-metric driven aim to create long term societal impact. Collaborative value creation to address a social need prompts social system actor engagement in the exchange of resources and knowledge to address a social need. In all three cases of BHBM, the emphasis is on the combination of resources and knowledge to build a long term support for the diffusion process. In the initial phase activities were carried out collaboratively by actors in the social system to create a broad set of tangible and intangible benefits driven by a purpose-led mission.

4.5.2 Development phase – Engagement with civil society

Our findings also illuminated the importance of public opinion and civil society in the diffusion process by identifying so-called ‘missed opportunities’ (Vladimirova, 2017). Civil society together with actors in the private and public sector has successfully developed new services from the use of the digital platform originally built to support the introduction of BHBM locally. Developing services such as online consultation and education has also contributed to the continuous use of the innovation. The active role of civil society in identifying opportunities and mobilising communities to support the diffusion of mHealth initiatives supports the current stream of literature on the rising role of citizens in the innovation process (Prabhu, 2020).

The two main activities associated with the development phase were deploying a digital platform and exploiting local knowledge by continuously engaging with civil society as part of the diffusion process. Community and civil society were both considered to be part of the adopters community and how they support the design and development of an innovation rather than the diffusion of the innovation in local context. has mostly been looked at from an adopter’s point of view.

Civil society’s active involvement in the search for an externally developed innovation as a solution to a social problem is new to the literature. Previously, it was mostly associated with innovations developed at a community level, such as bottom of the pyramid or grassroots innovations. Also, digital technology and its role in contributing to large scale diffusion has only been looked at as a potential pathway to reach the end customer, the role of digital in catalysing new services has not been discussed in the literature in this detail.

In the development phase, activities were directed towards engaging with civil society and exploiting the potential of the digital platform as part of BHBM service itself to raise awareness of NCDs across the population which in turn generated a critical mass of users/throughput that made it self-sustaining. This also maps onto current views of diffusion’s nature as a dynamic, co-evolving process (Vargo et al., 2020) in which social system actors combine their resources and knowledge to address a social problem.

4.5.3 Scaling phase – Continuous use of innovation

As previously noted, the three main activities associated with the scaling phase were mobilising communities, building new services and/or replicating existing ones. Mobilising communities to support the continuous use of the innovation and providing them with opportunities to get involved in the development of new services has moved communities from the adopter role to active engagement with the continuous use of the innovation and the development of new services. Also, actors in the social system engaged in the development of new services, such as online consultations through WhatsApp Business to focus on management of disease. While BHBM services were enabled by the digital platform, the new emerging services were separate from the platform whether by identifying a new need or by replicating an existing one to provide better access to overall access to all. In the scaling phase, activities were directed towards the continuous use of an EDSI in which social system actors were able to develop new services and/or replicate these to uplift current health services, resulting in the formation of an innovation ecosystem.

Our findings also support the views of Vargo and Lusch's (2011) service ecosystem perspective on diffusion which removes the divide between innovator/diffuser and consumer/adopter. To build on their view we consider diffusion as an actor-actor process where multiple actors (Vargo and Lusch, 2011, Vargo et al, 2020) work in close collaboration (Chesbrough, 2003) to generate value from the innovation (Amit and Zott, 2001; Zott et al., 2011). The literature refers to the formation of an ecosystem being either designed in a process or being emergent and co-evolving (Dougherty, 2017; Jacobides, 2018; Granstrand & Holgersson, 2020). In the case of both Senegal and Sudan we have witnessed the co-evolving nature of new services developed by actors in the social system. In India activities associated with the diffusion of BHBM were initiated by the government compared to the case of Senegal, where the diffusion of BHBM was mostly driven by members of civil society, which in turn led naturally emerging new services.

By examining the activities of actors in the social system along the diffusion journey, we aim to build on Vargo's conceptualisation of diffusion as "a co-creative process that involved multiple actors integrating new resources" (Vargo et al., 2020 p.4). Drawing on current theories of actor-actor partnership (Vargo et al., 2020), diffusion is reconstructed as an actor-actor process. Viewing diffusion as an actor-actor process brings each actor, including those in civil

society, to the forefront of the diffusion process, and rectifies an earlier conceptual blindspot. This has particular relevance for the continuous use of the innovation and its embeddedness in the local systems.

4.5.4 Limitations

This research focuses on the diffusion of an EDSI. It is important however to acknowledge the three important areas in which our research is currently limited. First, our study's healthcare context restricts both the ways we can draw overall conclusions from our research and their generalisations for innovation management in other fields. However, it is precisely this healthcare context which provides us valuable insight into how to diffuse digitally enabled social innovations into LMIC healthcare systems. The increasing number of digitally enabled EDSI requires further empirical investigation to strengthen our findings for potential applicability across sectors and contexts. Second, the Covid-19 pandemic made it impossible for the researcher to visit these countries and meet with further local actors undoubtedly holding pertinent information on the last stage of adoption. An opportunity therefore exists to design empirical field work with particular focus on the scaling stage of the diffusion process. Third, to strengthen our understanding of social system activities, we need not only to look at successful cases but must also focus careful attention on less successful cases, in order to identify factors that could hinder the potential impact of an EDSI into an LMIC.

4.6 Conclusion

Looking at the social system as a key concept in diffusion afforded us the opportunity to reconceptualise social system as no longer separate communities of diffusers and adopters but rather a single actor-actor system. This actor-actor view of the social system supports the recent literature on rethinking diffusion in the innovation process (Vargo et al., 2020). In addition, looking at activities carried out by actors in the social system confirmed the view on diffusion from linear process to a recursive (King, 1992) dynamic process in which social system actors engage in joint activities and continues feedback loops throughout the initiation, development and scaling of the innovation. (Van de Ven, 1999; Seelos and Mair, 2017)

In all three cases our findings highlighted activities associated with the deployment of the digital platform, exploitation of local knowledge and development of new services through

BHBM to sustain the innovation and transform the existing health system. In all three cases our findings highlighted activities associated with the deployment of the digital platform, exploitation of local knowledge and development of new services through BHBM as crucial to sustaining the innovation and transforming the existing healthcare system. Developing new services from the deployment of the digital platform has made preventative healthcare widely accessible to all parts of society in all three cases, with new healthcare services uplifting the quality of managing diabetes locally. In India alone, over 2 million people are currently using BHBM services with the numbers consistently rising.

There is also evidence to demonstrate the important role of an ecosystem (Jacobides et al., 2018; Teece, 2018) in supporting the diffusion process in developed countries, but hardly any cases highlight their role in developing countries and how these contribute to the continuous use of EDSIs in LMICs.

Both in Senegal and Sudan, we have observed the emergence of new services as a result of all actors working in collaboration to create value from the use of the digital platform throughout the diffusion process. Actors of the social system in Senegal developed a creative approach, building long term collaborations across the private, public and third sector, for example creating new services through WhatsApp Business. Compared to India's top-down approach, Senegal has adopted a bottom-up approach, with society taking ownership of BHBM by forming strong partnerships across sectors. Having a natural and emergent approach to new service development supports Vargo et al's (2020) views on service-based ecosystems and their importance to bring sustainability into the diffusion.

We also emphasised civil society's importance in the development of new services, suggesting that diffusion driven by civil society in close collaboration with the private and public sectors could contribute to the innovation's successful scaling. According to the WHO's impact measurement, BHBM's financial sustainability will occur at the point when the Ministry of Health takes ownership of the initiative and incorporates it into its yearly financial plan. MDiabetes has been running in Senegal for 8 years and in Sudan for 4 years, and the Ministry of Health in both countries has failed to meet the requirements set by the WHO to incorporate BHBM into the government's budget. However, the strong collaboration between the patient association and the private sector has resulted in new services to support the continuous use of BHBM, with the aim to become financially sustainable. Our findings suggest that an externally

developed digital infrastructure could change the future of primary healthcare services both in Sudan and Senegal. Empowering civil society to develop a stronger voice and engage in continuous experimentation through collaboration with the private sector could build new bridges and create sustainable models for diffusion.

One of the biggest challenges associated with financial sustainability is finding efficient and appropriate ways to embed an EDSI into local systems for eventual population-wide outreach. BHBM was developed and designed by the WHO in collaboration with the ITU as a pilot initiative with the overall aim of robustly tackling NCDs globally, by replacing previous short term objectives with a longer term, financially sustainable and contextually relevant vision. Some argue that innovation for healthcare depends on new inventions that are entering the market. Based on our findings we call for a deeper and more nuanced understanding of new service formation linked to the activities of the social system throughout the diffusion process. We recommend this especially in an LMIC context, where scholarly understanding of ecosystem formation is currently limited.

The challenge with an externally developed social innovation such as BHBM derives from its embeddedness in the local system, alongside the question of who should be doing what along the diffusion process. Supporting the diffusion and adoption of innovations such as BHBM requires multiple actors working together to solve a specific social problem, which in turn creates space for new applications and services to emerge. Having a digital platform in place has created new knowledge and allowed new services to be developed, thereby supporting BHBM's successful diffusion into all three countries. We call for future research on two accounts: first, to understand how to apply knowledge created from the use of digital to manage crises situations such as Covid-19, and second, to understand how digitally enabled social innovations could reduce the time in which an EDSI is diffused into an LMIC context.

4.7 References to Chapter 4

- Accard, P., (2019). Criticality: How Changes Preserve Stability in Self-Organizing Systems. *Organization Studies*, 40(11), pp.1613-1629
- Acheampong, G. and Esposito, M., (2014). The nature of entrepreneurship in bottom of the pyramid markets. *International Journal of Entrepreneurship and Small Business*, 21(4), pp.437-456.
- Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented Innovation: A Systematic Review. *International Journal of Management Reviews*, 18(2) pp.180-205
- Adner, R. and Kapoor, R., (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic management journal*, 31(3), pp.306-333
- Adner, R., (2006). Match your innovation strategy to your innovation ecosystem. *Harvard business review*, 84(4), pp.98
- Adner, R., (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of management*, 43(1), pp.39-58
- Agélli Genlott, A., Grönlund A., Viberg O., (2019). Disseminating digital innovation in school – leading second-order educational change. *Education and Information Technologies* 24(5)
- Agarwal, N. and Brem, A., (2017). Frugal innovation-past, present, and future. *IEEE Engineering Management Review*, 45(3), pp.37-41.
- Akaka, M.A. and Vargo, S.L., (2014). Technology as an operant resource in service (eco) systems. *Information Systems and e-Business Management*, 12(3), pp.367-384
- Anderson, P., (1999). Perspective: Complexity theory and organization science. *Organization science*, 10(3), pp.216-232
- Asongu & Agyenim Boateng, (2018). Introduction to Special Issue: Mobile Technologies and Inclusive Development in Africa, *Journal of African Business*, 19(3), pp.297-301
- Bloom, D. E., Cafiero, E. T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L. R., Fathima, S., Feigl, A. B., Gaziano, T., Mowafi, M., Pandya, A., Prettnner, K., Rosenberg, L., Seligman, B., Stein, A. Z. & Weinstein, C. (2011). The Global Economic Burden of Non-Communicable Diseases Geneva: World Economic Forum: World Economic Forum & Harvard School of Public Health
- Bock, T. and Sergeant, J. (2002) 'Small Sample Market Research', *International Journal of Market Research*, 44(2), pp. 1–7
- Boddy, C.R. (2016) Sample size for qualitative research. *Qualitative Market Research* 19(4)pp.426-432

- Boyer, J., (2020). Toward an Evolutionary and Sustainability Perspective of the Innovation Ecosystem: Revisiting the Panarchy Model. *Sustainability*, 12(8), p.3232
- Caulier-Grice, J., Kahn, L., Mulgan, G., Pulford, L., & Vasconcelos, D. (2010). *Study on social innovation. Paper prepared by the Social Innovation Exchange (SIX) and the Young Foundation for the Bureau of European Policy Advisors*. Sine Loco: European Union/The Young Foundation.
- Cennamo, C., Gawer, A. and Jacobides, M.G., (2018). Towards a theory of ecosystems. *Strategic Management Journal*, 39, pp.2255-2276
- Chandler, J., Cumpston, M., Li, T., Page, M.J. and Welch, V.A., (2019). Cochrane handbook for systematic reviews of interventions. *Hoboken: Wiley*.
- Cilliers P., (2005). An introduction to “The architecture of complexity”. *Emergence: Complexity and Organization*. 1(12)
- Clar, C., Campbell, S., Lisa, D. & Wendy, G. (2011). What are the effects of interventions to improve the uptake of evidence from health research into policy in low and middle-income countries? University of Aberdeen (UoA)
- Cohendet, P., Grandadam, D. and Simon, L., (2010). The anatomy of the creative city. *Industry and innovation*, 17(1), pp.91-111
- Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Sage Publications, Inc.
- Creswell, J. W. and Miller D.L. (2000) Determining Validity in Qualitative Inquiry, *Theory Into Practice*, 39(3), 124-130
- Davis, J.P. and Eisenhardt, K.M., (2011). Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Administrative Science Quarterly*, 56(2), pp.159-201
- de Jong, J.P., Gillert, N.L. and Stock, R.M., (2018). First adoption of consumer innovations: Exploring market failure and alleviating factors. *Research Policy*, 47(2), pp.487-497
- Dhondt, S., & Oeij, P. (2014). Social innovation related to innovation in management studies. In J. Howaldt, A. Butzin, D. Domanski, & C. Kaletka (Eds.). *Theoretical approaches to social innovation – A critical literature review* pp. 122–150 Dortmund: Sozialforschungsstelle: Social Innovation: Driving force of social change - SI-Drive
- Dhondt, S., Oeij, P., & Schröder, A. (2018). Resources, constraints and capabilities. In J. Howaldt, C. Kaletka, A. Schröder, & M. Zirngiebl (Eds.). *Atlas of social innovation – New practices for a better future* pp. 74–77. Dortmund: Sozialforschungsstelle: TU Dortmund
- Dougherty, D., (2017). Taking advantage of emergence for complex innovation ecosystems. *Journal of Open Innovation: Technology, Market, and Complexity*, 3(3), p.14.

- Dubois, A. & Gadde, L.-E. (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research*, 55, pp.553-560
- Dutta, S., Reynoso, R. E., Wunsch-Vincent, S., León, L. R. & Hardman, C. (2019). Creating healthy lives— the future of medical innovation. In: Dutta, S., Reynoso, R. E., Wunsch-Vincent, S., León, L. R. & Hardman, C. (eds.) *Global Innovation Index 2019: Creating Healthy Lives—The Future of Medical Innovation*
- Eisenhardt, K. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), 532-550.
- Eisenhardt, K.M. and Graebner, M.E., (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), pp.25-32
- Franceys, R. & Weitz, A. (2003). Public–private community partnerships in infrastructure for the poor. *Journal of International Development*, 15, pp.1083-1098
- Fu, X., Kingiri, A. and Fu, X. (2020) The Diffusion and Adoption of Digital Finance Innovation in Africa: The System Dynamics of M-PESA. In *Innovation under Radar. The Nature and Sources of Innovation in Africa*. Cambridge: Cambridge University Press, pp.284-302.
- Gambardella, A., Raasch, C. and von Hippel, E., (2017). The user innovation paradigm: impacts on markets and welfare. *Management Science*, 63(5), pp.1450-1468
- Gawer, A. and Cusumano, M.A., (2014). Industry platforms and ecosystem innovation. *Journal of product innovation management*, 31(3), pp.417-433
- Gawer, A., (2014). Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research policy*, 43(7), pp.1239-1249
- Geels, F.W., (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research policy*, 33(6-7), pp.897-920.
- Gehman, J. et al. (2018) ‘Finding Theory–Method Fit: A Comparison of Three Qualitative Approaches to Theory Building’, *Journal of Management Inquiry*, 27(3), pp. 284–300.
- Gioia, D. A., Corley, K. G. and Hamilton, A. L. (2013) ‘Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology’, *Organizational Research Methods*, 16(1), pp. 15–31.
- Graebner, M.E. and Eisenhardt, K.M., (2004). The seller's side of the story: Acquisition as courtship and governance as syndicate in entrepreneurial firms. *Administrative Science Quarterly*, 49(3), pp.366-403
- Granstrand, O. and Holgersson, M., (2020). Innovation ecosystems: A conceptual review and a new definition. *Technovation*, 90, p.102098
- Grodal, S., Anteby, M. and Holm, A.L., (2020). Achieving rigor in qualitative analysis: The role of active categorization in theory building. *Academy of Management Review*,

- Hallen, B.L. and Eisenhardt, K.M., (2012). Catalyzing strategies and efficient tie formation: How entrepreneurial firms obtain investment ties. *Academy of Management Journal*, 55(1), pp.35-70
- Hammond, A. & Prahalad, C. K. (2002). What works: Serving the poor, profitably. <http://www.wri.org/publication/what-works>: World Resources Institute
- Hart, S. & Christensen, C. M. (2002). The great leap: Driving innovation from the base of the pyramid. *MIT Sloan Management Review*, 44, pp.51 – 56
- Howaldt, J., & Hochgerner, J. (2018). Desperately seeking: A shared understanding of social innovation. In J. Howaldt, C. Kaletka, A. Schröder, & M. Zirngiebl (Eds.)
- Hu, E.Y., Ramachandran, S., Bhattacharya, K. and Nunna, S., (2018). Peer Reviewed: Obesity Among High School Students in the United States: Risk Factors and Their Population Attributable Fraction. *Preventing chronic disease*, 15.
- Immelt, J.R., Govindarajan, V. and Trimble, C., (2009). How GE is disrupting itself. *Harvard business review*, 87(10), pp.56-65.
- Jack, W. and Suri, T., (2011). *Mobile money: The economics of M-PESA* (No. w16721). National Bureau of Economic Research.
- Jacobides, M.G., Cennamo, C. and Gawer, A., (2018). Towards a theory of ecosystems. *Strategic management journal*, 39(8), pp.2255-2276.
- Johannessen, J.A., (2013). Innovation: a systemic perspective—developing a systemic innovation theory. *Kybernetes*.
- Johnson, S. (2001). *Emergence: The connected lives of ants, brains, cities, and software*. NewYork: Scribner.
- Kamel, S., (2005). The use of information technology to transform the banking sector in developing nations.
- King, N., 1992. Modelling the innovation process: An empirical comparison of approaches. *Journal of Occupational and Organizational Psychology*, 65(2), pp.89-100.
- Klein, M., Faratin, P., Sayama, H. and Bar-Yam, Y., (2002) Negotiating complex contracts. In *Proceedings of the first international joint conference on Autonomous agents and multiagent systems: part 2* (pp. 753-757).
- Kliner, M., Knight, A., Mamvura, C., Wright, J., & Walley, J. (2013). Using no-cost mobile phone reminders to improve attendance for HIV test results: a pilot study in rural Swaziland. *Infectious diseases of poverty*, 2(1), pp.12
- Langley, A. (1999). Strategies for Theorizing from Process Data. *The Academy of Management Review*, 24(4), 691-710.

- Langley, A. (2007) 'Process thinking in strategic organization', *Strategic Organization*, 5(3), pp. 271–282.
- Levin, S.A., Barrett, S., Aniyar, S., Baumol, W., Bliss, C., Bolin, B., Dasgupta, P., Ehrlich, P., Folke, C., Gren, I.M. and Holling, C.S., (1998). Resilience in natural and socioeconomic systems. *Environment and development economics*, 3(2), pp.222-235
- Locke, K., Feldman, M.S., Golden-Biddle, K. (2015) Discovery, Validation and Live Coding. *Handbook of Qualitative Organizational Research* (1st edition) Routledge
- Lucian, C. and Mpogole, M., (2008). Forecasting models for predicting commercial rental values in Dar es Salaam City. *Journal of Building and Land Development*, 15(1-2), pp.15-2
- Marshall, B., Cardon, P., Poddar, A. and Fontenot, R., (2013) Does Sample Size Matter in Qualitative Research?: A Review of Qualitative Interviews in is Research, *Journal of Computer Information Systems*, 54(1), pp.11-22,
- Mazzucato, M., and Roy, V., (2019) Rethinking value in health innovation: *from mystifications towards prescriptions*, *Journal of Economic Policy Reform*, 22(2) 101-119
- Mena, S. and Suddaby, R., (2016). Theorization as institutional work: The dynamics of roles and practices. *Human Relations*, 69(8), pp.1669-1708.
- Moore, J.F., (1993). Predators and prey: a new ecology of competition. *Harvard business review*, 71(3), pp.75-86
- Mpogole, H., Usangaz, H., & Tedre, M. (2008). Mobile phones and poverty alleviation: A survey study in rural Tanzania. In S. Pettersson (Ed.), *Proceedings of 1st International Conference on M4D Mobile Communication Technology*
- Mulgan, G.(2010) Measuring Social Value. *Stanford Social Innovation Review* 8(3) 38-43
- O'Reilly III, C.A. and Tushman, M.L., (2013). Organizational ambidexterity: Past, present, and future. *Academy of management Perspectives*, 27(4), pp.324-338
- Oeij, P.R., van der Torre, W., Vaas, F. and Dhondt, S., (2019). Understanding social innovation as an innovation process: Applying the innovation journey model. *Journal of Business Research*, 101, pp.243-254
- Oh, D.S., Phillips, F., Park, S. and Lee, E., (2016). Innovation ecosystems: A critical examination. *Technovation*, 54, pp.1-6
- Ozcan, P. and Eisenhardt, K.M., (2009). Origin of alliance portfolios: Entrepreneurs, network strategies, and firm performance. *Academy of management journal*, 52(2), pp.246-279
- Pansera, M. and Owen, R., (2015). Framing resource-constrained innovation at the 'bottom of the pyramid': Insights from an ethnographic case study in rural Bangladesh. *Technological Forecasting and Social Change*, 92, pp.300-311.

- Peltoniemi, M., (2006). Preliminary theoretical framework for the study of business ecosystems. *Emergence: Complexity & Organization*, 8(1)
- Powell, E.E. and Baker, T., (2014). It's what you make of it: Founder identity and enacting strategic responses to adversity. *Academy of Management Journal*, 57(5), pp.1406-1433
- Prabhu, J. (2021). How Should A Government Be? The new leavers of state power. (Main edition) London: Profile Books
- Prahalad, C.K. and Ramaswamy, V., 2004. Co-creating unique value with customers. *Strategy & leadership*.
- Prahalad, C.K., (2012). Bottom of the Pyramid as a Source of Breakthrough Innovations. *Journal of product innovation management*, 29(1), pp.6-12.
- Priem, R.L., Butler, J.E. and Li, S., (2013). Toward reimagining strategy research: Retrospection and propection on the 2011 AMR decade award article. *Academy of Management Review*, 38(4), pp.471-489
- Ramani, S. V., Sadreghazi, S. & Duysters, G. (2012). On the diffusion of toilets as bottom of the pyramid innovation: Lessons from sanitation entrepreneurs. *Technological Forecasting and Social Change*, 79, pp.676-687
- Radjou, N., Prabhu, J. and Ahuja, S., 2012. *Jugaad innovation: Think frugal, be flexible, generate breakthrough growth*. John Wiley & Sons.
- Ray, S. & Ray, P. K. (2011). Product innovation for the people's car in an emerging economy. *Technovation*, 31, pp.216-227
- Ritala, P. and Almpanopoulou, A., (2017). In defense of 'eco' in innovation ecosystem. *Technovation*, 60, pp.39-42
- Ritala, P., Agouridas, V., Assimakopoulos, D. and Gies, O., (2013). Value creation and capture mechanisms in innovation ecosystems: a comparative case study. *International Journal of Technology Management*, 63(3-4), pp.244-267
- Robertson, P.J. and Choi, T., (2010). Ecological governance: Organizing principles for an emerging era. *Public administration review*, 70, pp.s89-s99.
- Rogers, E. M. 2003. *Diffusion of Innovations* (5th Edition). New York: Free Press.
- Rogers, E.M., Medina, U.E., Rivera, M.A. and Wiley, C.J., (2005). Complex adaptive systems and the diffusion of innovations. *The Innovation Journal: The Public Sector Innovation Journal*, 10(3), pp.1-26
- Schumpeter, J. (1942) *Capitalism, Socialism and Democracy*; Routledge: Abingdon-on-Thames, UK
- Scott, W.R., Davis, G.F., (2016). *Organizations and Organizing: Rational, Natural and Open Systems Perspectives*. Routledge, New York

- Seelos, C. and Mair, J.,(2017). *Innovation and Scaling for Impact: How Effective Social Enterprise Do It* . (Illustrated edition) Stanford University Press
- Shetty, P. (2012) Public health: India's diabetes time bomb. *Nature* 485, S14–S16
- Smith, W.K., (2014). Dynamic decision making: A model of senior leaders managing strategic paradoxes. *Academy of Management Journal*, 57(6), pp.1592-1623
- Strauss, A. and Corbin, J., (1990). *Basics of qualitative research*. Sage publications.
- Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, 47, pp.1367-1387
- Trotter R. T., 2nd (2012). Qualitative research sample design and sample size: resolving and unresolved issues and inferential imperatives. *Preventive medicine*, 55(5), 398–400.
- Tukker, A. (2005). Leapfrogging into the future: developing for sustainability. *International Journal of Innovation and Sustainable Development*, 1
- UN (2015). Transforming our world: the 2030 Agenda for Sustainable Development. <https://sustainabledevelopment.un.org/post2015/transformingourworld>: United Nations
- Van de Ven, A.H., Polley, D.E., Garud, R. and Venkataraman, S., (1999). Building an infrastructure for the innovation journey. *The Innovation Journey*, pp.149-180.
- Van de Ven, A.H., (2017). The innovation journey: you can't control it, but you can learn to maneuver it. *Innovation*, 19(1), pp.39-42.
- Valkokari, K., (2015). Business, innovation, and knowledge ecosystems: How they differ and how to survive and thrive within them. *Technology Innovation Management Review*, 5(8)
- Vargo, S. L., & Lusch, R. F. (2017). Service-dominant logic 2025. *International Journal of Research in Marketing*, 34(1), pp. 46–67
- Vargo, S. L., Wieland, H., & Akaka, M. A. (2015). Innovation through institutionalization: A service ecosystems perspective. *Industrial Marketing Management*, 44, pp.63–72
- Vargo, S.L., Akaka, M.A. and Wieland, H., (2020). Rethinking the process of diffusion in innovation: A service-ecosystems and institutional perspective. *Journal of Business Research*. Vol.116, pp.526-534
- Vladimirova, D., (2019). Building Sustainable Value Propositions for Multiple Stakeholders: A Practical Tool. *Journal of Business Models*, 7(1), pp.1-8.
- Wargny M, Kleinebreil L, Diop SN, *et al.* (2018) SMS-based intervention in type 2 diabetes: clinical trial in Senegal *BMJ Innovations* 4 142-146.
- WHO-ITU (2014). Be He@lthy Be Mobile: Report January 2013 to December 2014. (www.who.int: World Health Organization)

World Health Organization, 2017. Be he@ lthy, be mobile: annual report 2016.

World Health Organization, 2019. Be he@ lthy, be mobile: annual report 2018.

Zaid, H., Salaheldeen, A., Othman, M. M., Hassany, M. & Sorour, A. (2019). Life is too short with HCV and NCDs— 100 million healthy lives initiative. In: Dutta, S., Reynoso, R. E., Wunsch-Vincent, S., León, L. R. & Hardman, C. (eds.) Global Innovation Index 2019: Creating Healthy Lives—The Future of Medical Innovation. Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO)

Zanello, G., Fu, X., Mohnen, P. & Ventresca, M. (2016). The creation and diffusion of innovation in developing countries: a systematic literature review. *Journal of Economic Surveys*, 30, pp.884-912

Zeschky, M., Widenmayer, B. & Gassmann, O. (2011). Frugal innovation in emerging markets: the case of Mettler Toledo. *Research-Technology Management*, 54, pp.38-45

5 CONCLUSIONS

This thesis examines in depth the fourth pillar of Rogers' (2003) diffusion of innovation – the social system-, previously an under-explored element of his theory. Our shift away from product-centric to systems based view of innovation diffusion underlines the importance of the social system's role, the actors' coming together, their activities and how these combine to create value that is both more durable and more widespread than the initial social innovation causing all actors to converge.

This research contributes to our understanding of the role of the social system in the diffusion of an innovation into low to middle income countries (LMICs), particularly in the context of an externally developed social innovation (EDSI) by addressing three primary research objectives: (1) to systematically review the literature on factors influencing the diffusion of EDSIs into LMICs; (2) to investigate the role of social system actors in the creation of value from EDSIs; and (3) to identify activities underpinning the diffusion of EDSIs into LMICs.

Insights from the thesis have enabled us to make contributions to both the domain-specific areas of EDSIs being diffused through the social system, first by reconceptualising social system into one community of multiple actors and second, by reconceptualising the diffusion process from unidirectional communication into a dynamic, recursive and multidirectional process. Both domain-specific contributions also give rise to wider discussion on diffusion of innovation in innovation management.

During the course of the research, we were also able to provide practical forms of dissemination and, by combining the theoretical and practical insights, we provide suggestions both for future research and recommendations for optimal practice. We furthermore note limitations to the study that may indicate worthy areas for future research.

5.1 Domain-specific contribution

5.1.1 Theory of diffusion of innovation

Diffusing an externally developed social innovation and creating long lasting social value are complex, dynamic and challenging processes. To develop a deep insight to this process requires a clearer understanding of the roles and interactions, the so-called relational dynamics between

members within the social system. Applying a systems view of the diffusion process corresponds with the current literature looking at both innovation diffusion and value creation as a dynamic process (Vargo et al., 2020), where all actors are involved in close collaboration to solve a social problem. In the diffusion process, the social system has been identified as key to successful adoption (Rogers, 2003; 2005); however, prior literature has focused more on the innovation attributes, i.e., external and internal factors influencing the innovation decision process (Ray and Ray, 2011, Zeschky et al., 2011, Radjou et al., 2012, Dhont, Oiej and Schroder, 2018; Howalt, 2018), rather than the relational dynamics between all actors involved in value creation from an innovation, and particularly from an ESDI.

5.1.2 Diffusion of social innovation can be value creating

By taking a systems view of the diffusion of innovation we have provided support for contemporary perspectives of diffusion not as a linear or uni-directional process suggesting that diffusion is more than communication about the innovation. It is about the engagement of the multiple actors in the system that come together to engage in joint activities to add value while the social innovation is being diffused. Such activities include, in particular, creating purpose-led alignment, combining resources, deploying a digital platform, exploiting local knowledge and developing new services. Our findings highlighted how multiple actors of the social system engage in the co-creation of value as part of the diffusion process, therefore suggesting that the definition of diffusion can include co-creation simultaneously with communication (see Fig 3-1).

As part of our findings in Chapter 3 we proposed viewing value creation as an integral part of the diffusion process. Our findings support Mazzucato's (2018; 2021) and Mazzucato and Roy's (2019) views on value creation being an all sector, collaborative approach to generate lasting impact in society. Our findings highlighted how both the private and public sector come together with civil society towards a mission orientated commitment by aligning with the purpose of BHBM. All actors became actively involved in the creation of value from an EDSI to solve a social problem.

5.1.3 Re-conceptualising the social system

Looking at the social system as a key concept in diffusion afforded us the opportunity to reconceptualise a social system as no longer separate communities of diffusers and adopters

but one actor-actor system. In addition, this actor-actor view supports the recent literature on rethinking diffusion as being co-creative and recursive (Vargo et al., 2020). This approach moves the adopter from being at the end part of a diffusion process as beneficiaries to coming into the diffusion process as equal members and involved in all stages of value creation.

Placing the adopter community at the forefront of the value creation process provides a new dimension to user involvement in the innovation process (Von Hippel, 1986). This is borne out by our findings, which illuminate the active role of civil society in the value creation process. For example, in the case of Senegal, members of the Diabetic Patient Association had long been seeking a robust, durable solution for managing and controlling diabetes and other NCDs.

Accordingly, the diffusion process is transformed from a unidirectional/bidirectional process to a recursive co-creative process. Each actor plays an active role throughout the diffusion process and engages in continuous conversation around the creation of value. New and much-needed services thus emerge from the process of continuous learning and adapting in which all social system actors are viewed as equals, thereby supporting the innovation's embeddedness.

Our findings also highlight how actors across sectors have openly worked together to create value (Chesbrough, 2003) from an externally developed innovation before it generates benefit for any of these actors. Mobile companies together with large pharmaceutical companies guided by civil society worked in close alignment to create space while also increasing local technical capacity to introduce the innovation at a local level. We also witnessed how the private and public sector worked openly with civil society through the combination of resources and knowledge that was needed to uplift local innovative capacity and find ways to solve a social problem. In doing so, they were able to build foundations for future long-term collaborations around a purpose-led mission (Dahlander and Wallin, 2020).

We also highlighted the important role of civil society in the diffusion process through entities and individuals such as patient associations, youth volunteers and healthcare workers. Civil society's committed role in searching for an appropriate innovation encourages a flat governance structure which in turn transforms the way in which value is created through multi-actor engagement. In this model, value takes on a new and more democratic and equitable meaning, corresponding more closely to actual social needs. More generally, existing high-

order structures that differentiate between innovators and adopters (Rogers, 2003) could act as a restriction to long term diffusion.

5.1.4 Technically Enabled Social Innovation

Recent reviews refer to social innovation as a powerful means of addressing some of the world's most intractable social problems with new, creative and sustainable approaches to promote social inclusion, wellbeing and prosperity (Alvrod et al., 2004, Mair and Marti., 2006), with the intention to bring social and economic value (Phills et al., 2008; Mulgan et al., 2007, Lawrence et al., 2014; Dacin et al., 2010). Externally developed social innovations of greater or lesser complexity have long been proposed as solutions to developing economy challenges, though there is more to learn from the potential impact of social innovations if these are managed carefully.

Over the past decade, research has focused on the individual, venture or innovation (Lawrence Dover and Gallagher, 2013; Leadbeater 2008; Morino, 2009), or taken a broader view of the importance of systems change (Mulgan, 2017; Westley, 2008). By contrast, in this research we have contributed to a deeper understanding of the management of social innovations through examining the diffusion of one EDSI in three different geographical locations.

The insights derived from the case of BHBM suggest that a social innovation coupled with an enabling technology also supports successful diffusion into LMICs. Information technology (IT) is also a catalyst for complementary changes. It represents what economists call a “general purpose technology” (Lipsey, Carlaw, Bekhar; 2005) that sets off waves of corresponding innovations in areas such as business processes, new ways of reaching customers, new ways of connecting to suppliers, and internal company organisation. These complementary changes are often 10 times as large as the size of the initial investments in the IT itself and have profound and long-lasting effects on our ability to create goods and services (Birkinshaw et al., 2011).

Though BoP innovations continue to offer the prospect of credible solutions to social challenges, the bottom up approach may not always be the most effective approach. Most importantly, EDSIs have the advantage of being able to provide access to leading-edge technological thinking, generally not available in low to middle income context, leaving BoP innovations still suboptimal. In LMIC context , the poorest communities are still operating on a day to day survival , decisions are still short term and focus on satisfying basic needs. In this

context activities that are reliable, predictable and are aligned with community interest and purpose could offer new solutions.

To address resource constraints - one of the factors affecting the diffusion and preventing the scaling of complex social innovations in LMICs - (Oiej et al., 2019; Howalt, 2018), actors in the social system should engaged in activities to build local capabilities and skills to support the diffusion process. By uplifting technical knowledge and capabilities also optimize ways in which home-grown innovations could support and co-developed suing external resources. Building the digital platform to introduce BHBM locally not only increased the local technical capacity in all three cases but also supported new innovations and services emerging from the use of the innovation. The increased local technical capacity also influenced the timeframe in which those new services were introduced and diffused. In particular, we saw the immediate effect of increased technical capacity during the 2014 Ebola crisis in Senegal, where the platform served as a catalyst to disseminate information for crisis response within 24 hours, through the use of mobile phones.

To address the challenge associated with reaching financial sustainability, finding efficient and appropriate ways to embed an EDSI into local systems for eventual population-wide outreach is key. BHBM was developed and designed by the WHO in collaboration with the ITU as a pilot initiative with the overall aim of robustly tackling NCDs globally, by replacing previous short term objectives with a longer term, financially sustainable and contextually relevant vision. A social innovation coupled with an enabling digital technology could also create opportunities to maximise value from the use of the innovation (Vargo et al., 2020) by developing new services, leading to local embeddedness and continued use of the innovation. Moreover, to look at technology for use, rather than for sale, supports the current literature on health economics (Mazzucato and Roy 2019) which highlights the role of digital technology in disease prevention. Our findings of the launching of BHBM in three geographical locations illuminated the role of multiple actors in the creation of value and also highlighted certain activities along the diffusion process that led to the continuous use of a social innovation locally as shown by Mumford et al., (2002).

In the context of social innovation, value is seen when a social agenda has been delivered or a social problem has been improved or solved. The challenge inherent to social value creation (Caldwell et al., 2017) is that while in the private sector generating profits acts as a mechanism for sustaining the innovation, generating social impact is much harder due to the lack of

understanding of how social gains might bring financial stability to the diffusion process. Instead of privileging the known metric of profit which can be measured in the short term, we could consider a more diverse set of metrics around public health outcomes which can only be known over longer terms (Mazzucato and Roy, 2019).

Based on these findings, we advocate a radical change in assumptions around what constitutes value, consistent with Mazzucato's (2021) mission economy concept. This would entail a move away from a profit-oriented or financial set of metrics to metrics predicated on human welfare and societal well-being. The former, narrowly economic definition, is now challenged by prominent Keynesian-influenced theorists and will require further empirical evidence to support the theoretical developments of measuring social impact. Instead, our findings support the reconceptualisation of diffusion as a dynamic recursive process which places at the centre those most in need of the innovation itself.

5.2 Wider theoretical contribution

Having embedded our work specifically in EDSI diffusion into LMICs in order to improve understanding of the role of the social system, we seek to draw wider lessons for the diffusion of innovation.

5.2.1 Innovation management

Innovation management leads us into economic theories and strategy to understand how resources and knowledge are deployed and how value is created through the introduction of new ideas. However, the adoption of new ideas (innovations) is hampered by the barriers of uncertainty, resistance and lack of resources leading to the high failure rate of innovation diffusion. These barriers lead to a search for information - based on the belief of the potential adopter in the innovation - and a search for evaluative judgments from trusted and respected entities and individuals.

Among the solutions this thesis puts forward are the building of multi-directional information pathways and continuous feedback loops (Papa et al., 2018), as well as furthering our understanding of social system resource deployment, leading to new collaborative pathways (Dougherty, 2017). Reconceptualising diffusion not only as a process of communication but as co-creation of value changes how we view innovation diffusion within the broader category of innovation management and promotes the co-creation of value.

Moreover, reconceptualising diffusion as a dynamic, recursive and multi-actor process coincides with the views on Chesbrough et al., 2018 how multiple actors engage in cross-sectoral co-creation of value to develop new innovative solutions. The response to the recent pandemic has also highlighted the importance of the collaborative spirit and its potential to create societal value through bringing together multiple actors with complementary skills and unlocking new ways to build long term collaboration to solve social problems. Dahlander and Wallin (2020) foreground the ways in which the current Covid-19 crisis created opportunities for actors across all sectors to change the way they build foundations for future collaboration. Our research findings on purpose-led alignment and the combination of resources support this new line of research to advance the role of the social system in innovation management.

5.2.2 Social systems and ecosystems

The reconceptualisation of the social system into a single community comprising both adopters and diffusers where multiple actors continuously engage in pertinent activities supports the emerging literature on service-based ecosystems (Vargo et al., 2020; Vargo and Lusch 2011).

In Chapter 3 we conceptualised the social system as a structure rather than an affiliation (Adner, 2017), where the creation of value occupies a central position. Chapter 4 illuminated ways in which new valuable services continued to be added to the local system through deployment of a digital platform. Previous case studies on platform ecosystems locate power and ownership in the platform itself. While it is true that the platform acts as a catalyst to the formation of an ecosystem, in fact BHBM's power and ownership no longer lie with the platform *per se*, but with the services co-developed by the social system, shifting the central point of the value creation from the platform to the service itself (Vargo et al., 2020). The unique value of BHBM derives from the combination of a digital platform and a service model in which value is co-created by all social system actors. Our research findings reinforce and build on innovation's systemic nature, by considering the ecosystem as dynamically evolving (Adner, 2017; Ritala, 2013; Dougherty, 2017).

Findings such as purpose-led alignment, combination of resources, mobilizing communities and developing new services also highlight the prioritisation of collaboration over competition (Valkokari, 2015) as key to new service development (Granstrand and Holgersson, 2020) in LMICs. Activities such as searching for innovation, manoeuvring, combining resources, exploiting knowledge and replicating existing services are simultaneously carried out within the social system, which suggests that social systems' roles are evolving in their nature, consistent with scholarly work on the formation of ecosystems along the innovation process (Ritala, 2017; Granstrand and Holgersson, 2020).

5.3 Contribution to practice

The lead researcher disseminated interim findings through a cross-sectoral workshop organised by the WHO. Participants responded extremely positively to the findings presented, and indicated particular resonance with the following points: firstly, to encourage governments to consider the role of civil society in the diffusion process, and secondly to emphasise the vital

role of digital technologies in enabling new service development. Consequently, the lead researcher was invited to contribute detailed notes for the development of a BHBM handbook supporting future strategic partnership to diffuse an externally developed social innovation. The feedback received from experts and practitioners underscored the lessons learnt from BHBM's diffusion in Senegal, Sudan and India as described below.

5.3.1 Lessons learnt from the successful diffusion of BHBM

The overall vision for promoting greater health and well-being in a sustainable way, working across sectors to address the wider determinants of health, to promote preventative healthcare and to efficiently manage diseases such as NCDs is key.

To support this vision, India has adopted a traditional top-down approach to the diffusion process led by the government of India, in contrast to Senegal and Sudan, where patient groups took an active role in searching for the innovation and adopted a bottom-up approach to the diffusion process in each case. BHBM was introduced to all three countries as an opportunity both to advocate on NCD-related problems and to improve the overall healthcare system with a specific focus on prevention. BHBM, enabled by digital platform technology, led to the development of new services which then contributed to the continued use of BHBM in the local healthcare system.

Adopting a long term view and aligning with a purpose-led mission have contributed markedly to BHBM's successful adoption in all three examined countries. The social system actors' shift in perspective on value, away from the use and economic benefits of the innovation towards value created from all-actor knowledge exchange enabled a longer term strategic view on diffusing innovation locally. Notably, promoting collaborative longevity generated new services such as online healthcare consultations while also effecting improved management of health conditions around diabetes.

Bringing the technical platform to life has resulted in advanced technical capabilities, improved local infrastructure and opened a dialogue between the private-public and third sectors. Successful diffusion of BHBM has resulted in a population-wide outreach on NCDs in Senegal, Sudan and India, especially on diabetes control and management.

5.3.2 Recommendations for building a strategic partnership

On the basis of the research, early dissemination and conversations with practitioners recommendations are put forward here for policy makers and partners who might consider the promotion of complex social innovation projects to be diffused at the community level.

Multi-sector dialogue

When taking a digitally enabled, externally developed social innovation, we recommend bringing all stakeholders together from inception. Consideration must also be given to technical capacity provision in order to create absorptive capacity and better understand the EDSI's benefits to society and its longer term efficacy.

Alignment with social purpose

In order to design successful future strategic partnerships, members of BHBM should align themselves with a larger societal purpose, such as the improved wellbeing of society. In Senegal, alignment with a social purpose resulted in a flat partnership structure where all mobile providers joined forces, regardless of market competition, power position or previous market share, resulting in an increased level of trust across all sectors. Aligning partnerships with a purpose-led mission has also attracted long term investment from the private sector.

Empower civil society

Both in Senegal and Sudan, civil society, especially the patient groups and diabetes associations, demonstrated a creative approach to solving a social problem by actively searching for new innovations and bringing partners together through open dialogue. Members of civil society, including precisely such patient groups, own more power than previously had been considered and could hold the key to establish future strategic partnerships. Social innovation projects need to identify the most relevant members of civil society to get their engagement and find ways to empower them.

Service-based innovation ecosystem

Developing a long term view on partnership and placing a digital platform at the heart of BHBM have generated notable spillover benefits. Best practices from India, Senegal and Sudan highlight the digital platform's potential to enable an array of new services emerging and forming a serviced-based ecosystem, which could help to sustain BHBM on a country level. It

is therefore recommended that promoters of social innovation should keep in mind and perhaps search for likely spill over benefits, such as the creation of new services that can enable the innovation to sustain itself in the longer term.

5.3.3 Insights about the use of digital

The dissemination of the research findings resulted in an invitation for the lead researcher to participate in the UN75 panel discussion (<https://www.whatnext4un.org/health>) on the use of digital technologies to find solutions for social problems such as lack of primary healthcare services. During this discussion, insight was gained into how countries such as Senegal used the deployment of digital (1) for governance, (2) for conveying crucial information to citizens on the prevention and management of Covid-19 and (3) for telemedicine to help services to continue their offerings after the disruption. Even the poorest countries are using services through already existing online platforms, such as WhatsApp Consultation in Senegal and India, and adapting them to their own healthcare system. Both the panel conversation and the participant voices included in the present research findings strongly suggest a need for future investigation of digital technology to increase universal access to primary healthcare.

Likewise, there is a significant uptake in the use of digital, both to provide care and treatment to and from remote areas through telemedicine and to support public health measures such as digital contact tracing, health information and disease prevention. This rapid increase of digital presence in healthcare presents a certain level of concern around the ethical use of data, however, it also provides governments with the means to ensure more efficient and more responsible information access and processing. Though we have seen a global uptake in digital technology access and use, even in the poorest countries, digital is not a replacement for a healthcare system. Rather, it is a means to an end and highly productive means through which to utilise and optimise the efficiency of healthcare systems and provide access to primary healthcare.

Countries with less developed infrastructure should use digital to increase the efficiency of health promotion and prevention. Indeed, the recent pandemic has highlighted the importance of public health promotion and health prevention. Digital could contribute to a quicker and more cost effective entry point in many developing countries and could additionally empower

civil society to search for innovation that helps to increase accessibility to primary healthcare services. Digital, through healthcare prevention and promotion, has the potential to give a voice to civil society members, enabling them to take a leading role in forming strong cross-sectoral partnerships.

In most developing countries the emphasis is still on curative healthcare, therefore to optimise investment from the private and public sector we should invest more into preventative healthcare and promotion, thus receiving a higher return of overall investment in the long term. Externally developed technologies such as digital platforms could promote other important aspects of universal access to healthcare. Historically, investments in healthcare have focused on treating ill patients rather than rewarding the medical community with preventing illnesses. Measuring the impact of disease prevention and health promotion is challenging, hence our call to governments and the UN to refocus their effort on prevention and health promotion, and by doing so to understand the long term societal benefits of preventative healthcare. An international call has been made by the WHO to governments to ensure universal access to healthcare, to build a foundation for primary healthcare and ensure that services are accessible, affordable and high quality even in the most remote regions.

Global health challenges such as the fight against Covid-19 also underline the importance of social determinants and the pandemic's consequent pressure on healthcare services to be affordable and accessible for all. Universal Health Coverage (UHC) requires access to an ecosystem, and in many developing countries a healthcare ecosystem requiring new forms of partnership between the private and public sector is so far non-existent. The WHO defines UHC as a health care system in which all residents of a particular country or region are assured access to health care. Organised around providing either all residents or only those not able to pay for healthcare with either health services or the means to acquire them, its end goal is that of improving health outcomes. Importantly, while digital is not a stand-alone service, when combined with social innovation it has the potential to offer a complementary solution to the global need for solid primary healthcare.

5.3 Limitations

The limitations of this research lie with the purposeful selection of the case of BHBM in the empirical work. Previous cases of social innovation diffusion into low to middle income

countries are based on single in-depth cases designed individually to find solutions to a particular social problem. Therefore, each case has its own characteristics to add to their own success, which makes it hard to generalize findings that can be applied to different sectors and different countries. The principal limitation of our research design was to look exclusively at successful diffusion of a social innovation. For reasons of accessibility and resources, unsuccessful cases were not included. However, future research could further test our findings through the inclusion of unsuccessful cases.

The diffusion of one particular social innovation – Be He@lthy, Be Mobile - into three different geographical locations, though reducing the effects associated with the geographical factors, only focuses on successful diffusion. Therefore, we believe it would be fruitful to extend our work to other geographical locations where BHBM failed to be diffused and adopted. Looking at failed cases could enrich our understanding of the factors supporting large scale diffusion on a systems level, as well as increasing our grasp of particular obstacles to diffusion success.

Further limitations stem from the choice of research method. The reason for choosing a case study method was to derive insights from the richness of data collected from the empirical case and to have the opportunity to contribute to the field of social innovation through theory building (Yin, 2013). The challenges inherent to case study methods and theory building, however, are two-fold.

The first is linked to data collection and potential obstacles to conducting all requested interviews during the pandemic. BHBM was designed as a multi-actor project between the private, public and third sector. Given the stringent international travel restrictions, gaining access to all relevant BHBM actors was challenging, and eventually the total number of participant interviews included in this research was 27. Though the 27 interviews appear to be a small sample, this number is nevertheless sufficient to establish data saturation using a grounded theory approach (Creswell, 1998; Marshall et al., 2013; Boddy, 2016) while also constituting an adequate number from which to reconstruct a case study-informed theoretical concept (Marshall et al., 2013; Boddy, 2016). All 27 interviews represent 90% of the total population of social system actors actively involved in the diffusion of BHBM into Senegal, Sudan and India (Trotter, 2012; Boddy, 2016).

Despite the logistical impossibility of local visits due to pandemic restrictions, the lead researcher designed data collection through interviews using WhatsApp and mobile phone with

local actors. In this way insight was gained into the ways in which these local actors engaged to support the successful diffusion of BHBM in their own country. To minimise the risk of retrospective rationalisation (Eisenhardt, 1989) the lead researcher interviewed diverse actors actively engaging in BHBM, additionally triangulating multiple data sources along the data collection process. This included meetings at the WHO headquarters in Geneva where the BHBM team shared best practice and insights from each project and reflected on the challenges associated with diffusion into an LMIC context.

The second challenge is that the findings of a case study are less generalisable than those of quantitative studies. Viewing BHBM as one social innovation diffused into three geographical locations gave us the opportunity to see patterns of activities emerging within a social system. Using an abductive approach to data analysis helped us to iterate between key theoretical concepts in innovation and the emerging evidence from our data across all three cases. Through the abductive approach we were able to modify core theoretical concepts in innovation diffusion and to generate new concepts. Nevertheless, careful consideration is still required as to how we apply our findings to other types of innovations that do not hold characteristics specific to BHBM.

While the limitations are acknowledged, I am grateful for the team at WHO and the respondents for giving me their time and trust, especially during such a universally challenging time.

5.4 Future research direction

At least three fruitful directions now emerge for future research. This research has extended to Rogers's fourth pillar element of the diffusion of innovation theory. It also took a systems approach in the particular context of EDSIs introduced to LMICs. Conceivably, future researchers might examine the same phenomenon in other contexts, thus building on the systems approach to further explore and explain the social system that enhances innovation diffusion.

The very process of diffusion is reimagined here as inclusive of value creation through multi-actor participation, which lends itself to both open innovation studies on the emergence of co-created value approaches and the development of new services. This in turn aligns with Mazzucato (2021), who suggests that actors from the private, public and third sector should

form future collaborations aligned with a mission-orientated goal in order to create long term benefits for society. Applying a systems approach to understand the inter-relational dynamics of value creation would significantly contribute to the embeddedness of social innovations.

We took a probing look into the case of Be He@lthy, Be Mobile in Senegal, Sudan and India to gain an insight into the diffusion of an EDSI into LMICs. To do this we have highlighted activities undertaken by each social system actor along the diffusion process. This has resulted in the reconceptualisation of the diffusion process and the reconfiguring of the social system. By applying a systemic lens to innovation diffusion, we reconstructed the diffusion process, moving away from a unidirectional process to a recursive multi-directional process in which value creation takes a central part. In so doing we have provided valuable insight into how social value is co-created amongst a social system through innovation diffusion (Vargo et al., 2020). In order to deepen our understanding of how social value is created and, most importantly, shared amongst multiple actors, further empirical evidence is needed especially in the context of externally developed social innovations.

There is no magic formula for creating lasting social impact. The process requires further research, both to develop a framework on factors associated with social impact and to create tools to measure social impact, not only as an outcome but also as a strategy for developing valuable new services. Furthermore, civil society and its ability to search for innovation and manoeuvre have contributed greatly to the longevity of the diffusion process. Bringing civil society into the diffusion process from the start also increased the chance both for resources to be allocated for the right need and for the creation of long term strategies to embed the social innovation locally. Given the interconnectedness of civil society and the knowledge created through dynamic multi-actor interactions, the question arises as to how best to apply the new knowledge created to solving social problems in different contextual settings.

We have also highlighted the important role of a digital platform and how it contributes to the successful embeddedness of the EDSI as new services continue to be added to the BIBM platform. Other profitable areas of future empirical exploration would include: (1) how could a digital platform reduce the time in which an innovation becomes adopted and (2) how increasing technical capacity by putting in place a digital platform could migrate knowledge across systems and contribute to better management of future crisis situations.

5.4 References to chapter 5

- Adner, R., (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of management*, 43(1), pp.39-58
- Alvord, S. H., Brown L. D., & Letts C. W. (2004). Social entrepreneurship and societal transformation: An exploratory study. *Journal of Applied Behavioral Science* 40(3) 260–282.
- Birkinshaw, J., Bouquet, C. & Barsoux, J. (2011). The 5 myths of innovation. MIT Sloan management review, 4, 1-8.
- Caldwell, N.D., Roehrich, J.K., George, G., (2017) Social Value Creation and Relational Coordination in Public-Private Collaborations. *Journal of Management Studies* 54/6
- Chesborough, H. W. (2003). The Era of Open Innovation. MIT Sloan Management Review, 44, 35-41.
- Chesbrough, H. (2003). Open Innovation: The New Imperative for Creating and Profiting from Technology, Boston, MA, Harvard Business School Press.
- Dacin, P.A., Dacin, M.T. and Matear, M., (2010). Social entrepreneurship: Why we don't need a new theory and how we move forward from here. *Academy of management perspectives*, 24(3), pp.37-57.
- Dahlander, L. and Wallin, M., 2020. Why now is the time for “Open Innovation”. *Harvard Business Review*, pp.08-27.
- Dougherty, D., (2017). Taking advantage of emergence for complex innovation ecosystems. *Journal of Open Innovation: Technology, Market, and Complexity*, 3(3), p.14.
- Granstrand, O. and Holgersson, M., (2020). Innovation ecosystems: A conceptual review and a new definition. *Technovation*, 90, p.102098
- Hunt, S.D. and Madhavaram, S., (2019). Adaptive marketing capabilities, dynamic capabilities, and renewal competences: The “outside vs. inside” and “static vs. dynamic” controversies in strategy. *Industrial Marketing Management*.
- Lawrence, T.B., Dover, G. and Gallagher, B., (2014). Managing social innovation. *The Oxford handbook of innovation management*, pp.316-334.
- Lipsey, R., Carlaw, K.I., Bekhar C.T., (2005). Economic Transformations: General Purpose Technologies and Long-Term Economic Growth. Oxford University Press. pp. 131–218.
- Mair, J., I. Marti. (2006). Social entrepreneurship research: A source of explanation, prediction, and delight. *Journal of World Business*, 41(1) 36–44.
- Mazzucato, M. (2018). *The value of everything: making and taking in the global economy*. London: Allan Lane

- Mazzucato, M., and Roy, V. (2019) Rethinking value in health innovation: *from mystifications towards prescriptions*, *Journal of Economic Policy Reform*, 22(2) 101-119
- Mazzucato, M., 2021. *The Mission-Driven Economy*. MIT Press.
- Mulgan, G. (2017). Social innovation –the last and next decade. NESTA (9th February 2017)
- Mumford, M.D., (2002). Social innovation: ten cases from Benjamin Franklin. *Creativity research journal*, 14(2), pp.253-266.
- Papa, A., Mital, M., Pisano, P., & Del Giudice, M. (2018). E-health and wellbeing monitoring using smart healthcare devices: An empirical investigation. *Technological Forecasting and Social Change*, (September 2017).
- Phills, J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering social innovation. *Stanford Social Innovation Review*, 6, 34-43.
- Ritala, P. and Almpanopoulou, A., (2017). In defense of ‘eco’ in innovation ecosystem. *Technovation*, 60, pp.39-42
- Ritala, P., Agouridas, V., Assimakopoulos, D. and Gies, O., (2013). Value creation and capture mechanisms in innovation ecosystems: a comparative case study. *International Journal of Technology Management*, 63(3-4), pp.244-267
- Rogers, E. M. (2003). *Diffusion of Innovations* (5th edition). New York: Free Press.
- Rogers, E.M., Medina, U.E., Rivera, M.A. and Wiley, C.J., (2005). Complex adaptive systems and the diffusion of innovations. *The Innovation Journal: The Public Sector Innovation Journal*, 10(3), pp.1-26
- Teece, D.J., (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, 28(13), pp.1319-1350.
- Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, 47, pp.1367-1387
- Valkokari, K., (2015). Business, innovation, and knowledge ecosystems: How they differ and how to survive and thrive within them. *Technology Innovation Management Review*, 5(8)
- Vargo, S. L., & Lusch, R. F. (2017). Service-dominant logic 2025. *International Journal*
- Vargo, S.L., Akaka, M.A. and Wieland, H., 2020. Rethinking the process of diffusion in innovation: A service-ecosystems and institutional perspective. *Journal of Business Research*, Vol. 116, pp.526-534.
- Von Hippel, E. (1986). Lead users: a source of novel product concepts. *Management Science*, 32, 791-805.
- <https://www.whatnext4un.org/health> (January 2021), UNA Groups

- Yin, R.K., 2013. Validity and generalization in future case study evaluations. *Evaluation*, 19(3), pp.321-332.
- Zhang, J.Z. and Watson IV, G.F., 2020. Marketing ecosystem: An outside-in view for sustainable advantage. *Industrial Marketing Management*, 88, pp.287-304.

APPENDICES

Appendix A Empirical research methods

A.1 Interview protocol for Be He@lthy, Be Mobile Healthcare Intervention

This is a recorded interview taking place at (insert location) on (insert date) at (insert time) with (researcher name) and (interviewee's name).

Hello,

Thank you very much for your time and for agreeing to take part in this interview. The reason for this research is to better understand the role that the social system play in facilitating the uptake and use of digital technology innovations in low resource contexts. By 'social system' I mean the network of individuals, organisations (public and private) and businesses who work together in ways to support the adoption. I am particularly interested in how information moves through the social system and the communication pathways that become established to promote this. This is why we have asked you to take part in an interview. Your contribution is highly valued and treated with confidence.

The interview will last around 60 minutes and will involve me asking you a series of questions about your role, responsibilities with the project and your understanding for successful interventions. There are different institutions, organisations, groups in this project and I am going to call them collaborators throughout the interview. If you wish, we could send you a summary of the research findings at the end of the research project. Although we will not be asking any personal or sensitive questions, if you would rather not discuss something, please let me know.

Your participation in the research is entirely voluntary and you have the right to withdraw from the research at any point. The data that we record will then be transcribed and analysed and may be used in published materials. Your data would be fully anonymised.

For my purposes I may take notes to help me follow up on something you may say also.

(Check for understanding) For the purposes of the recording can you confirm that you are happy to participate in the research?

Do you wish for your data to remain anonymous at this point? Thank you.

Overall research questions

How do 'social system' collectively build new information pathways that lead to large scale diffusion of digital healthcare interventions?

How do both social system of adopters and diffusers communicate effectively and build trust?

Be He@lthy, Be Mobile Interview protocol

1. How do you define a digital healthcare intervention?
2. Could you tell me about Be He@lthy, Be Mobile and the different collaborators you are working with?

Probes:

- *What was the motivation for your organization to take part in this project?*
- *What issues or problems does this project want to address?*
- *What has been the attitude towards collaboration in general within your organization?*
- *What do you think the motivation of the other collaborators was?*
- *How was this collaboration set up and by who? Why was it set up this way? Has this changed*

over time? If so, what has happened?

2. How would you describe the relationship between you and your collaborators? What were the main challenges in building up the project?

Probes:

- *How do you find and/or choose your collaborators?*
- *Why did you want to work with them? Why did they want to work with you?*
- *How did you generally communicate with each other?*

3. What extent were you and your collaborators able to access and make use of the opinions and knowledge inputs of your target users?

Probes:

- *How? Any unique insights/contributions from this group?*
- *Who talked to whom? How did it happen?*

4. What kinds of difficulties have you faced in the communication process?

Probes:

- *What has been the most difficult case concerning the communication of the technology?*

5. Would you approach the challenge in the same way if you were to do it again? If so, where do you see them? How do you propose to address them?
6. What do you see as being the main challenges for digital interventions to become financially sustainable? How do you propose to address these?
7. What are your key learnings or reflection from building up this collaboration?

Probes:

- *Was it successful? If so, what has made it successful How would you define success?*

A.2 BHBM Consent form

Informed consent form

Title of the project:	Be Healthy, Be Mobile Social system relations in the diffusion of healthcare interventions in India and Senegal
Name of the researchers:	Orsolya Ihasz (Lead researcher), Dr Richard Adams, Dr Shailendra Vyakarnam
Researcher's contact details:	I.Orsolya@cranfield.ac.uk ; 07968652458; r.j.adams@cranfield.ac.uk ; shailendra.vyakarnam@cranfield.ac.uk
Participant number:	
Date:	

1. I confirm that I have been informed about this research project and I agree to take part.
2. I understand that all personal information I provide will be treated with confidence and my name will not be used in any report, publication or presentation.
3. I have been provided with a participant number as shown above. The researcher(s) will record data against my participant number instead of recording my name. The file linking my name to my participant number will be accessible only to the lead researcher, and will be securely destroyed after 1st January 2022.
4. I understand that I can withdraw from this project at any stage by informing a member of the research team, for whom contact details have been provided. I also understand that I can withdraw my data at any time up until 1st January 2021, however after this time these data will be anonymously aggregated with other informants' data.
5. I understand that the data I provide will be used by Cranfield University for the purpose of research. The data (and any backups) will be stored in securely encrypted areas, only accessible by authorised users in accordance with the UK Data Protection Act 2018.

Interviews will be recorded and securely stored on the Cranfield University network as audio files. These audio files will be securely deleted as soon as they are no longer required. The recordings will be transcribed and saved as text files. These files (and any backups) will also be securely deleted as soon as they are no longer required.

Anonymised transcripts will be created, by removing or replacing identifiers such as name, age, and location. These anonymised transcripts may be quoted from or published in full, in support of findings (e.g. in journal articles, conference papers).

Analytical software will be used to aggregate the results of the research and every reasonable step will be taken to anonymise the data.

- I am happy for extracts from my anonymised transcript to be published: Yes / No

- I understand that the aggregated data will be published in support of the research findings. ☐

- I understand that the discussions will be audio recorded and transcribed for analysis. The analysis will be only used for this research project and no other purpose. Any results in the report to the client will not be available to me for commercial reasons. ☐

- I will respect the confidentiality of the others taking part in the workshops by not discussing comments made outside of the room. ☐

Appendix B Systematic Literature Review

	Authors	Date	Context	Key Insights	Theoretical lens	Research design	Factors of diffusion
1	Papa et al.	2018	India	The role of external knowledge when sourcing an innovation helps to build trust in adopting various technologies. . There is a necessity of planning strategically when exploitation of EDSI in healthcare sector	Innovation , healthcare systems	Case study	Relations
2	Gries, T. et al.	2018	Africa	Global diffusion of technology and its gains are very diverse. Reasons for this diverse participation in gains include power structures in global value chains combined with an excess supply of labour and the malfunctioning of local governments and institutions in LDCs	Diffusion and adoption	Case study	Relations
3	Masuda et.al.	2018	WWF	Informal boundary spanners—individuals who cross internal organizational boundaries (for example, departmental or geographic) via their informal social networks, are strong change agents even though there may not be a strong association between being a boundary spanner and an early adopter.	Social network and organizational learning	Case study	Communication
4	Ramani et al.	2017	Bangladesh	Marginalized groups are ready to use technology and by using technology they can influence their future and increase their life and well-being.	Diffusion and adoption	Surveys	Capacity
5	Booyens et el.	2017	South-Africa	Although embedding local networks into diffusion has a strong role, , external knowledge is significant for successful diffusion of an innovation. Lack of government support is also observed.	Innovation systems, Diffusion	Multiple case study	Relations
6	Kaika	2017		Highlighting the role of urban communities in innovation diffusion	Diffusion and adoption, social innovation	Case study	Relations
7	Matthews	2017	West-Africa	Highlighting the role of creativity and intelligence of indigenous people in diffusion of a social innovation.,	Diffusion and adoption	Case study	Capacity
8	Godfried & Azerikatoa	2017	Ghana	Illustrating how the interactions and dynamics between actors of the social system shape the diffusion of an EDSI, in this case mobile money.	Diffusion , Actor-network	Case study	Relations/ Communication
10	Bidit et al.	2016	Bangladesh	Highlighting practice-based and bottom-up approach to marketing and the co-creation of value together with adopters community.	BoP	Case study /interviews	Communication
11	Ratcliff & Doshi	2016	Mexico, India and Bangladesh	Highlighting that social networks played an important role in diffusion and it also highlighted how adaptability of the network enabled larger scale adoption of the innovation	Diffusion and adoption BoP	Case study	Relations, Capacity
12	Hossain et al.	2016	India, Bangladesh and Nepal	Through the empirical cases the paper outlined four patterns of diffusion for frugal innovation and how it is different from traditional innovation	Diffusion , frugal innovation	Multiple case study	Aim
13	Derwisch et al.	2016	Sub-Saharan Africa	Rise (or fall) of expectations associated with social networking activities and the learning process associated with peers' interactions had a strong influence on diffusion and adoption	Diffusion and adoption	Survey	Capacity
14	Bhatia & Ritchie	2016	India	This paper looks at local communities and local knowledge in the diffusion and adoption process.	Diffusion and adoption, BoP	Case study	Capacity, Communication, Relations
15	Sriwannawita & Laestadiusb	2015	Bangladesh	Highlighting the role of social entrepreneurs in the diffusion process	Diffusion and adoption	Case study	Relations, Communication
16	Acheampong & Esposito	2014	Ghana	Highlighting the role of heterogeneity of BoP markets demanding localised adaptations and building on the strength of local networks and interpersonal communication within poor communities to support successful adoption	Diffusion and adoption, BoP	Case study	Capacity, Relations
17	Prahalad	2012	India	Highlighting the role of ecosystem development in diffusion of innovation for BoP	Diffusion and adoption, BoP	Review	Capacity
18	Tumbo et al.	2013	Tanzania	Highlighting social systems being a key factor driving the diffusion process	Diffusion and adoption	Survey	Communication/ Capacity
19	Foster & Heeks	2013		Highlighting adaptation and intensive learning within the social system being key for successful diffusion into BoP	Diffusion and adoption, BoP	Case study	Capacity