New Venture Opportunity for Implementing M-health in Myanmar

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I owe everything to my beloved parents who supported me to study at this reputable Leeds University Business School, requested necessary latest statistics from Ministry of Health and Ministry of Communications, Posts and Telegraph owing to the scant literature on m-health in Myanmar, and introduced me to policy makers.

Last but not least, this demanding social research would not have succeeded without my motivation by 70% of a population of more than 60 million with their pitiable health news.

Abstract

Background: Myanmar (formerly 'Burma') has suffered from decades of military regimes and lagged behind other Asian peers. It had the second lowest in both health system performance and mobile density globally. Nevertheless, recent restructuring in main industries by the new civilian government gives hope to its population of over 60 million, and myriad market opportunities to entrepreneurs. This study proposes m-health as a leapfrogging tool to overcome inaccessible healthcare facilities and provide the residents with interactive medical advice from an urban healthcare workforce.

Methodology: To collect qualitative data, 37 semi-structured interviews were conducted in the UK (a developed country) and Myanmar (a developing country) from service provider (experts) and customer (users) perspectives.

Results and analysis: Key findings involved critical success factors (five 'A's, trust, 24-hour service, effective advice, partnership, government support), barriers to success (lack of infrastructure, alternative sources, operators' requirements), and sustainability issues (confidentiality, EMR system). These were reapplied in the 'Opportunity Business Model' to realise the most feasible idea of m-health implementation in RMNCH via a healthcare call centre.

Conclusions*:* Noticing its limitations, a series of practical interventions were recommended for an enterprise to exploit the realised opportunity of m-health to be launched and developed successfully in Myanmar.

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1.0 Introduction

1.1 Focus and Motivation of the Research

Standing on the crossroads of Asia with rich endowments of natural resources (Chhor et al., 2013), Myanmar used to be one of Asia's most important economies in the 1960s (OECD, 2014). However, the junta's decades of foreign sanctions, economic stagnation and self-sufficiency hindered the development of national healthcare network (Dittmer, 2010). Consequently, the majority of Myanmar population in rural areas (approximately 70% of 60 million) have limited access to adequate healthcare services (Saw et al., 2013).

Nonetheless,

> *"…the labels 'pariah' or 'isolationist', which are conferred frequently on Myanmar, makes sense only in a specific context of time and space"*
>
> (Alamgir, 2010, p.233).

As a basis of the economic development initiated from political reforms into democracy during 2000 (IMF, 2013), the new government has recognised the importance of universal access to healthcare (Ministry-of-Health, 2013).

Here, Information and Communication Technologies (ICT) would act as a catalyst to stimulate Myanmar's developmental catch-up plans to leapfrog the intermediate stages of the conventional bricks-and-mortar route in other principal industries including healthcare. E-health is simply defined by WHO (2012) as using ICT for health. One of its most widely-

applicable categories in less-developed countries (LDCs), ‘m-health’, will improve healthcare services as a nationwide-accessible tool by overcoming geographical boundaries. Rural patients can consult urban medical professionals via a real-time information system (Martin and Vogt, 2013).

All these reasons motivated the author, who is also a doctor and interested in entrepreneurship in implementing m-health in Myanmar. Being a socially and academically gratifying topic, this research was undertaken. The paper explores the entrepreneurial opportunities for a new venture to fulfil the health needs of poor Myanmar inhabitants with the promise of m-health.

1.2 Research Questions, Aim and Objectives

Aim : To realise a new venture opportunity for implementing m-health in Myanmar

Objectives :

(a) To determine the size of the opportunity

(b) To identify Critical Success Factors (CSFs)

(c) To identify barriers to success

(d) To analyse its drivers and dimensions employing Opportunity Business Model

(e) To develop a series of forthcoming steps for exploiting the opportunity of interest

Research Questions :

Primary: How can a new venture in m-health be launched and developed successfully in Myanmar?

Secondary:

(a) What are the opportunities for successful m-health implementation in Myanmar?

(b) How can the most feasible opportunity be exploited?

(c) What are its CSFs, barriers to success and sustainability issues?

1.3 Structure of the Research

This dissertation attempts to address the above research questions, aim and objectives either directly or indirectly throughout the six succeeding chapters.

Chapter 2: reviews the overall literature in a funnel approach, starting from global m-health narrowing down to a Myanmar context.

Chapter 3: justifies the methodology adopted in this study.

Chapter 4: presents the relevant findings from data analysis. Embodying five global themes, it intermixes results and discussion for a smoother flow.

Chapter 5: further proposes a recommended business model, based on the above data analysis.

Chapter 6: concludes the study with limitations encountered during the research process and a set of potentially-applicable steps to be taken to exploit the opportunity.

2.0 Literature Review

2.1 Introduction

This chapter assesses existing articles and reports that concern the research questions. Recent journal articles were searched in academic databases within reach such as ProQuest, JSTOR, SagePub, etc. and Google Scholar using the keywords like 'm-health/e-health/telehealth'; 'Myanmar/Burma/Southeast Asia (SEA)'; AND/OR 'enterprise/new venture/entrepreneurship' etc. either alone or in various combinations. It extended further searches for WHO Library Cataloguing-in-Publication Data, conference proceedings, and reports from Non-Governmental Organisations (NGOs) and reputable consultancies.

To minimise the problem of scant published literature on Myanmar m-health, various formats of sources from e-health textbooks (by hand-searching) to unpublished data were thoroughly reviewed. Eventually, the author had to compare other m-health projects that can reflect applicability in a Myanmar context.

Beginning with major **health problems worldwide**, this chapter revealed **m-health potential** to tackle them. Then, **NHS Direct**, regarded as an ideal model for m-health implementation, is evaluated, followed by some examples of **m-health initiatives in Africa**.

All these comparable sections reinforce Section 2.5, which encompasses **recent reforms in Myanmar** that create entrepreneurial opportunities, including m-health which is driven by **current Myanmar health status** and **telecommunications growth**. Finally, the **business model** which guides the enterprise to exploit this opportunity is introduced.

2.2 Global Health Issues with the Emphasis on Less-developed Countries (LDCs)

Our earth with its high mortality rate (Figure-1) is entering a new era with three interrelated domains of healthcare challenges (Jamison et al., 2013): Reproductive, Maternal, Newborn and Child Health (RMNCH) in LDCs; double burden of communicable and noncommunicable diseases (NCDs) with associated risk factors; and financial needs to control these as rising GDP drives cost escalation in medical spending (Clements et al., 2012).

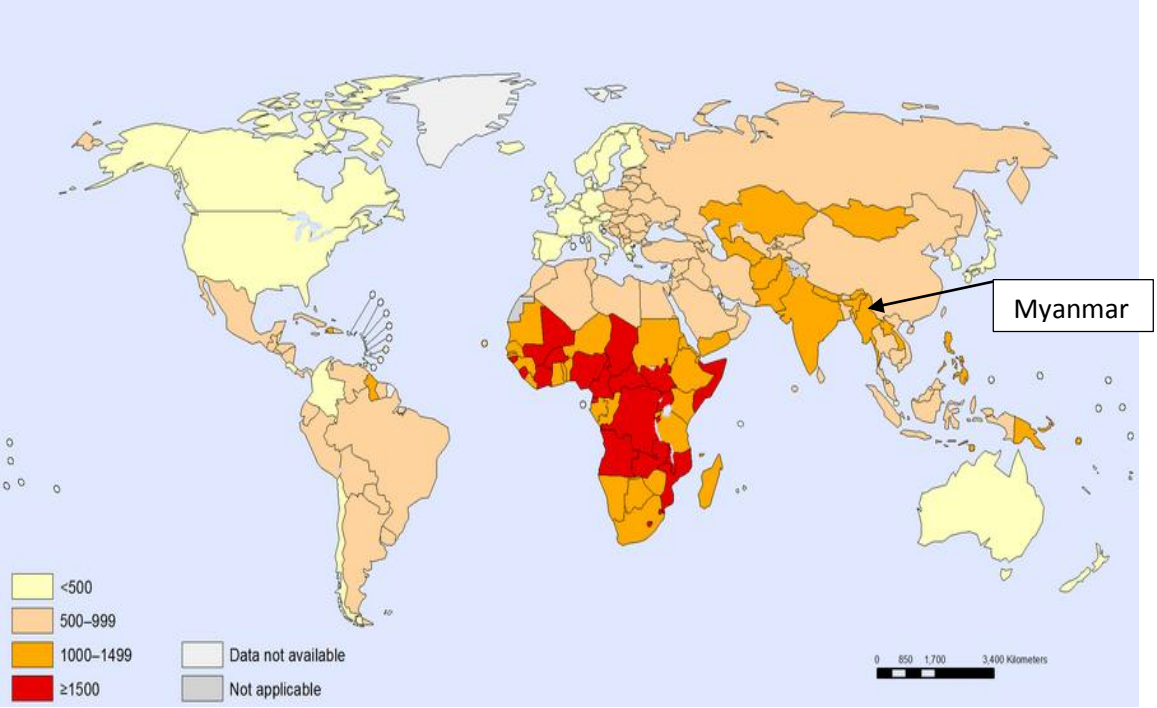


Figure-1. Age-standardised mortality rates (per 100,000 population), all causes, 2012

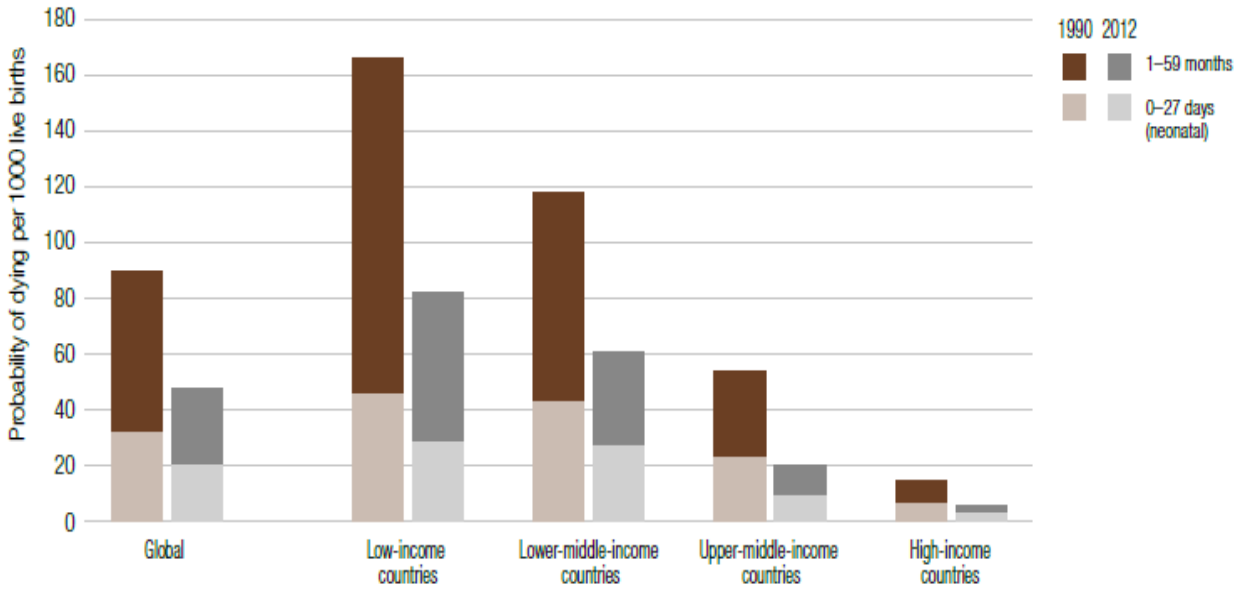
(Global-Health-Observatory, 2014)

Maternal Mortality Rate (MMR) remains unacceptable although it halved from 523,000 in 1990 to 289,000 in 2013. Gender-based inequities mean, women have limited reproductive health (RH) knowledge, and cannot negotiate safe sex. Adolescent females are particularly susceptible to Human Immunodeficiency Virus (HIV), and unplanned pregnancies. Complications of septic abortions kill almost 800 women daily, of which 99% is accounted for by LDCs including SEA where Myanmar is situated (WHO, 2009).

Region	Maternal mortality ratio (MMR)	Range of MMR uncertainty		Number of maternal deaths	Lifetime risk of maternal deaths: 1 in
		Lower estimate	Upper estimate		
AFR	500	370	720	171 000	40
AMR	68	52	92	11 000	680
SEAR	190	130	270	68 000	210
EUR	17	14	22	1 900	3300
EMR	170	120	260	26 000	180
WPR	45	32	66	12 000	1200
Global	**210**	**160**	**290**	**289 000**	**190**

Table-1. Estimated MMR (maternal deaths per 100,000 live births) by WHO region, 2013 (WHO, 2014, p.38)

Furthermore, neonatal deaths increased from 37% of the total under-five mortality rate in 1990 to 44% in 2012, of which around 45% was caused by undernourishment (Black et al., 2013).



Each bar indicates the total under-five mortality rate as the sum of the neonatal mortality rate (0–27 days; lighter-shaded bars) plus the combined mortality rate for infants aged 1–11 months and children aged 1-4 years (darker-shaded bars).

Figure-2. Neonatal and under-five mortality rates – globally and by country income group, 1990 and 2012 (WHO, 2014, p.14)

There remains a significant inequity between developed economies and low-and-middle-income nations. Global mal-distribution and shortages of healthcare workers and resources are exacerbated by epidemiological transition, demographic alterations and disability burden redistribution which warn universal health coverage (WHO, 2013).

2.3 Revolutionary E-health (Including M-health) Potential

CIAWCH (2014) recommends:

> *"By 2015, all countries have integrated the use of ICT in their national health information systems and health infrastructure."*

As a solution to global health issues, ICT has spawned exponential advancement in healthcare industry (Hardiker and Grant, 2011), along with 'e-health':

> *"…an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies"* (Eysenbach, 2001, p. e20).

This collective terminology is broad and universal, virtually encompassing beyond *the internet medicine* and *telehealth* (Khalil and Jones, 2007). Detmer (2001) categorises three fields of *health informatics*, which is sometimes interchangeably used with e-health:

(i) Consumer informatics : health information websites

(ii) Medical and clinical informatics : *Electronic Medical Records (EMR)*

(iii)Bio-informatics : Telemedicine

> *"Telehealth…covers education for health, public and community health, health systems development and epidemiology, whereas telemedicine is orientated more towards the clinical aspect"* (Darkins and Cary, 2000,p.2).

Being a component of e-health, m-health basically can embody all three fields. Istepanian et al. (2006) define m-health as mobile ICT for healthcare which signifies the evolution of

emerging *wireless* e-health systems via 3rd and 4th Generation (3G and 4G) mobile networks. Straightforwardly, it is the provision of healthcare services through mobile devices. M-health can capitalise on core utilities of *voice and short messaging service (SMS)* and complex functionalities like *Global Positioning System and Bluetooth* technologies (WHO-Global-Observatory-for-eHealth, 2011).

M-health has subsumed conventional desktop telehealth platforms because mobile subscriptions overtook prohibitively-expensive landlines worldwide in 2002 (Feldmann, 2003). Landlines necessitate wires to be installed in every street. Africa with its lengthy distances, poor transportation infrastructure and low population density leapfrogged unlike telecommunications development in Europe (Aker and Mbiti, 2010).

The potential **benefits** are significant, promising higher efficiency in time and energy, process improvement and cost-savings that diminish the requirement of physical healthcare resources. Superior performance, data rates, miniaturisation, availability and convergence of m-health systems are reshaping existing healthcare delivery methods (Istepanian et al., 2006). Health-related information and expertise become accessible virtually anywhere at any time (Gurak and Hudson, 2006) and sophisticated applications reach underserved rural populations (Meier et al., 2013). Supporting data collection will complement the strategies to decrease MMR (WHO, 2014). Jordanova and Lievens (2011) add that better healthcare quality, patient outcome, patient-healthcare provider partnerships and consumer engagement all contribute to meeting the stakeholders' needs. All these create a massive market in m-health industry (Figure-3).

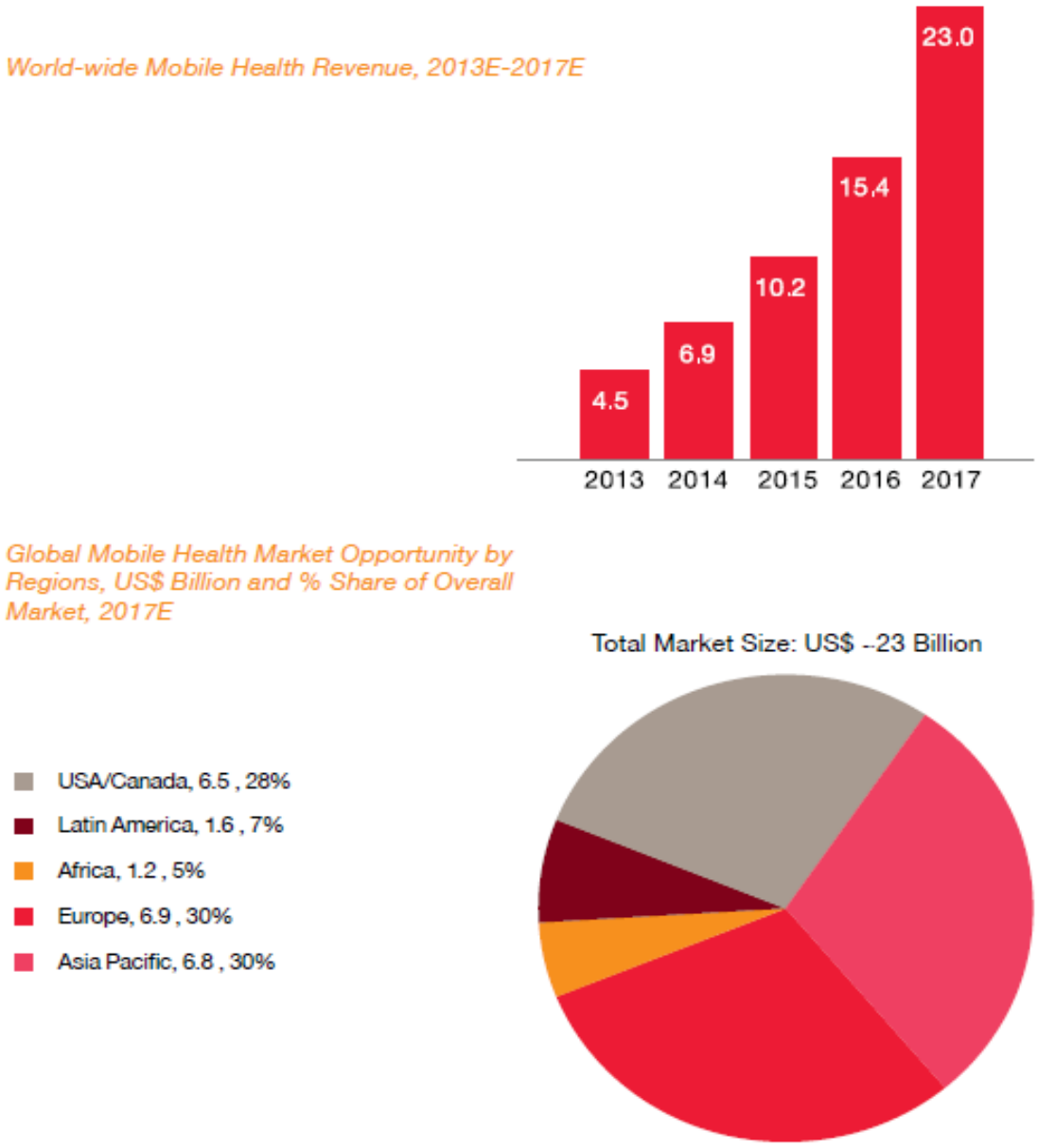


Figure-3. Potential of profitable m-health industry (Vishwanath et al., c2012, p.5)

2.4 NHS Direct in the UK: A Successful M-health System

Europe is the most active in m-health due to its implementation of health call centres. Above all, *NHS Direct* made the UK a world leader in m-health (WHO-Global-Observatory-for-eHealth, 2011).

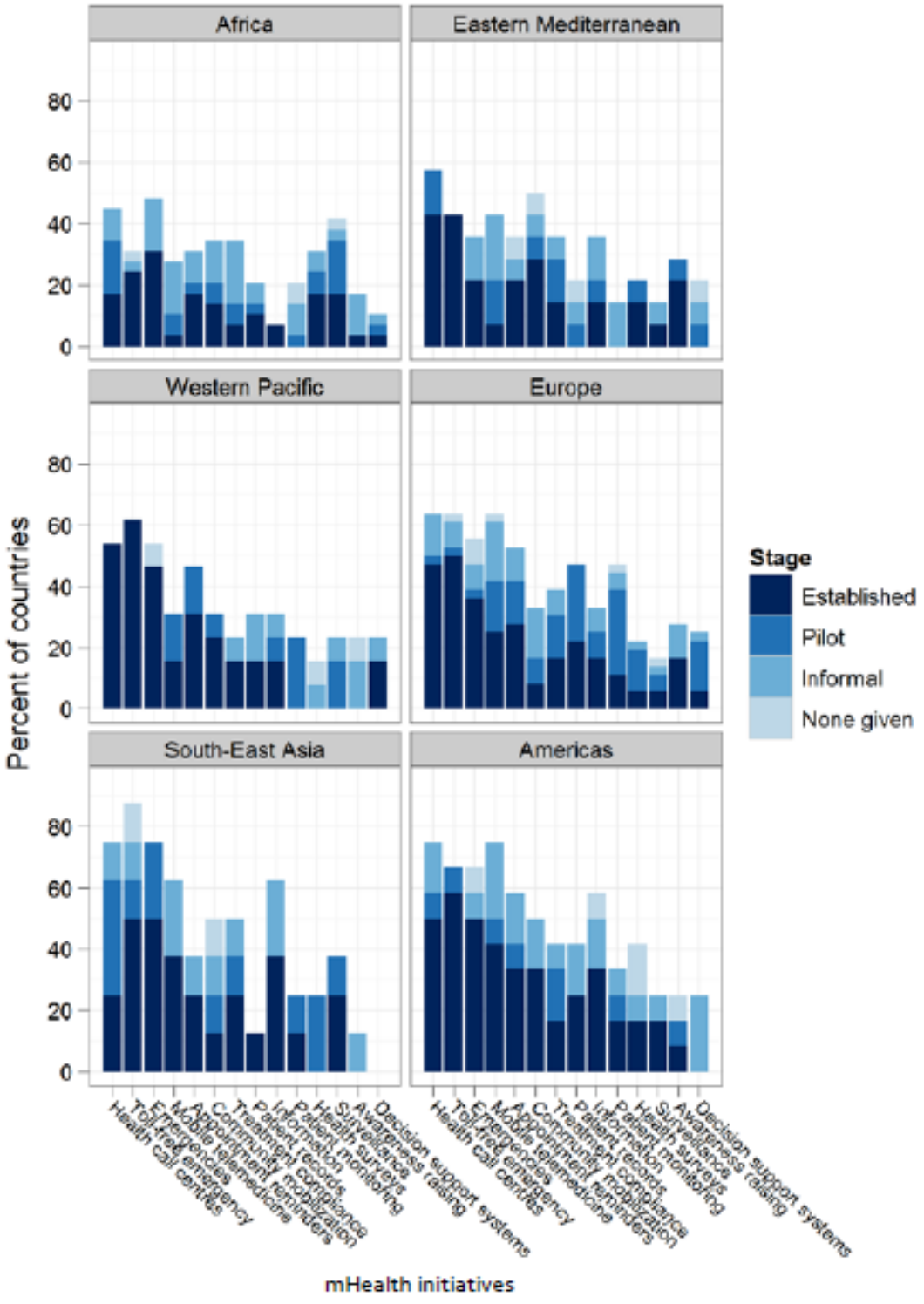


Figure-4. Adoption of m-health initiatives and their phases, by WHO region

(WHO-Global-Observatory-for-eHealth, 2011, p.15)

The UK government's *National Health Services (NHS)* established NHS Direct in England in 1998 to offer:

> *"…easier and faster advice and information for people about health, illness and the NHS so that they are better able to care for themselves and their families"* (Department of Health, 1997), similar to NHS 24 in Scotland.

This free 24-hour nurse-led helpline annually received around five million telephone calls asking for medical advice, of which 60% were solved without referral needs and below 0.01% complained. NHS Direct was effective in decreasing the workload of NHS and GPs (Lattimer et al., 1998). Between 2009 and 2010, NHS Direct prevented 2.4 million primary care appointments and 1.6 million emergency visits by ambulance. It cost 90 million annually (George, 2002), but saved approximately £213 million (Gaffney and Heymann, 2010).

O'Cathain et al. (2000) observed, although it has achieved the standard satisfactory level of other helplines primarily giving **reassurance**, only 63% of 1,050 callers found the advice helpful. Despite the criticism of inconsistent advice, commonsensically, different medical personnel would be expected to put forward varying solutions. Their answers will be even more non-standardised and unsafe without computerised protocols (Appendix-2) (Mayor, 2000). In helplines without EMR and decision support systems, external factors like bad mood may influence operators' advice.

Like commercial call centres, NHS Direct operators wore headsets, used computers and received calls. As stated by Herzberg (1966), this repetitive work causes boredom and

dissatisfaction. Taylor and Bain (1999) labelled call centres 'customer service sweatshops' that lead to high employee turnover. However, the majority were satisfied with their new role and only one-fifth complained of prolonged and stressful nature of work, and lack of training and employee motivation (Knowles et al., 2002).

Greater usage of NHS Direct was detected in higher socio-economic status (SES) and affluent groups (Knowles et al., 2006). At ***household level***, low SES determinants (eg, low income, manual work) and material deprivation were negatively associated with NHS Direct use. Bigger households with children call more frequently whereas the elderly and ethnic minority households noticeably underused the service. Under-five children, adolescents and the young were mostly concerned with casualty use of NHS Direct which was low in people aged 35-54 (Shah and Cook, 2008). Presumably, the elderly are those most needful of healthcare. Since the article did not propose any solution, its explanation was sought in Section-5.2.3.

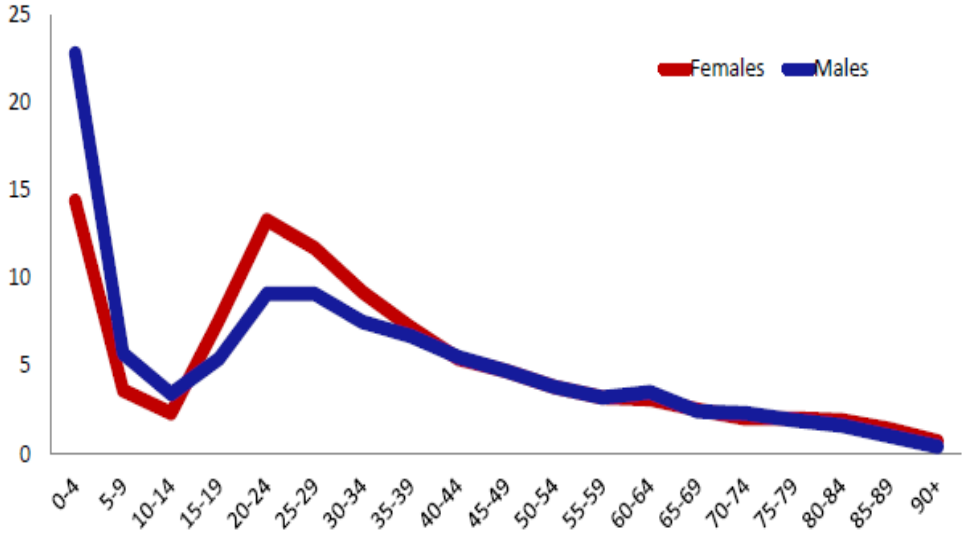


Figure-5. Percentage of patients (children via their parents/carers) by age and sex who used NHS Direct in July 2010 (Cook et al., 2010)

Finally, NHS Direct was decommissioned in March 2014 (NHS Direct, 2014), and replaced by NHS 111 because it seemed to disproportionately attend to the groups with lowest potential needs; it met those young and affluent people's demand for reassuring preventive care which would be self-managed otherwise (Shah and Cook, 2008).

Counter to incoming calls to helplines, doctors can also proactively transmit information to users. NHS Direct was contracted by *Pfizer Health Solutions* to launch innovative '**Birmingham OwnHealth'** (PHS, 2007). Nurse care managers, chosen for their interpersonal skills and medical expertise, telephoned patients in Birmingham, who suffered from NCDs like cardiovascular diseases and diabetes, to regularly monitor their long-standing signs and symptoms and provide motivational coaching. 1,108 non-high risk patients with an average age of 66 were consulted for approximately 15 minutes monthly, using *decision-supporting OwnHealth software*.

Its findings evidenced 96% customer satisfaction with user-friendly service quality within reach. There were improvements in their non-pharmacological (behavioural) therapy, regular medication and symptom relief. Moreover, this telecare indicated its cost-effectiveness and decreased utilisation of other facilities. Participants considered the operator as somebody supportive rather than paternalistic advisers. It was also beneficial for care managers' careers and personal lives. Staff training was regarded as a CSF for Birmingham OwnHealth.

Other applications and uptake of m-health are further examined in the context of LDCs. Despite telephone triage in advanced countries, low-cost SMS projects mostly were found in Africa.

2.5 M-health in Developing Countries: Leapfrogging in Africa

Founder of Grameen Bank comments: "The quickest way to get rid of poverty right now is to have one mobile telephone" (Ganapathy and Ravindra, 2008, p.1). 'Digital divide' along SES is less-pronounced in mobiles than in other ICT (Forestier et al., 2002). Affordable mobiles become ideal communication tools for developing-world populations, who constitute 64% of global mobile phone users, compared to scarce computers and hospital beds (Figure-6).

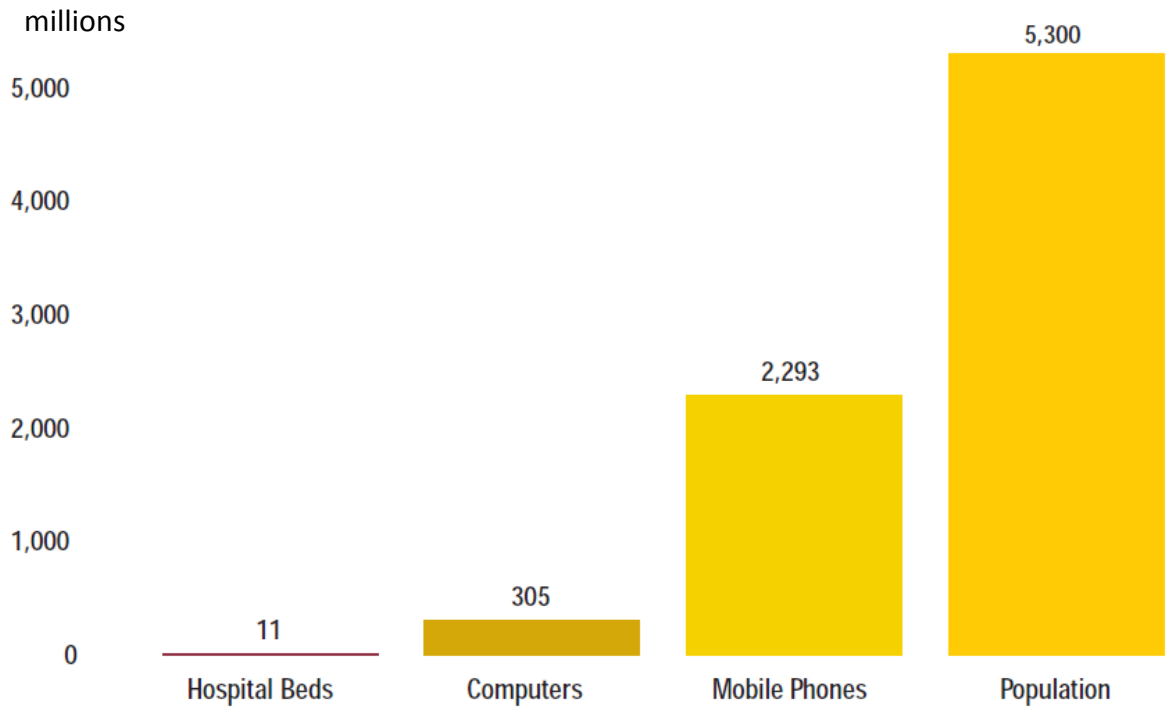


Figure-6. Leapfrogging in mobile phones over other resources by developing countries

(Vital-Wave-Consulting, 2009, p.7)

This trend pinpoints mobiles' massively-scalable potential to deliver basic healthcare services in resource-constrained settings (Vital-Wave-Consulting, 2009). Appendix-3 explains six kinds of m-health applications to solve health problems in LDCs. Some examples are discussed below, indirectly reflecting benefits, CSFs and barriers of m-health implementation in LDCs.

Zanzibar implemented '**Wired Mothers**' involving the linkage of pregnant women and healthcare via mobiles throughout their gestation period. This intervention sent automated unidirectional SMSs with neutral phrasing and local language (See User Interface features in Appendix-9B) regarding pregnancy education and appointment reminders, and gave mobile phone vouchers for interactive consultation to wired mothers. A study on 2,550 such women reported, increased antenatal care quality and awareness, reaching even non-mobile owners. With perfect antenatal care attendance, more complications were diagnosed and referred for preventive measures (Lund et al., 2014).

Furthermore, a highly-scalable '**Health Management Information System**' on Neglected Tropical Diseases (NTD) was piloted in NTD-endemic four villages in Tanzania. Each Village Health Worker (VHW) collected household data through web-based smart phones instead of registration in physical files. VHWs gained efficiency in recording and reporting the data with reduced workload. Direct communication with supervisors expedited planning processes and supported VHWs (eg, notification of low pharmaceutical stock level and arrival time of new supplies). This, however, created a digital divide between VHWs who

could and could not assimilate m-health into routine work, regardless of their previous good reputation (Madon et al., 2014).

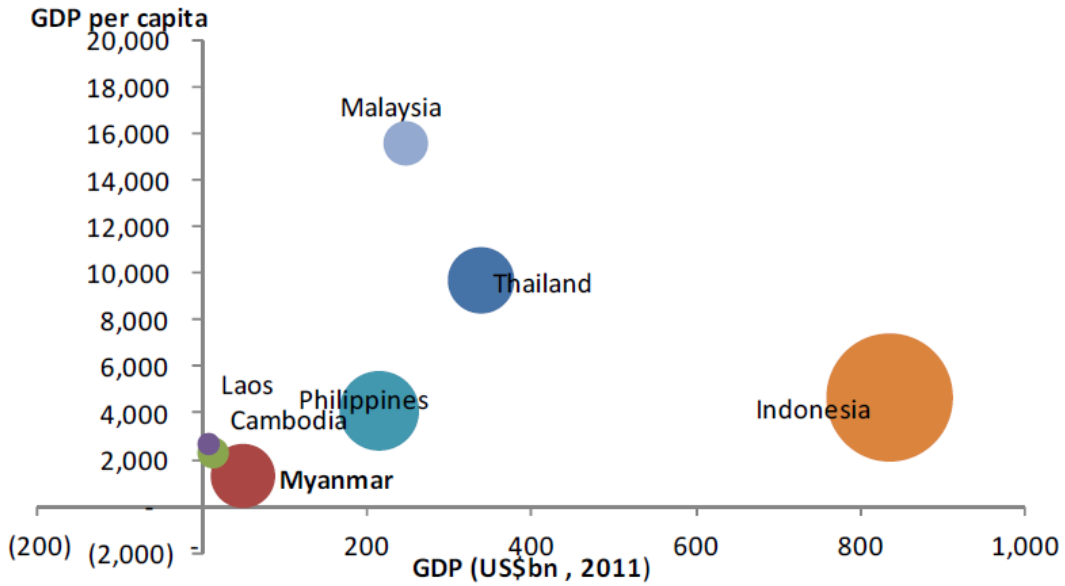
In Uganda, the incidence of new HIV/AIDS cases climbed from 105,000 in 2007 to 129,000 in 2010 despite the '**Text to Change**' project, implemented to promote *HIV knowledge, counseling and testing (HCT)*. Ten thousand active subscribers received such SMS quiz, rewarding correct respondents with incentives including free HCT service. However, only one-fifth of SMS recipients answered the quiz. The barriers here involved sociocultural, informational, economic and individual vulnerabilities which this project ignored (Chib et al., 2013). The recipients might worry about breach of their confidentiality, and witnessing positive test results. Most mobile owners were literate men with a high income. The opposite group, the most vulnerable to infection, was actually omitted. One needed to be familiar with the quiz format, and read and reply to the SMS in English. A knowledge gap was reinforced in which only the high SES group could participate and know correct answers. Partnership with a single mobile service provider neglected others' customers. The summary of these barriers discovered in a WHO global survey is demonstrated in Appendix-4.

Myanmar also follows a similar trend and characteristics of m-health in other LDCs. This is appraised scrupulously in the next section.

2.6 M-health in Myanmar

2.6.1 Country Changes: 'Opening up' or Opportunities for Entrepreneurship

The Republic of the Union of Myanmar (formerly 'Burma') has suffered from 50 years of military government system and lagged behind its SEA neighbours. IMF (2014) estimated its GDP per capita as US$ 1,300.



*bubble size represents total population

Figure-7. Size of the economy (GDP US$bn, 2011) versus GDP per capita (Nomura-Equity-Research, 2012, p.5)

Along with unstable inflation and a rigid interest rate scheme, Myanmar's *Human Development Index* was ranked 150th (UNDP, 2014).

Fortunately, with the combined size of England and France, Myanmar is strategically located between two emerging giants, China and India, and the westernmost in SEA. This most dynamic economic region has a market size of almost three billion people (Central-Intelligence-Agency, 2014), making Myanmar a potential regional trading hub (Chhor et al., 2013). Myanmar population itself totals over 60 million, of which 70% resides in rural areas (UNFPA, 2010). The demography of Myanmar's 14 regions and states are demonstrated in Appendix-9C. 62% of Myanmar citizens are at working-age or **fertile (RH) age group** (15-59 years) (Table-2).

Population Structure	Estimate (in million)	%
0-14 years	17.62	29.19
15-59 years	37.45	62.01
>= 60 years	5.31	8.80
Female	30.53	50.56
Male	29.85	49.44
Sex Ratio (Male/100 Female)	97.77	
Total	60.38	100

Table-2. Population estimates (2011-2012) (Population Department, 2013)

The new parliamentary government, that won 'General Election 2010', has just transformed a centralised economy into a market-oriented one to **privatise** numerous developmental activities (Ministry-of-Health, 2013). The U.S. and the European Union have suspended sanctions in several sectors. Liberalisation of *Foreign Direct Investment* improves the inefficient and opaque business climate (Duflos et al., 2013).

The projection of Myanmar economy is 6.8% in 2013-14 and its positive outlook will continue in medium-term (World-Bank, 2013). At annual GDP growth rate of 8%, Myanmar is expected to quadruple its economy size reaching US$ 5,100 by 2030 and saving 18 million population from poverty (Chhor et al., 2013). Average movement in *consumer price index* was 5.8% in 2013 (IMF, 2014). Entrepreneurs anticipate tripled consumer spending from US$ 35 billion today to US$ 100 billion in 2030 (Chhor et al., 2013).

2.6.2 Current Healthcare Situation: Necessitates M-health

Myanmar's overall health system performance (overall efficiency) was the second lowest amongst 191 WHO Member States (WHO, 2000). This resulted in substandard care in RMNCH, whose detailed facts are displayed in Appendix-9D.

Healthcare services in Myanmar are provided by both public and private systems, striving to strengthen **public-private partnership**. *Ministry of Health (MOH)* embodies eight Departments (Figure-8). In the *Township Health System*, a Township Medical Officer is accountable for 100,000–200,000 population, and they administer 1,481 Rural Health Centres (Tin et al., 2010). There, 20,617 midwives, 3,397 Lady Health Visitors, and 18,489 Community Health Workers (CHWs) provide limited primary healthcare services (Oo H., 2014). Serious cases are referred to Station, Township, District and Specialist Hospitals as necessary.

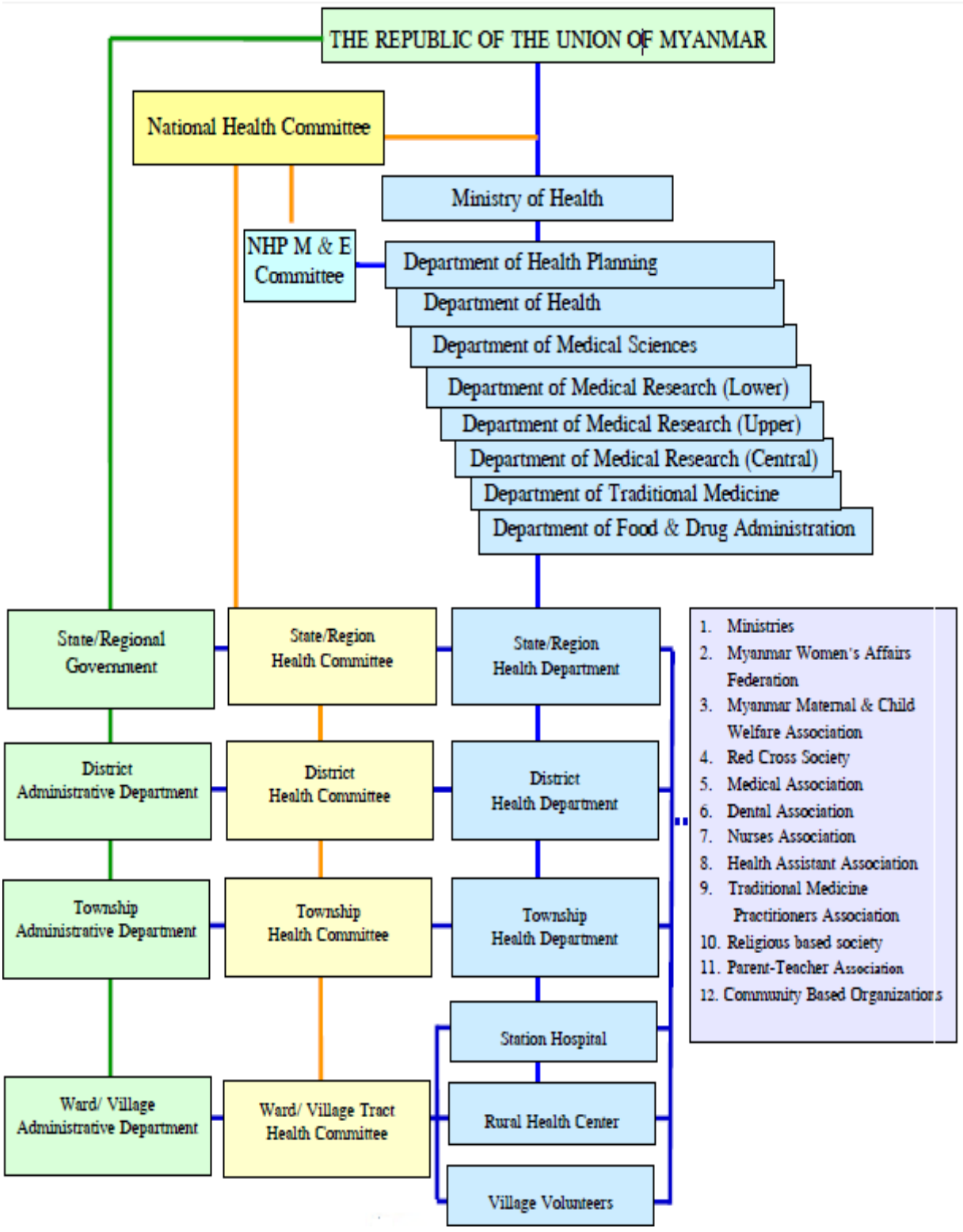


Figure-8. Organisation of health service delivery (Ministry-Of-Health, 2013, p.8)

Coordination techniques along this chain of command need to be harmonised with village volunteers kept on standby who team up with CHWs without payment, covering the most peripheral level countrywide (Tin, 2008), as cited in Tin et al. (2010, p.98). Most midwives are demotivated by being overburdened with work with traditional data collection procedures affecting fundamental RMNCH duties, and insufficient support of supervision and operational costs.

Fourteen national NGOs and thirty-seven international NGOs (Oo H., 2014) also collaboratively take some share in healthcare provision eg, *Myanmar Maternal and Child Welfare Association (MMCWA)*. Three hospitals under the Ministry of Labour render free medical services to insured workers under the **Social Security Board** (Ministry-of-Health, 2013).

In the absence of a nationwide health insurance scheme, Myanmar public hospitals have been practising a **'Community Cost Sharing'** system since 1993. The quasi-civilian government pays doctors' fees for patients who cover the cost of medicine and investigations. Rich patients are asked to subsidise lower-income ones, by purchasing additional medical supplies (Shobert, 2014). It is viewed as financially unsustainable system nonetheless (IRIN, 2011).

Regarding for-profit entities, licensed General Practitioners (GPs) offer ambulatory care facilities haphazardly (on an out-patient basis) in their own small clinics. Big cities such as Yangon, Naypyitaw and Mandalay have some polyclinics and hospitals. In accordance with

Private Health Care Services regulations, they also charge their patients higher prices than public healthcare. Most GPs charge fixed prices to all patients regardless of patients' income. In Accident and Emergency (A&E) at hospitals, one receives treatment first and can pay later.

The thirty-year lasting *Myanmar Health Vision 2030* was planned to develop a national healthcare system (Ministry-of-Health, 2013), furthered by political changes. **Greater budget has been allocated to health** (World-Bank, 2013). The figures are relatively larger in annual rate of increase than other sectors, despite remaining among the lowest in SEA (Fife, 2014).

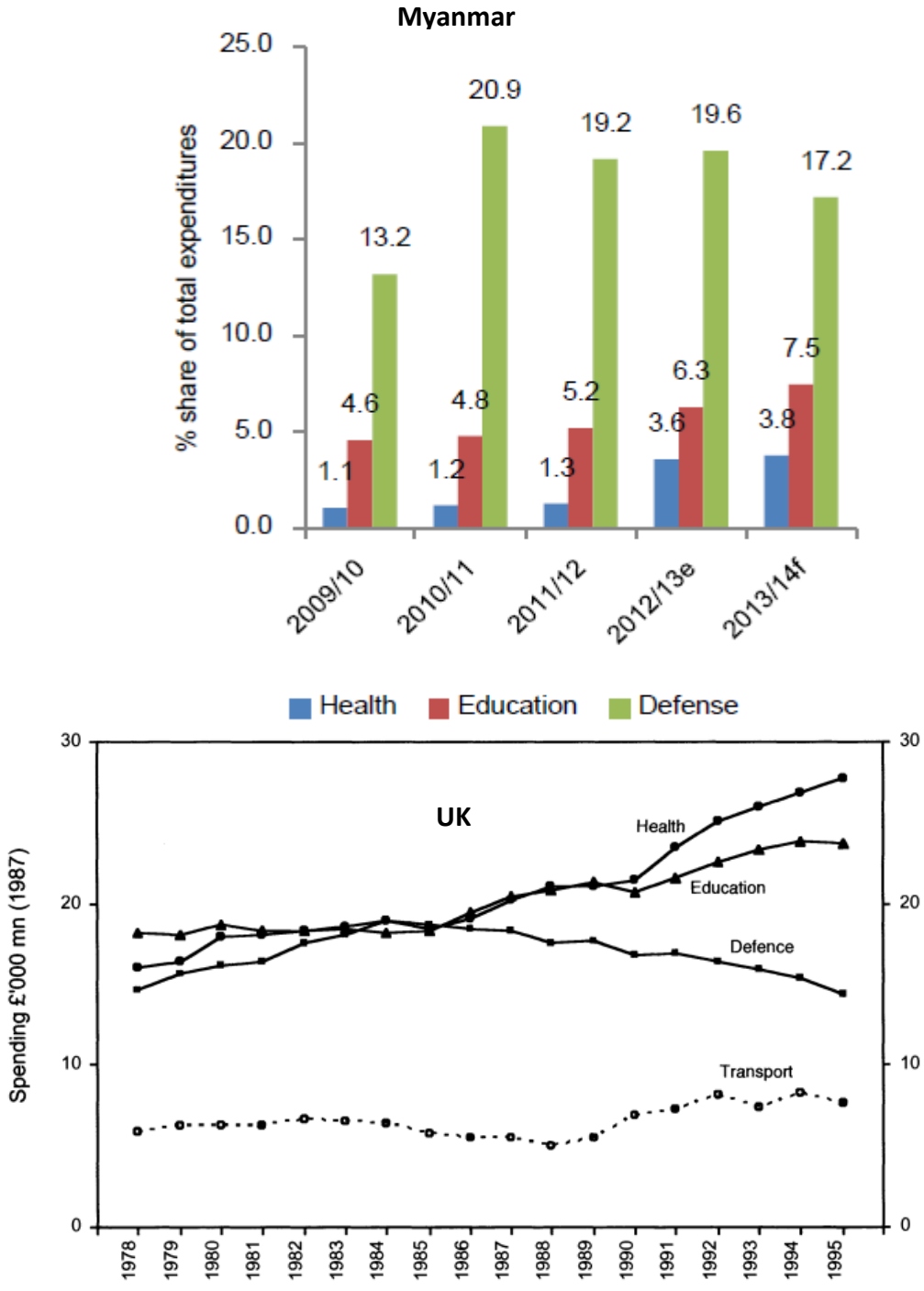


Figure-9. Comparison of Myanmar expenditures in health, education, and defense (World-Bank, 2013, p.6) with those in the United Kingdom (Soroka and Wlezien, 2005, p.672)

National Health Plan 2011-2016 contains the role of telecommunications in healthcare restructuring. *Department of Health Planning* has recently instituted an *E-health data centre* to deliver a complete EMR system using data center storage (Leik, 2013). Any further information about this has not yet been publicised.

2.6.3 Telecommunications Boom

Myanmar placed second lowest in the mobile SIMs/100 ranking above St. Helena where mobile service is absent. However, total mobile connections rocketed from 367,388 in 2008 to 5.44 million in 2012 with 337% growth rate between 2011 and 2012 (Fife, 2014).

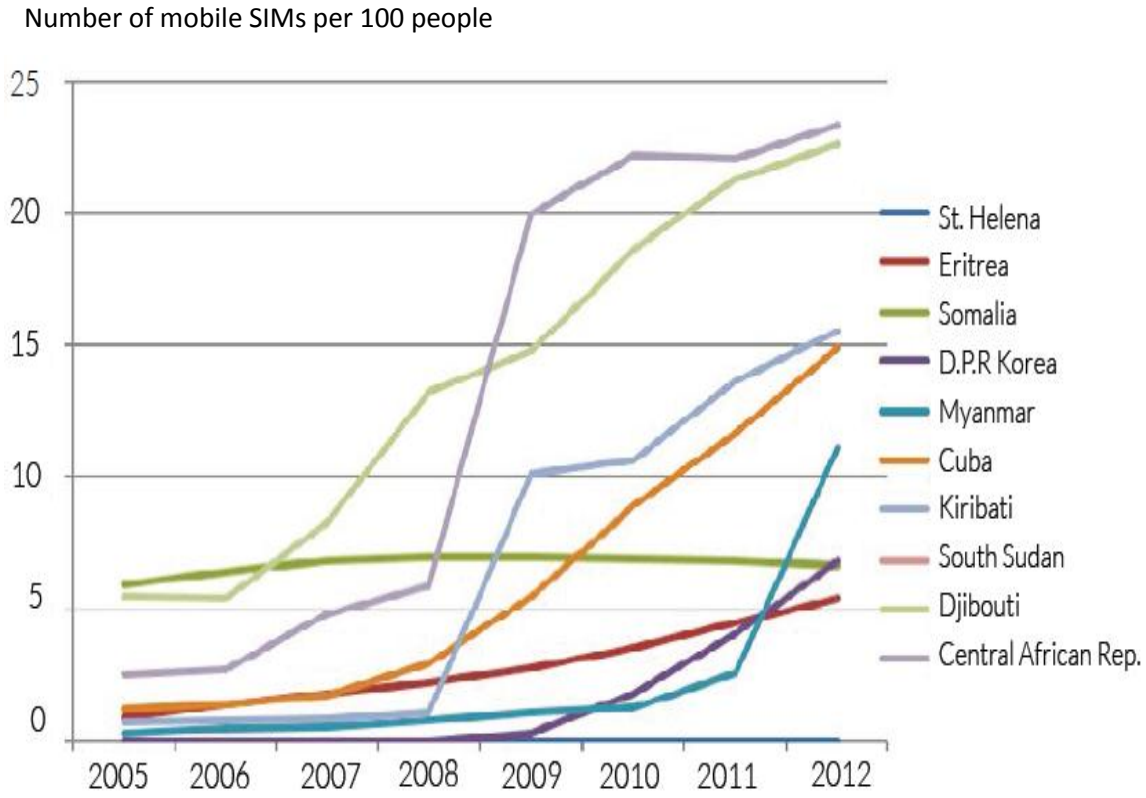


Figure-10. Number of mobile SIMs per 100 people

among countries with lowest penetration (Fife, 2014, p.7)

The state-owned *Myanmar Post and Telecommunications (MPT)* used to monopolise telecommunications service provision (World-Bank, 2013). Nowadays, a liberalised robust ICT ecosystem has been recognised as a foundational pillar for economic and social development. The World Bank proved the positive relationship between economic growth and ICT by studying 120 LDCs, where every 10% increase in tele-density raises GDP by 1.38% (Qiang and Rossotto, 2009). Myanmar, therefore, aims:

> *"…to increase the overall tele-density of the country to 75% to 80% by 2015-2016, to make the telecommunications services available to the public at affordable prices in both urban and rural areas"* (TOTESC, 2013, p.1).

The cost of a SIM (Subscriber Identity Module) card, that was initially around £2,764, has recently fallen to 93p (Thomson, 2013). Although overpriced handsets led to slow uptake, the market nowadays has seen low-end handsets like *Huawei* at reasonable prices (around £30) while average weekly wage (five days of employment) is approximately £9.35 (World-Food-Programme, 2010).

MCPT transparently issued two private telecom operator licenses in 2013. Norway's *Telenor* and Qatari *Ooredoo* were the winners of 15-year mobile licenses in a highly-competitive tender, and became current private mobile service providers (Fife, 2014). Both state-owned carriers have operational experience in developing wireless markets including SEA (Wong and Mahtani, 2013).

The competition of the incumbent MPT and foreign players accelerated mobile growth. Mobile penetration rate in May 2014 was 13.94% with 8.5 million subscriptions; 11.56% accounted for urban mobile users while only 2.37% represented rural ones (Oo H., 2014). Over commercial 2G and 3G network, Telenor will ensure voice quality and high-speed data connectivity (Telenor, 2014). Beyond these, Ooredoo committed to roll out mobile money and mobile broadband nationwide (Ooredoo, 2014). Their commitments are compared in Appendix-9E.

New international players must confront incompatible systems and different organisational culture from local companies (Deloitte, 2012). A boycott against Muslim-owned Ooredoo was urged by monks owing to recent religious conflicts between Buddhists and Muslims (Htwe, 2014). A broad geographical area with under-developed transport infrastructure, unstable electrical power and scant skilful engineers make their targets challenging (Deloitte, 2012).

2.7 Opportunity Business Model (OBM): Introduction

Overall, Myanmar has promised boundless market opportunities, attracting unprecedented interest from entrepreneurs and investors worldwide (Chhor et al., 2013). Myanmar is encountering significant reforms in the digital age when affordable mobile phones are increasingly available. Ubiquitous mobiles offer rural populations remote access to urban healthcare workforces cost-effectively.

In this study, a new venture in m-health is proposed as an entrepreneurial opportunity that can be explored by OBM. It is composed of four drivers and five key dimensions which pinpoint the opportunity (Figure-11).

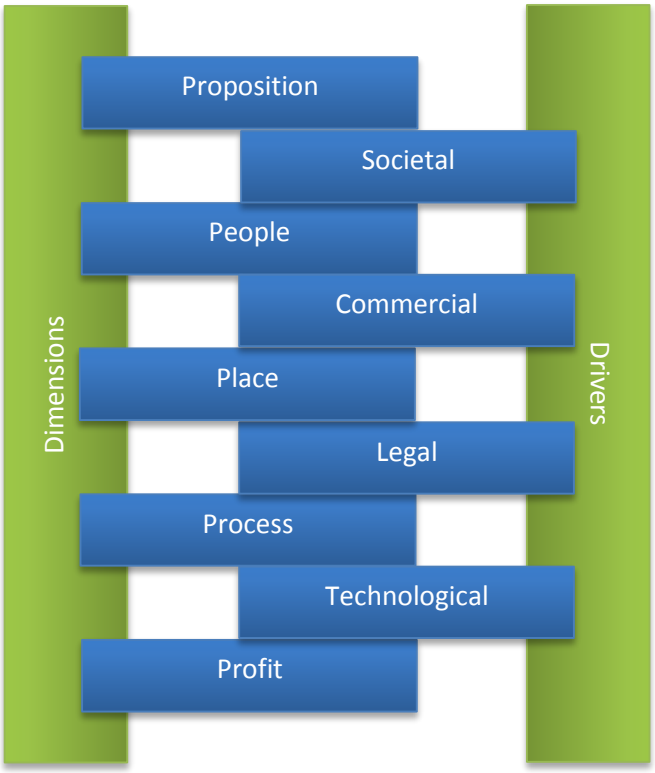


Figure-11. The Opportunity Business Model (Blundel and Lockett, 2011, p.40)

All the **drivers** are beyond individual control. Dynamic external environment must be proactively adapted to realise the opportunity. Here, the proposed idea of m-health implementation in Myanmar has emerged from the influences of technological, societal and commercial drivers (Section-5.1).

Dimensions, 5 'P's, express building blocks of the idea to support structure discussion. *Proposition* is its core value as perceived by customers. *People* literally covers all the stakeholders, including the leader and his/her social advisory network. In *place*, market analysis enables customer segmentation while industry analysis reveals gaps (Figure-12).

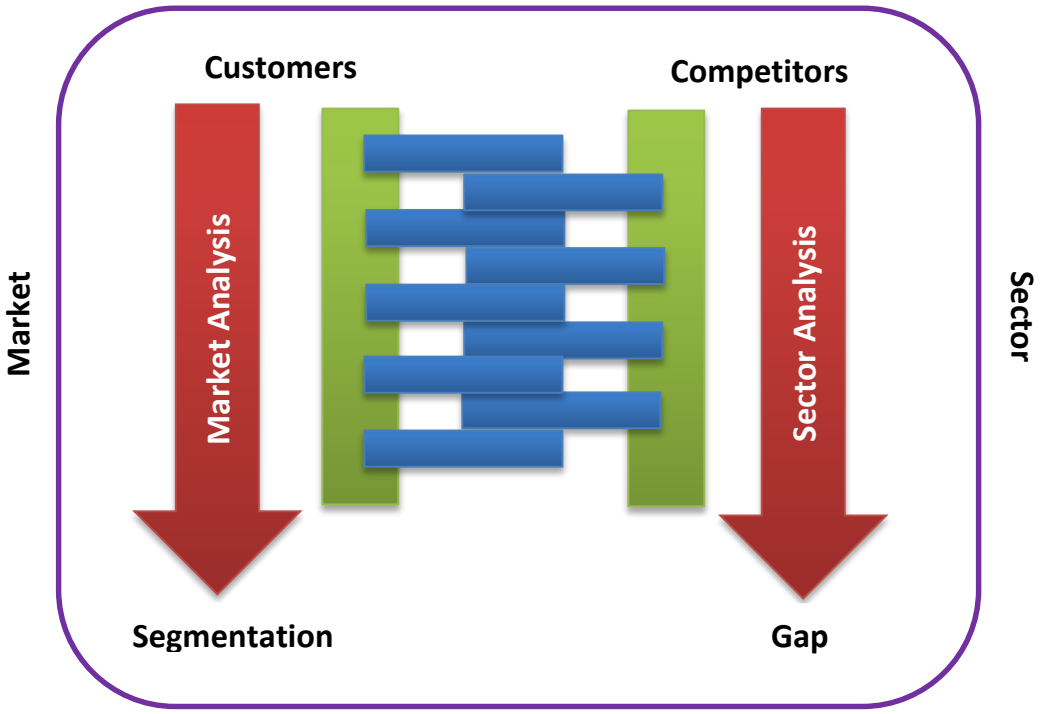


Figure-12. The entrepreneurial opportunity context (Blundel and Lockett, 2011, p.46)

Process demonstrates how the venture operates including chief procedures, relationships and ICT role. *Profit* can be financial returns calculated by cash flow forecasts and/or social returns.

Blundel and Lockett (2011, p.40) explain OBM as:

> *"…an effective way of accelerating your entrepreneurial learning and of developing opportunities into viable entrepreneurial ventures*."

Entrepreneurial learning constitutes idea generation, opportunity recognition, and exploitation in enterprises. Continuous learning in this cycle (Figure-13) makes entrepreneurs understand their ventures more. Starting with entrepreneurial characteristics of the individual, for example, the founder of the LNT Group *Lawrence Tomlinson* (Oo S., 2014), his idea of *Ideal Care Homes* was analysed by appropriate business models. In this study, OBM was chosen among several business models because of its comprehensiveness. Then, that opportunity is recognised or **realised** (Rae, 2007) and consequently **exploited** by setting up a venture. This activity again enhances the individual's entrepreneurial ability.

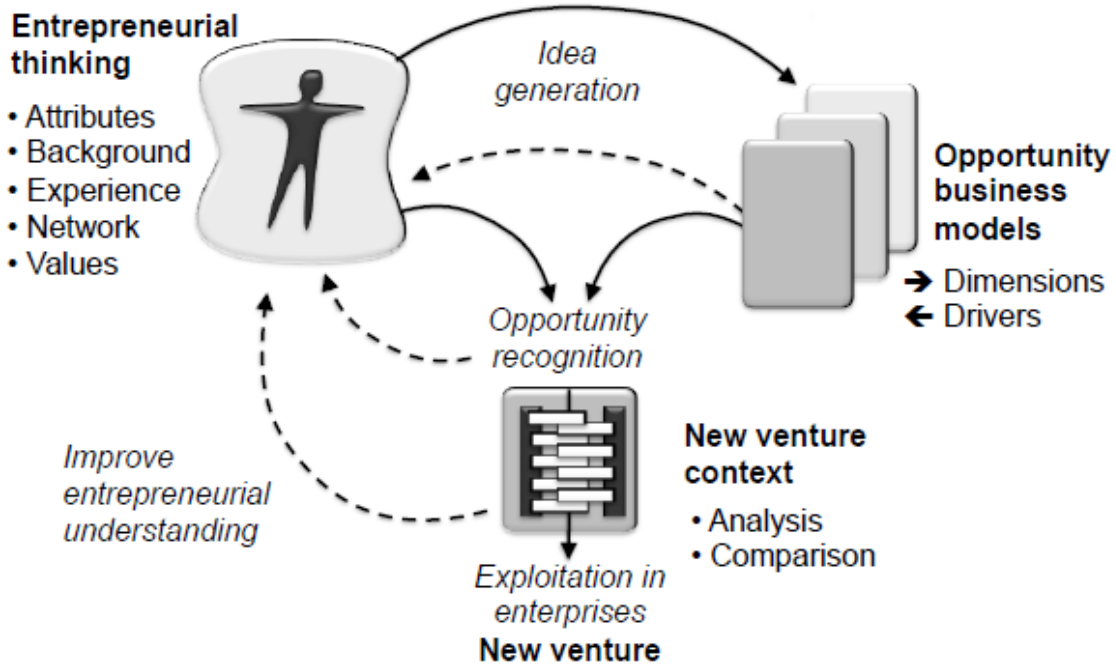


Figure-13. Entrepreneurial Learning Cycle (Blundel and Lockett, 2011, p.33)

3.0 Methodology

3.1 Introduction

This chapter exhibits the research methods adopted to answer the primary research question about 'opportunity exploitation': *how a new venture in m-health can be launched and developed successfully in Myanmar*. Secondary ones were also considered in choosing an appropriate research strategy, which involves decisions about methods of information-gathering and data analysis depending on budget and timetable (Ticehurst and Veal, 2000). They are justified by **epistemological considerations**, **operationalisation** and **data analysis methods**.

3.2 Epistemological Considerations

According to the research onion (Figure-14), this study was *pragmatism* philosophy. It was affected by anticipated consequences of a naturalistic real world researcher who looked at practical concerns of m-health. Commencing with other m-health studies, desirable outcomes in Myanmar were identified (Cherryholmes, 1992), as cited in Robson (2011).

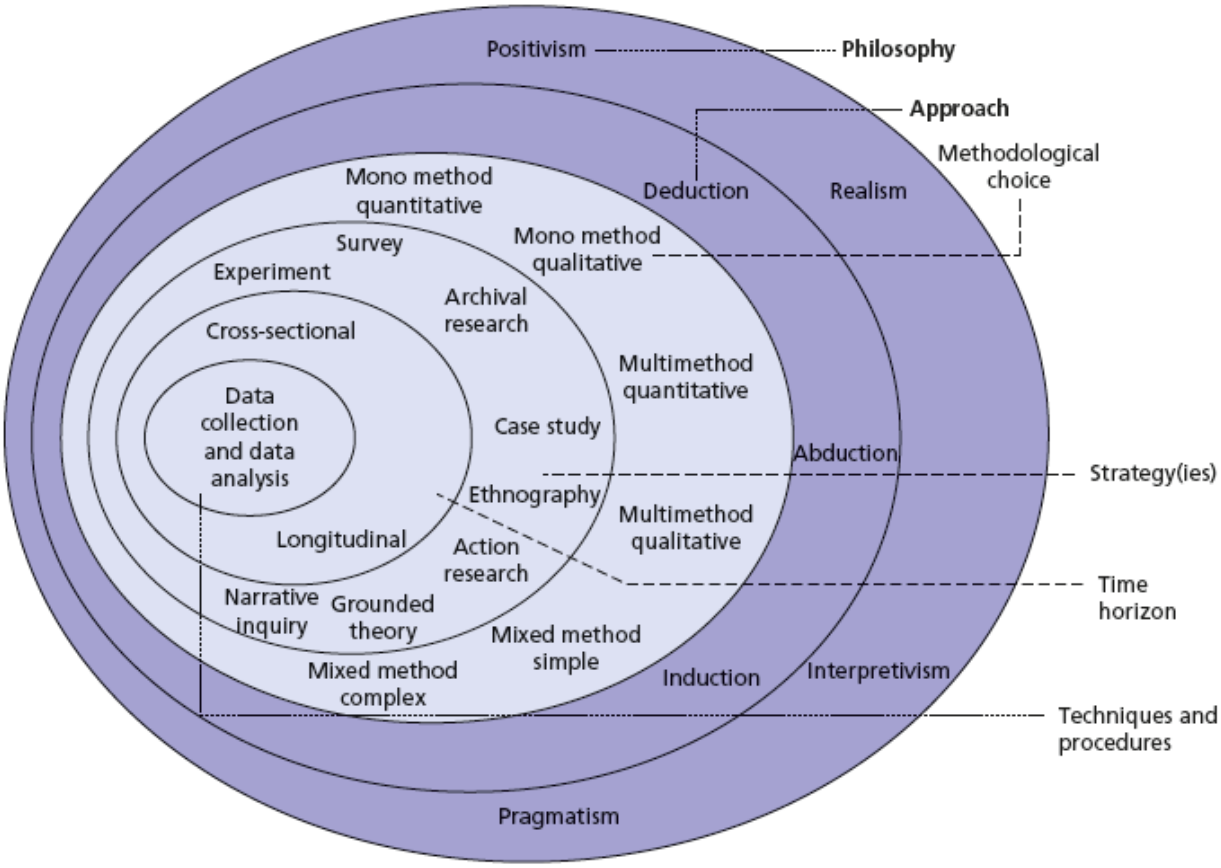


Figure-14. The research onion (Saunders et al., 2012, p.128)

Again, Robson (2011) categorises approaches to social research as follows:

(a) Quantitative paradigm: Positivist and Post-positivist

(b) Qualitative paradigm: Social constructionist

(similar to social constructivist and interpretivist)

> *"Social constructionism indicates a view that social properties are constructed through interactions between people, rather than having a separate existence"* (Robson, 2011, p.24).

There are two reasons why m-health study in Myanmar fits *social constructionism* or *ideographic research* most. Firstly, human interests form the core of this scrutiny, in which different stakeholders' perspectives (especially service providers and customers) should be incorporated. Secondly, the notions should be 'induced' from rich data as the research progresses under minimum structure, and generalised through theoretical abstraction instead of statistical probability (Gill and Johnson, 2002; Easterby-Smith et al., 2002). Thus, *qualitative data* was collected to fulfill these requirements.

According to the interconnected and interactive nature of data collection and analysis of qualitative research (Saunders et al, 2012), this *flexible design* helped the interview questions evolve and change reflexively. Consequent findings led to further data collection along the research process. Sample size was kept flexible to undertake more interviews and heighten representativeness.

3.3 Operationalisation

M-health stakeholders were divided into experts and users for clearer understanding. Experts were assumed to provide the **perspectives of service providers** whereas users or potential users, the **perspectives of customers/consumers,** in marketing terminology. Again, these two perspectives were further sub-divided into four strata of samples based on the location of data collection, the UK and Myanmar. Despite limited accessibility to the UK's NHS, scholars have already generated a sufficient body of research on NHS Direct to enable comparison with Myanmar m-health, on which limited secondary data was detected. Hence, a larger sample was created intentionally and more people were interviewed in Myanmar than in the UK.

The participants were selected by *non-probability sampling method (Purposive)* to identify the closest people to preset criteria (Experts must have superior m-health experience or knowledge; Users must have some potential to call/have called a helpline). Twenty-two prospective users in Myanmar were further deliberately classified according to their socio-economic status (SES) (high/middle/low) which is determined by levels of occupation, education and income (Appendix-9F) because Shah and Cook (2008) proved its association with NHS Direct usage.

Amongst *non-standardised face-to-face interview* techniques (*exploratory*), *semi-structured interviews* were utilised. Four sets of interview questions (Appendix-6) were composed for four strata/two perspectives. Required data pertained to the interviewees' facts, beliefs and attitudes on the research questions, which were independently addressed by each question set. Service provider perspectives embodied advanced interview questions such as benefits and trend of m-health in developed countries (the UK) and/or LDCs (Myanmar), the most useful m-health application, CSFs, barriers to success including face-to-face treatment and confidentiality, privatisation of m-health and sustainability issues. Question types from customer perspectives covered habit of mobile phone usage, behaviour towards healthcare, experience with calling helplines, CSFs, barriers to success, demand on operator requirements, etc.

The author conducted interviews with two strata in the UK. The rest of the samples in Myanmar cannot be taken by the same person because the long distance between Europe and SEA imposed **time and budget constraints** with regard to traveling. The author, therefore, requested four reliable and experienced peers from his social network in Myanmar to conduct interviews on his behalf.

Places in Myanmar where interviews took place were Yangon (former capital) recognised as urban area, and Naypyitaw (newly-established capital), surrounded by many villages regarded as rural areas. Five potential users in rural Myanmar who visited a 'mobile-clinic'

of MMCWA (a medical team's monthly excursion to out-of-town areas by a vehicle to deliver free healthcare services) were interviewed.

Hereinafter, specific code numbers were assigned to each interviewee's name to conceal his/her identity. For instance, UKE#1 means UK=United Kingdom, E=Expert, 1=number assigned randomly to avoid bias, and MMR#4 means MM=Myanmar, R=Rural potential user.

Interviewee ID	Role/Description	Date Interviewed	Duration of Interview	Method of Interview
UKE#1	Experienced implementer/co-developer of 'OpenMRS'	8-July-2014	57min	Face-to-face
UKE#2	Deputy Chief Executive of a NHS Primary Care Trust	7-July-2014	30min	Face-to-face
UKE#3	module leader of 'Mobile Health' on MSc in Health Informatics	9-July-2014	33min	Face-to-face
UKE#4	Public health doctor from Nigeria	5-July-2014	32min	Face-to-face
UKE#5	'mHealth habitat' program officer	31-July-2014	37min	Face-to-face
***MME#1**	Community fieldwork medical officer	13-July-2014	28min	Face-to-face
***MME#2**	Operator at RH hotline (weekends) under Department of Medical Research	11-July-2014	24min	Face-to-face
***MME#3**	Telephone Counsellor (weekdays)	15-July-2014	26min	Face-to-face

	under Myanmar Medical Association			
***MME#4**	Marketing Manager of Huawei, Myanmar	19-July-2014	23min	Face-to-face
***MME#5**	Doctor-in-charge at MMCWA Clinic	5-August-2014	29min	Face-to-face
***MME#6**	Telephone Counsellor under Myanmar Medical Association	15-July-2014	25min	Face-to-face
MME#7	Director of RMNCH Department at MOH	22-July-2014		Email
UKU#1	Postgraduate student from the US who used NHS 24	3-July-2014	36min	Face-to-face
UKU#2	Postgraduate student from England who used NHS Direct	29-July-2014	34min	Face-to-face
UKU#3	A Myanmar doctor studying in Scotland who used NHS 24	26-July-2014	38min	Skype (Video-call)
***MMU 6,7,8,11,14**	Users who phoned a health-related call centre	5to11-July-2014	30min-55min	Face-to-face

***MMU 3,5,10,12,15**	Urban (high SES)	9to16-July-2014	25min-40min	Face-to-face
***MMU 1,2,4,9,13,16,17**	Urban (middle SES)	15to23-July-2014	20min-60min	Face-to-face
***MMR 1-5**	Rural (low SES)	28to30-July-2014	20min-55min	Face-to-face

*Audio-transcript sent to the author

Interviewers

Dr Su Myat Mon Phone: Experienced researcher in Dengue projects

Wai Yan Phyo Oo: Journalist from 'Eleven Media Group'

Chaw Su Wynn: MBA graduate

Dr Myo Min Oo: Experienced community fieldwork medical officer

The author

Table-3. Overview of data collection of four strata

In conformity with research ethics which concern respect for the participants' rights (Ticehurst and Veal, 2000), interview protocol was organised systematically and followed consistently. Informed consent (Appendix-6) was taken before commencing interviews. Although the author's Gantt chart set the deadlines of data collection, the participants' availability was prioritised by letting them choose a preferred time and location for appointments.

3.4 Data Analysis Methods

The data collected was then analysed in detail by applying *template analysis* which is both inductive and deductive (King, 2004). The need to investigate deeper issues and seek more clarity demanded an increase in sample size, which required the author to revisit previous sessions iteratively.

As qualitative data contains socially-constructed subjective expressions, the results were non-standardised and complex (Saunders and Lewis, 2012). Additionally, the interviews in Myanmar were conducted in Burmese instead of English to fully reveal their opinions. The **translation** process, consequently, happened twice before and after each interview alongside the **transcription**. The task was not outsourced to external agents or online services to self-familiarise with initial data.

After a first attempt to treat the data manually, bulkier samples necessitated *Computer Assisted Qualitative Data Analysis (CA**QDA**S) NVivo 10* to handle huge amount of qualitative data efficiently and effectively. Coding (constant comparison analysis), and developing themes driven by both theory and dataset are the core of QDA. A *Thematic coding approach* was employed, as demonstrated in Robson (2012). Constituting multiple codes, Attride-Stirling (2001) recommends a *thematic networks analysis*, which unearths salient themes at different levels. It extracts lowest-order 'basic themes' evident in the

transcript, which converge towards more abstract ‘organising themes’, encapsulated into super-ordinate ‘global themes’.

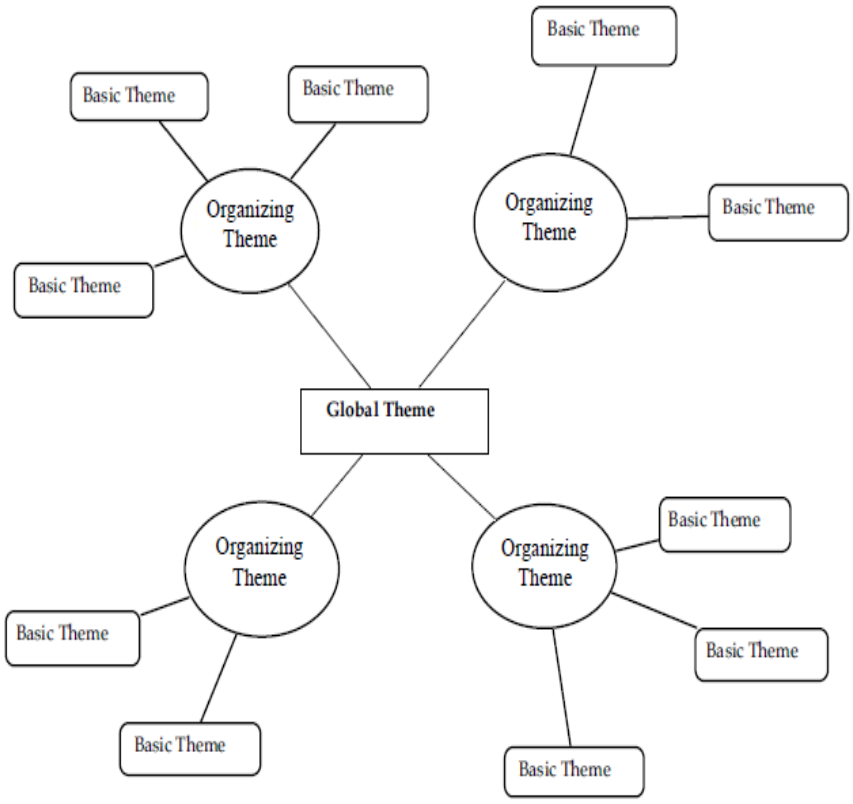


Figure-15. Representation of a thematic network as a web-like map

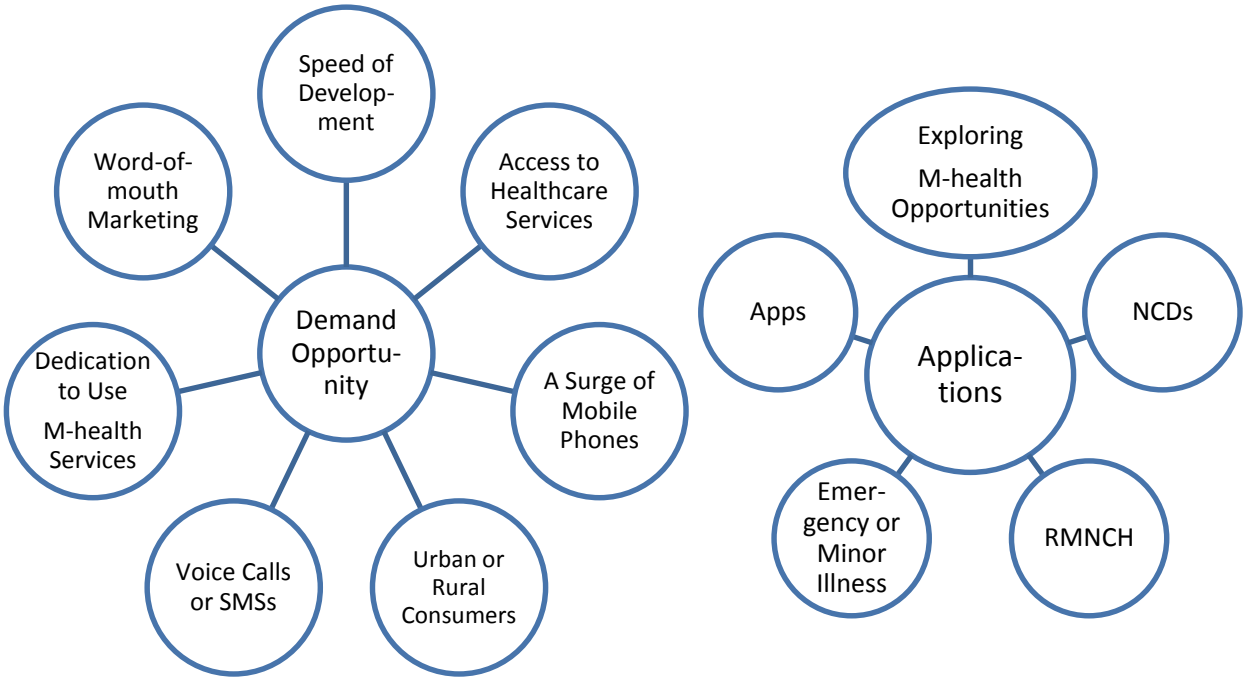
(Attride-Stirling, 2001, p.388)

Later phases of data analysis undertaken were integration and interpretation to identify patterns, trends and relationships, termed *generating meaning* by Miles and Huberman (1994).

4.0 Results and Discussion

4.1 Introduction

This chapter presents the discussion alongside the results together in order of the research questions, aim and objectives to enable focused and clear demonstration of data analysis. In this study, five 'global themes' were identified (Figure-16).



*Numerous basic themes are omitted in this illustration to avoid confusion.

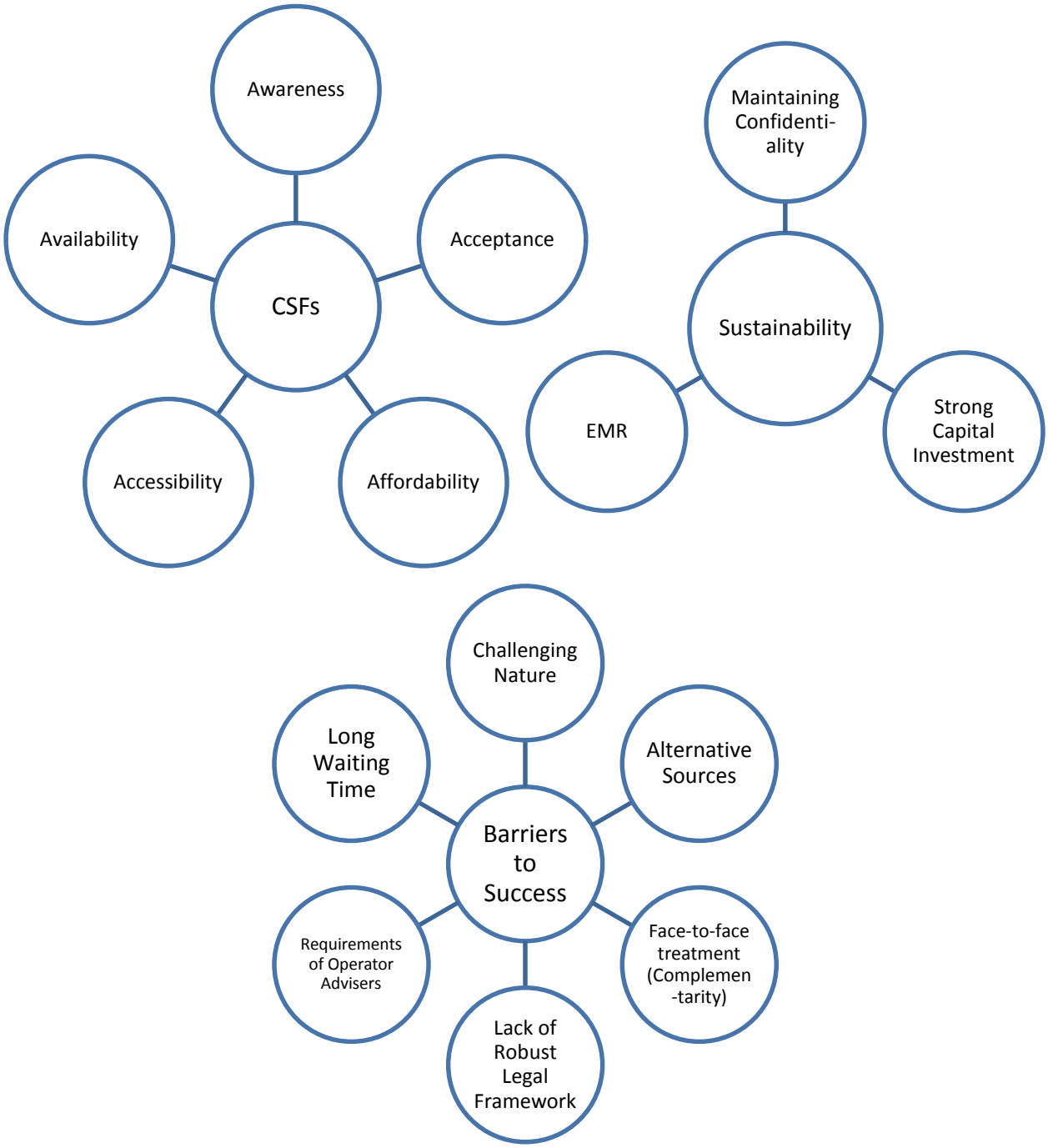


Figure-16. Identified global themes and their respective organising themes

Based on this structure, the results are discussed in six sections. First, **demand for m-health** determines the size of m-health opportunity, and the most feasible initiative amongst

several **applications** is ascertained. Then, **CSFs, barriers to success,** and **sustainability** issues are explored, followed by their **relationships.**

In each section, both expert and user responses were mixed to assist comparison and reflect the degree of similarity in both perspectives. From each perspective (*service providers* and *customers*), comparative analysis was done between m-health *in the UK* and that *in Myanmar*. Hereinafter, 'the user participants/interviewees' refer to those in Myanmar, unless the UK users, being very small group, are mentioned specifically.

4.2 Demand Opportunity

4.2.1 Speed of Development

The world has witnessed how ICT can confront global health issues. E-health is portrayed as a healthcare movement without walls (Anderson, 2007). This revolution continues with fast-moving disruptive innovation as warned by Gartner's Hype Cycle (Fenn, 2010).

> *"…so much happen every year in this area. Mobile phones have replaced many things. Technology changes so quickly"* (UKE#3).

UKE#3 further argued, m-health must be part of the routine, people deal with conventional healthcare. This mindset cannot be changed overnight. Even in developed markets: "We're not used to using telehealth since 1920s in the UK" (UKE#2). In LDCs, UKE#4 reckoned, m-health is in:

> *"…earliest stage, still picking up people who are unfamiliar with ICT. It'll take longer in developing countries."*

However, according to most Myanmar experts' prediction, m-health implementation would take only 1-5 years to be accepted by the stakeholders. MME#4 elucidated:

> *"People have been waiting for their health needs to be fulfilled…Myanmar is now developing fast and the government is welcoming modern techniques…"*

This indicates their demand for m-health, but they may have underestimated the real barriers in Section-4.5.

4.2.2 Access to Healthcare Services

All urban user participants were satisfied with their residential area in terms of telecommunications, healthcare facilities and transport. Despite the abundance of polyclinics, pharmacies, and GPs, some complained about the traffic congestion in city centre.

However, in rural areas, more serious difficulties arose to travel to distant healthcare centres carrying patients, especially during rainy season (MMR#1). MMR#4 sadly said:

> *"My village is very far from healthcare facilities. No transportation by car. We have to use a cart by passing through woodlands."*

Inadequate CHWs in the village worsened this situation (MMR#5). Unequal distribution and shortages of healthcare workforce are mirrored by hard-to-reach regions where poor population cannot attract or retain medical professionals (Goodman and Fisher, 2008).

4.2.3 A Surge of Mobile Phones

> *"In the past, only rich people afford mobiles, but most office staff, students and even trishaw workers are using mobiles now except grandparents"* (MMU#17).

Each urban interviewee had their own mobile, which highlights the affordability of mobile phones in cities. This is probably why urban areas represented 11.56% in 13.94% total tele-

density. The countryside is beginning to follow this trend. Only one participant there used a public shared phone, and each household had at least one mobile. Size of an average household was 5.21 in 2004-2005 (Central Statistical Organization, 2006).

4.2.4 Urban or Rural Consumers

All Myanmar experts believed, m-health should target customers in urban zones first, against the author's initial thought, extending to peri-urban and rural vicinities later with a step-by-step approach. As stated by Myanmar experts, rural areas have:

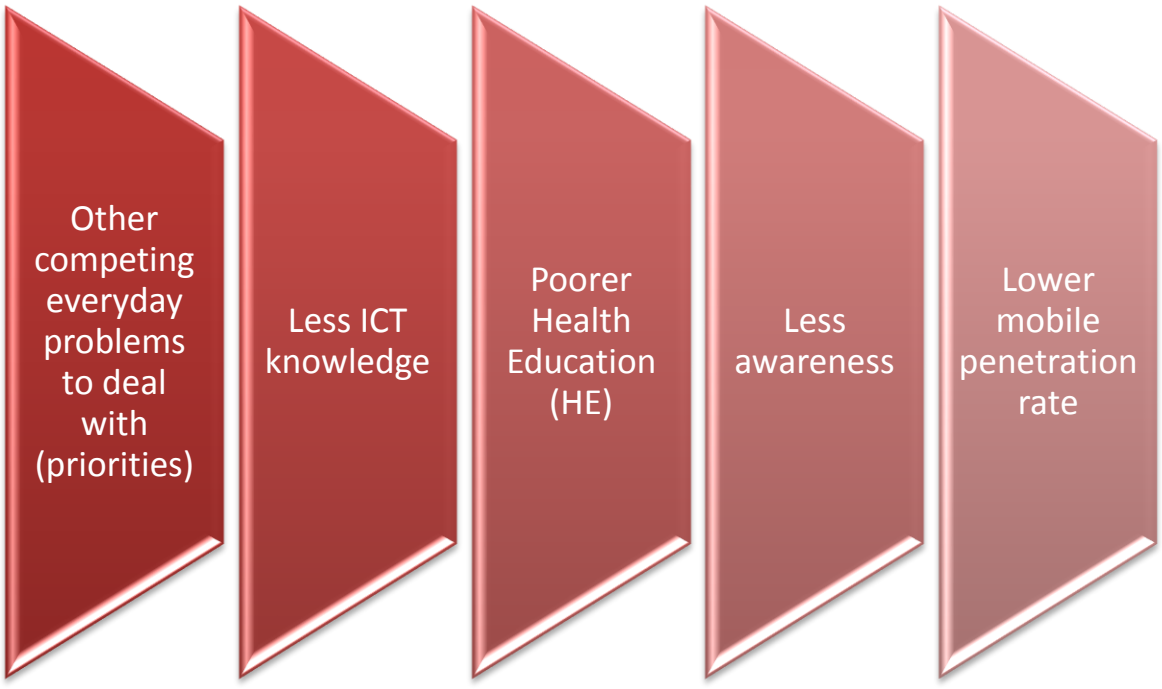


Figure-17. Obstacles for rural inhabitants

to become early customers of m-health service provider

4.2.5 Voice calls or SMSs

Urban participants often use mobile for 5-30 times daily, predominantly for phone calls. Although Chib et al. (2013) emphasise cost effectiveness of SMSs, especially rural interviewees prefer to communicate through more expensive voice calls to SMSs owing to some reasons (Table-4). Similarly, three-fourths of Myanmar experts found phone calls simpler and easier to communicate with patients than SMSs.

Voice Calls	SMSs
Fullness of information	Language barrier between English and Burmese (Burmese font-enabled smart phone handsets are expensive)
Certainty, Ability to request clarification immediately	Both users and operators may misinterpret and misunderstand English texts
Directly communicating: fast decision	Longer response
	Gross IT gap: some illiterate users do not know which keypads to press in composing texts.

Table-4. Participants' reasons for voice preference over SMSs

Despite limited usage of SMSs in Myanmar, the results varied with the context. In the UK: "barely ring somebody for 5-min speech, but I text 20 times a day" (UKU#2).

4.2.7 Dedication to Use M-health Services

Over half of user participants occasionally seek healthcare knowledge somewhere or online. 24 in 25 users including the UK users are willing to phone a new 24-hour hotline, and most can pay slightly above normal call rate. MMR#1 felt:

> *"If the cost is not expensive and it's available for 24 hours, I will always call, of course. It's like a doctor at home."*

4.2.8 Word-of-mouth Marketing

Every satisfied caller would share their experience of the helpline with their friends and recommend using it. The **awareness**, therefore, can be effectively promoted by ensuring satisfaction of every customer. MMU#16, however, warned:

> *"Negative news may spread everywhere shortly, though positive ones take longer. It's human nature."*

4.3 Applications

4.3.1 Exploring Achievable M-health Opportunities in Myanmar

There is a broad array of m-health initiatives being implemented around the world. For instance, "M-health can help clinicians remotely access key lab data in EMR" (UKE#1). In Nigeria, counterfeit drugs can be distinguished by messaging a specific code to receive a reply confirming genuine or fake ones (UKE#4).

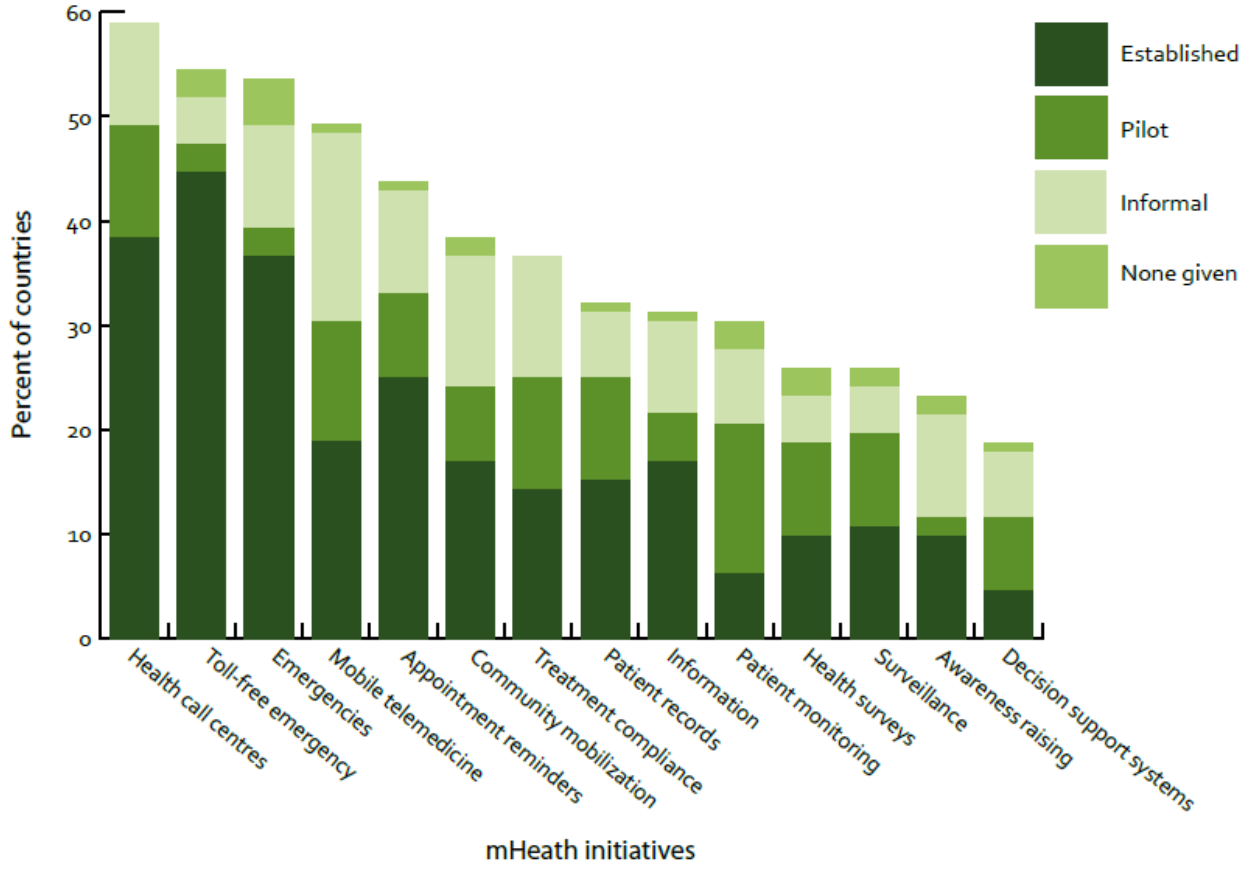


Figure-18. Adoption of m-health initiatives and phases, globally

(WHO-Global-Observatory-for-eHealth, 2011, p.13)

Among them, health call centre or helpline was assumed to be the most feasible m-health implementation in Myanmar currently. The internet coverage is only 1.0% (534,930 internet users in 2012) (Internet-World-Stats, 2014). Most gain access through internet-subscribed mobile phones. Other m-health initiatives incorporated in the call centre are discussed in 'Process' (Section-5.2.4).

As advised by UKE#1 to "start with a few examples of specific clinical gap", the literature review pinpointed RMNCH to be the biggest disease burden in Myanmar, which was further confirmed by the interviewees.

4.3.2 Chronic Diseases

There were only a few patients with chronic diseases at home revealed by three out of 22 Myanmar users, who visited their physicians regularly. It demonstrates, the impact of NCDs is still low as compared to what the UK experts have underlined. Stroke, heart failure and diabetes are nowhere near the top causes of morbidity and mortality of Myanmar populace (Table-5).

Single Leading Causes of Morbidity (2011)

Sr. No.	Causes	Percent
1	Other injuries of specified, unspecified and multiple body regions	10.6
2	Other complications of pregnancy and delivery	6.7
3	Single spontaneous delivery*	6.0
4	Diarrhoea and gastroenteritis of presumed infectious origin	5.4
5	Malaria	3.2
6	Other pregnancies with abortive outcome	2.9

Single Leading Causes of Mortality (2011)

Sr. No.	Causes	Percentage(%)
1	Human immunodeficiency virus [HIV] disease	6.3
2	Septicaemia	5.0
3	Other diseases of the respiratory system	3.9
4	Respiratory tuberculosis	3.9
5	Other diseases of liver	3.8
6	Slow fetal growth, fetal malnutrition and disorders related to short gestation and low birth weight	3.7

Table-5. Burden of RMNCH (ie, **Size of the opportunity**)

(Ministry-of-Health, 2013, p.138-139)

4.3.3 Reproductive, Maternal, Newborn and Child Health (RMNCH)

This burden can be reduced by implementing m-health countrywide. Almost all Myanmar experts recommended RMNCH as a suitable m-health project, especially RH by all potential users. MME#7 expounded on:

> *"RH cases are confidential in culture. For other diseases, patients can go to clinics. RH is better off talking on the line, rather than counselling outside…About maternal and child health…mothers do not need to bring infants to clinics often, and so do women in mature pregnancy."*

Myanmar nationals are too shy to discuss issues about contraceptives and Sexually-transmitted Infections (STIs) including HIV with family members, friends, and even doctors. It inhibits the intention to use first **alternative source**, social network. The helpline lets them enquire about their private questions and concerns anonymously without being seen by others. MMR#1 divulged:

> *"After I had sex with my girlfriend, I saw my condom was torn. I was about to ask my friends, but afraid they would think of me badly."*

Here, MME#2 exposed a legal issue that, in unplanned pregnancies, callers often ask for information about clandestine private clinics where abortion can be intentionally induced and executed, despite being illegal in Myanmar. Unskilful traditional birth attendants who service abortion cases without complete and sterilised equipment often bring septicaemia and death to poor girls in countryside.

MMU#1 contemplated, expectant mothers should receive HE about prevention and treatment of common infections for respective gestation periods. It proved, Myanmar citizens are expecting a m-health platform like *'Mobile Alliance for Maternal Action (MAMA)'* that globally helps m-health reach low-income mothers by delivering time-sensitive and stage-based messages on pregnancy tips including maternal emergencies (MAMA, 2012).

However, a few disagreed with the applicability of m-health in newborns. MME#5 disputed:

> *"Neonates have the most urgent cases. Mothers won't bother helpline, but go straight to hospital. Newborn issues like vaccination reminders are yet to be researched in Myanmar."*

Nonetheless, in accordance with most UK experts, NHS Direct was predominantly used by mothers for their children's health issues. Mothers are usually more worried about their children than themselves.

4.3.4 Emergency or Minor Illness

From customer perspectives, most urban interviewees would call for common ailments and general enquiry.

> *"In emergencies, I'll go straight to hospital…only non-urgent queries about mainly diet and lifestyles which attract people interest"* (MMU#14).

However, MMU#16 argued:

> *"eg, about dyspnoea of a family member, m-health can be life-saving, advising what first aid to take."*

MME#1 stressed the tremendous advantageousness of m-health in emergency cases in country outskirts where there are limited A&E facilities.

4.3.5 Apps

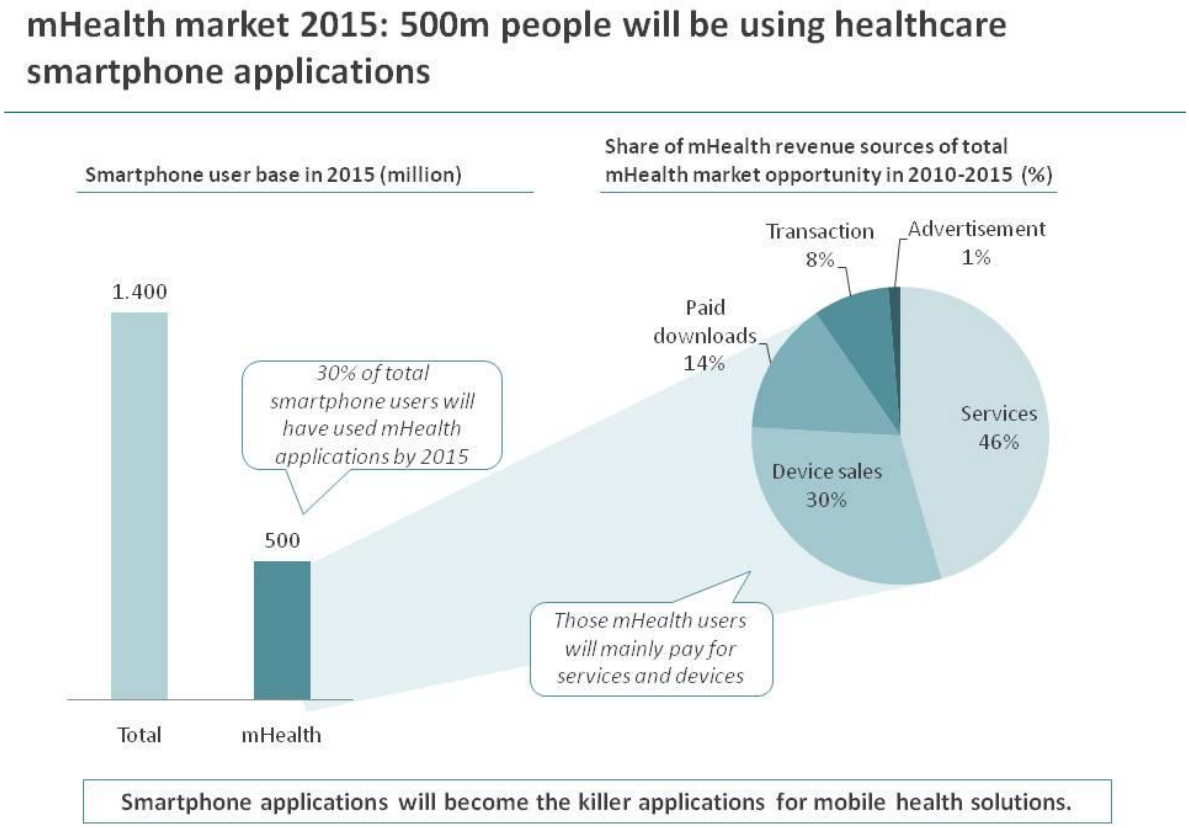


Figure-19. Apps explosion (Jahns, 2010)

Following the trend in Figure-19, all Myanmar users of high and middle SES had smart phones with some apps installed. However, below 10% of them downloaded healthcare apps related to diet, exercise and menstrual cycle calendar (eg, *BMI Calculator*, *Period Tracker*) while most in remote areas have never heard about apps. Hence, apps trend is still in its infancy stage in Myanmar unlike developed markets where UKE#2 would consider more profitable (through apps sales and advertisements) and self-sustaining platform technology like healthcare apps.

4.4 Critical Success Factors

4.4.1 5 'A's: Awareness, Acceptance, Affordability, Accessibility, Availability

Awareness was viewed as a key CSF by most Myanmar experts and UKE#4 (from LDCs) whereas it was not mentioned by any UK expert. Only some urban users knew current call centres and their numbers in Myanmar. Most reasons for calling were merely to enquire about contact details of a healthcare unit although they also provide consultation services. Surprisingly, only one UK user has heard of NHS Direct, and two phoned NHS 24. MME#2 implied:

> *"Even some clinicians are not aware of m-health. First, general public must know what m-health is."*

Type of Advertising Media	*Urban*	*Rural*
TV	✓	✓
Radio	✓	✓
Newspaper	✓	✓
Facebook	✓	
Billboard	✓	
Pamphlets		✓
Loudspeaker (announcing in the streets)		✓
Healthcare talks and sessions		✓

Table-6. Possible marketing strategies effective in urban or rural areas

(according to the participants' source of awareness about call centres)

Acceptance from policy makers to end-users, especially clinicians, is also imperative to execute m-health. Many experienced doctors are old and hesitate to learn new technologies (Yu et al., 2006). M-health care managers should persuade GPs to fully engage and partner instead of competing over alternative service provision (PHS, 2007). UKE#5 underscored the 'digital literacy' required by GPs to succeed in adoption of m-health by their patients.

MME#1 and MME#5 emphasised the need to fulfil other three 'A's: **Affordable, Accessible, and Available** for ***24 hours*** to accomplish a m-health project. Several experts wondered whether rural customers can afford the service. UKE#3 doubted:

> *"…far more expensive than it is in developed countries. Compared with their income, the cost is massive."*

This is because rural inhabitants are employed in agriculture, a low-profitability sector (Kim et al., 2012). MMR#1 revealed positive association between cash from farming and frequency of calls. *National Poverty Incidence* decreased from 32.1% in 2005 to 25.6% in 2010, concentrated in rural areas (UNDP-Myanmar, 2011). Hence, particularly rural interviewees were inclined to call at lower charge. Current outgoing local call costs 3.69p/min with free incoming calls (Nomura-Equity-Research, 2012). This rate or below 6p/min was recommended by most Myanmar experts to reach all SES. However, some interviewees showed less concern about it, claiming that money is nothing when in need of healthcare. MMR#4 was one of them showing her attitude towards HE:

> *"…because I can question everything I want even when healthcare service is not required. To gain knowledge is more important."*

Overall, CSFs indicated by the UK and Myanmar experts and users that will make a m-health enterprise both successful and sustainable are illustrated.

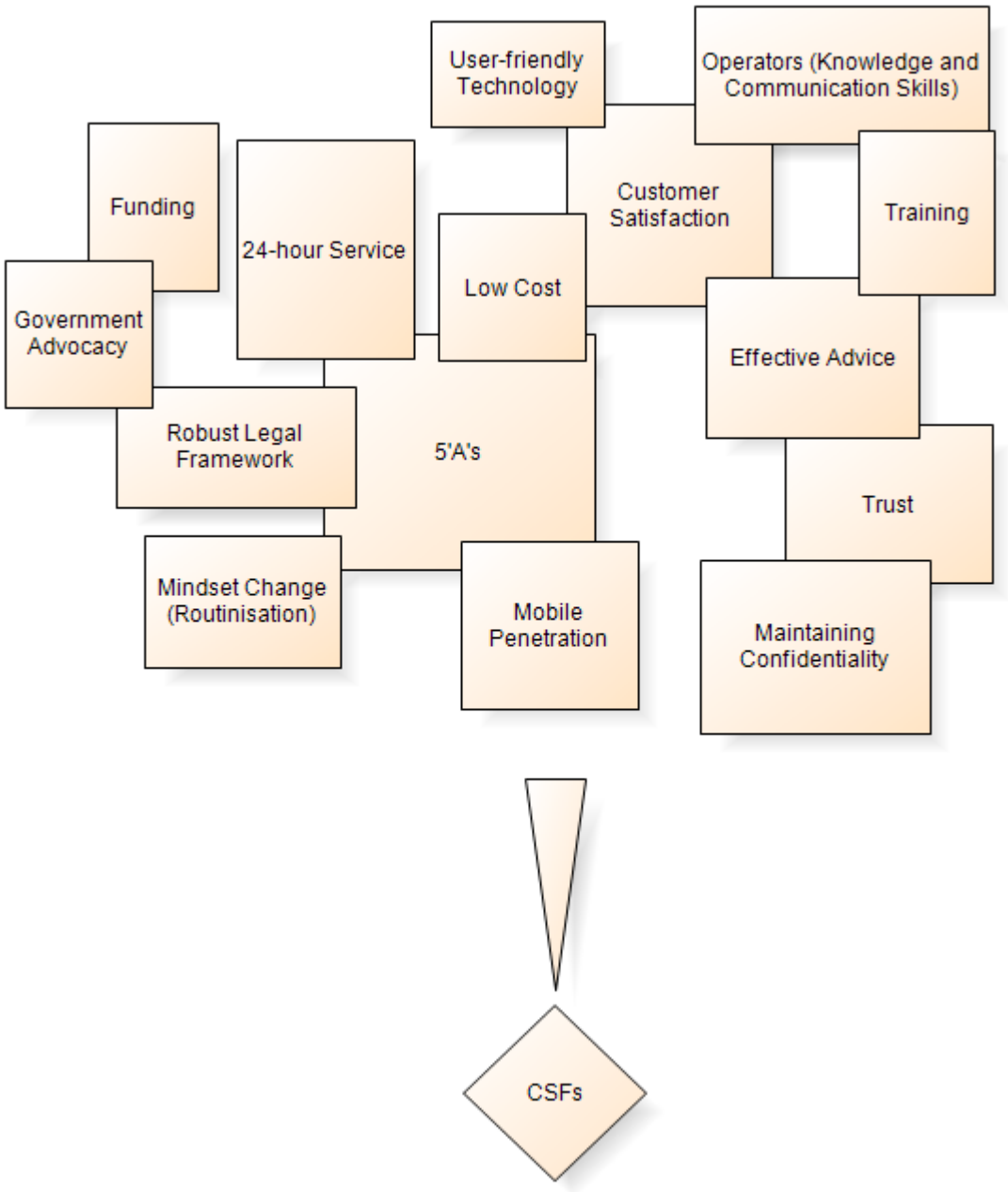


Figure-20. CSFs which were most frequently mentioned by the participants

demonstrating three features:

*All factors are interconnected;

*Superficially-layered factor causes deeply-layered factor (eg, to achieve public ‘trust’, first, operators’ advice must be effective and callers’ confidentiality must be maintained systematically);

*The bigger the rectangle, the more important it is (each factor’s size was calculated on its frequency of appearance in all transcripts and the number of people mentioned).

4.5 Barriers to Success

4.5.1 Challenging Nature

The need of health infrastructure was emphasised by the UK experts. UKE#3 argued:

> *"It's on the top. If you don't have a good health service or organisation, you can't have good e-health,"*

while UKE#2 repeatedly warned, lack of technological infrastructure makes m-health start-up risky. Some Myanmar experts predicted, current telcos are unlikely to reach their publicised targets, and poor network connection will remain. There is also no significant successful history of health technology start-ups in Myanmar.

4.5.2 Alternative Sources

Apart from the helpline, there are other traditional or habitual approaches to seek medical advice and solutions. UKE#2 revealed:

> *"Alternative sources of healthcare information can be obtained from family and social networks. Frankly, when a young mother worries about how to feed her kid, she'll ask her mother or her GP, or just google it. As a whole, there are potentially much better options. That's why not many people utilise or know about it. Value proposition must be good enough*,"

where UKE#1 defined value proposition of m-health as:

> *"It's not about advanced technology. It's about how useful the service is and the information is."*

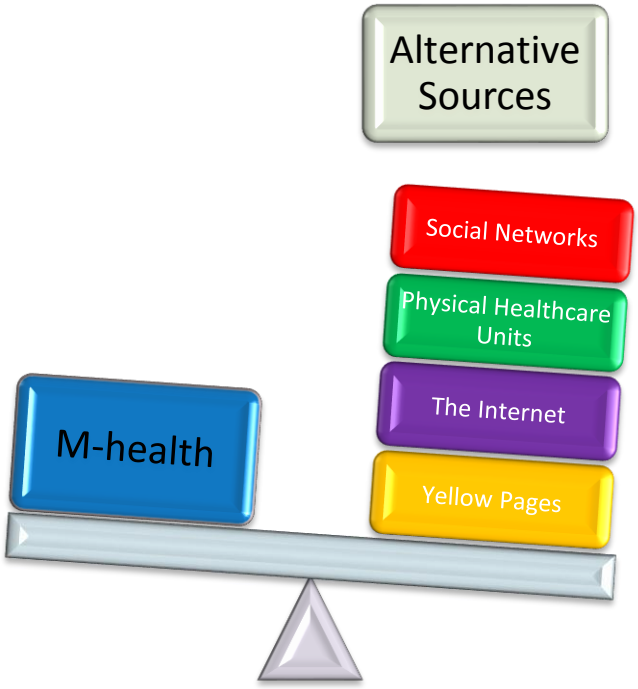


Figure-21. Alternative sources of healthcare information

which hinder helpline usage

However, all these alternative sources might not necessarily apply to Myanmar civilians. When feeling ill, even urban participants usually get advice first from relatives or friends who are doctors, neighbours and the elderly in their social networks, and most do not bother calling a helpline, surfing the internet or turning a telephone directory. Obviously, since there are fewer alternative sources in rural areas, m-health might be the only choice of health assistance there.

4.5.3 Face-to-face Treatment (Complementarity)

> *"History, physical examination, and investigation happen at the same time as necessary at hospitals. Even on sight, misunderstanding can happen among doctors"* (MME#4).

According to many Myanmar experts, seeing a physician has been a must in traditional patient mindset. In fact, some users do not even care about this **doctor-patient relationship**. For most users, face-to-face treatment is crucial to a certain degree, but will not necessarily prevent them from using the helpline, particularly in non-urgent cases. MMU#9 added:

> *"In common ailments, being face-to-face is unimportant…First, the operator can say which medicine to take and refer to a doctor if necessary."*

It also depends on the callers' location. Where conventional health facilities are inaccessible, m-health is far better than nothing.

UKE#3 disagreed with multiple Myanmar interviewees who believe face-to-face treatment is indispensable:

> *"There is a generation coming through that used to do things online. Very routinely, they'll be quite happy to use email, messages, etc. Those people are young, old, and a whole spectrum of society that will grow."*

Actually, m-health does not replace, but complements traditional healthcare as a supportive tool. UKE#2 articulated:

"Often, it's easier to manage patient remotely, once you've established some kind of initial contact. Consultation, follow-up continuing care and monitoring blood test results can be done remotely, but some diseases are definitely done face-to-face."

UKE#4 agreed on the insufficient nature of m-health alone and the need to combine them.

4.5.4 Lack of Robust Legal Framework

Legislations like *the Companies Act* in Myanmar, exercised under the junta, have gone out-of-date and are ill-suited to opening economy and global standards (OECD, 2014). MME#4 questioned:

> *"Lack of health insurance system is a factor that pulls m-health back. If mistreated, how will they cover and compensate?"*

Monopoly government-owned '*Myanma Insurance'* issued private operation licenses to nine local insurance companies (World-Bank, 2013) which will offer general and life insurance to the citizens (Duflos et al., 2013).

In serious mistreatment, most users would discourage others from calling, but would not sue the helpline and operator responsible unless the consequences were life-threatening. UKU#1 felt:

> "I faithfully committed to dialling the helpline number on my own…it's reasonable because the physician cannot see me in m-health."

Similarly, Myanmar rural participants judged, no doctor is always right, and the responsibility lies with the patient who trusts them. The act of legal disclaimers is practised less in rural areas because of long-standing cultural respect for doctors and lack of knowledge about human rights (MME#7).

4.5.5 Requirements of Operator Advisors

Few interviewees have used healthcare call centres. There were only five callers in the city and almost no one in countryside. While two UK users were pleased with NHS helpline, customer dissatisfaction with Myanmar call centres ensued from ineffective advice, poor communication skills including impatience, and outdated information. Most participant users did not phone again. MMU#5 highlighted the importance of first impressions: "It depends on how helpful the first call is". Generally, all their feedback on call centres was negative, indicating the significance of **training**. MMU#14 complained:

> *"I called 1875 for chronic joint pain. The advice was too general, and too much history-taking…not relieved…better if they can answer each query patiently and specifically in detail*."

Despite the utilisation of computerised system, high SES participants accept only doctors and nurses as the operators. They are sensitive about ordinary operators. MMU#10 explicated:

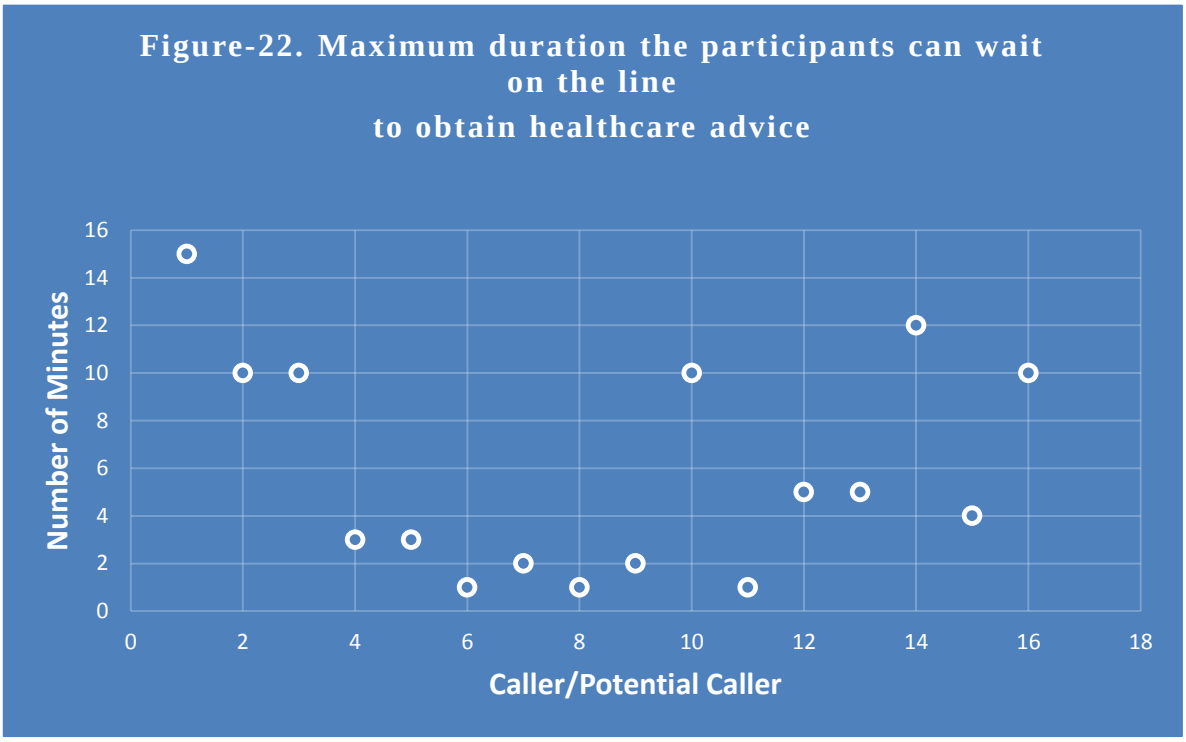
> *"It's our health and lives. If he's a layman with the same depth of knowledge like us, how much can he understand? Expert doctors are the best!"*

MMU#12 agreed that their advices, cultivated from different experience and knowledge, cannot be of same quality.

The potential users wanted operators to identify themselves (name and certificate). MMU#12 seemed cynical, saying anyone can pretend to be medical staff on the phone. Low SES interviewees neglected the operators' medical certificate nevertheless. MMR#4 will recognise: "…operator who can answer whatever I ask. It doesn't matter who he is." However, without building trust, nobody will believe health advice given by an unseen operator and follow the instructions offline.

4.5.6 Long Waiting Time

Notably, even though m-health cuts traveling time, most users were impatient to be put on-hold for a few minutes (Figure-22). The operators' irrelevant history-taking and long instruction without necessity were undesirable. A few even cannot wait for the doctor who will call them back unless the query is life-threatening.



4.6 Sustainability

4.6.1 Maintaining Confidentiality

Most participants express serious concern over the disclosure of personal information and previous medical history. Actually, the oath of medical professionals has already warned them about breach of confidentiality (MME#1). UKE#3 blamed privacy issues:

> *"…monumentally important, one thing that holds back doing m-health. Governance and ethics are the big problems…stopping things happening."*

MMU#14 will reply to the operator's questions about her only after she knows where to use and how to store her records. Almost half of the user samples declined to expose private information, with MMU#9 who wanted to make enquiries anonymously, against the author's initial thought that societies from LDCs may not take their confidentiality very seriously. However, MME#5 again confirmed the author's misstep, clarifying that all types of SES people value their privacy to some extent. She maintained:

> *"Confidentiality essentially covers all diseases…without patient consent, doctors can't release these details to others, even his family members. Some have social stigmata eg, Leprosy, they don't want to show their skin conditions. Even TB patients are shy to mention they cough…being online, they're more willing to tell their secrets…"*

That is why her recommendation was for the diseases where patient confidentiality is essential eg, HIV. Anonymously, Myanmar rural interviewees are not reluctant to divulge other private matters (eg, contraception).

4.6.2 Strong capital investment

UKE#3 insisted,

> *"UN and Vodafone people are going to developing countries, doing a project in m-health, and putting lots of money. But unless there is any difference from other projects, as soon as their money isn't there, they just stop. Sustainability and scalability are the two huge problems..."*

Hence, the painful reality for most telehealth projects is that they must ultimately take a commercial proposition at one stage to survive longer (Darkins and Cary, 2000).

4.6.3 Incorporating an EMR system into the helpline

Most UK experts suggested, m-health ventures should have sound technological infrastructure including a comprehensive database system to manage data overload efficiently. It will provide m-health start-up with a *competitive advantage*. Competitors in Myanmar lack a proper EMR system, and some still utilise physical file records. UKE#1 recommended integrating **Open-Source software** such as *OpenMRS, SANA, ODK,* and *CommCare* into m-health business model.

OpenMRS is freely-available open-source EMR platform at low to no up-front cost overcoming barriers to adoption at limited-resource settings in LDCs (Mamlin et al., 2006). It is largely scalable, and can store over 300,000 patients. With minimal programming literacy requirement (Mohammed-Rajput et al., 2011), it supports foreign language encoding to translate into local languages (eg, *Burmese*). OpenMRS can be integrated to enhance interoperability with mobile phone-based data collection tools such as SANA, ODK, and CommCare (Fraser et al., 2012). It contains a modular software structure that can be customised by loading additional modules without modifying the core system (Wolfe et al., 2006). Web-based OpenMRS is programmed in Java and other open-source components (Figure-23).

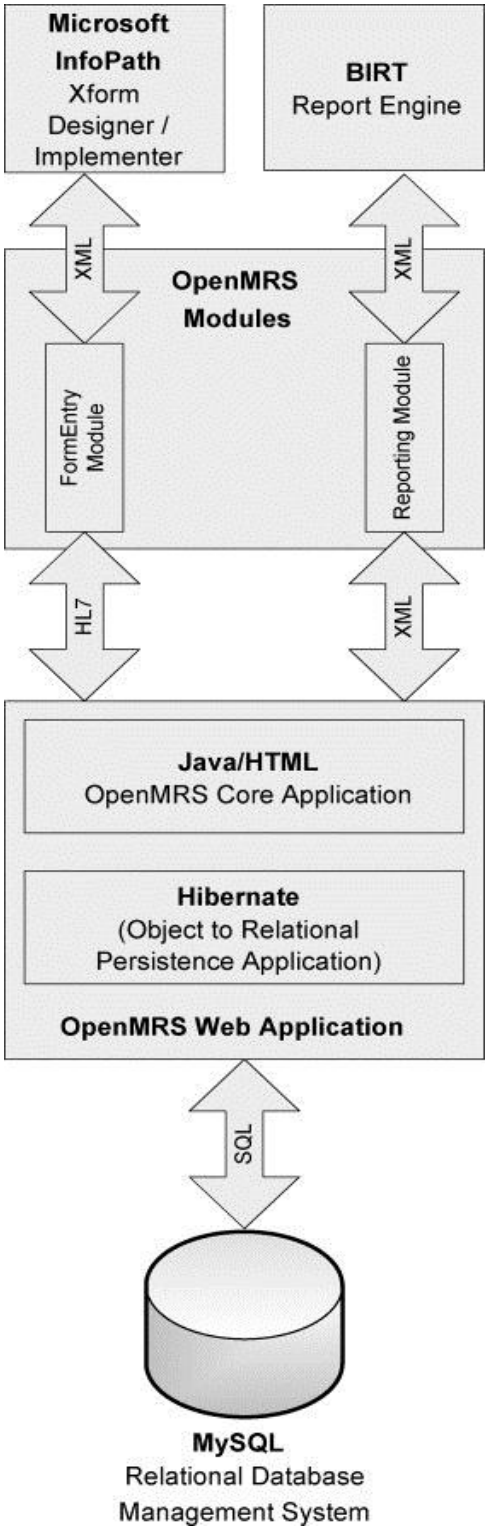


Figure-23. OpenMRS technical architecture (Seebregts et al., 2009, p.713)

4.7 Relationships between CSFs, Barriers to success, and Sustainability

In summary, according to the interview findings, there is an *inverse relationship* between CSFs and barriers to success, while realising a *causal relationship* between CSFs and sustainability, as depicted in Figure-24.

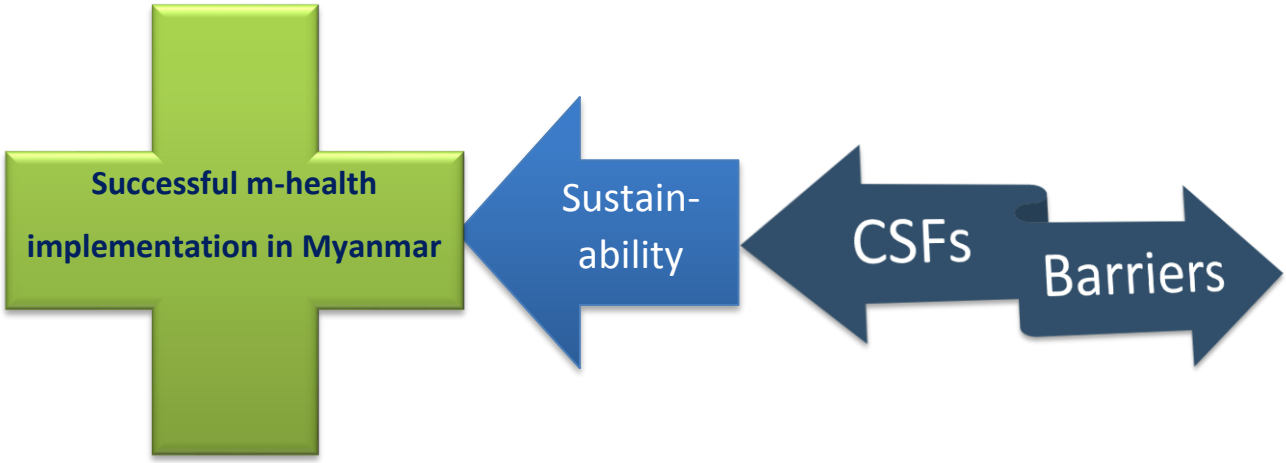


Figure-24. Path of a new venture in m-health

to be launched and developed successfully in Myanmar

Prime CSFs to overcome the barriers in this path were observed to be five 'A's, trust, effectiveness of advice, and communication skills. Conversely, negative aspects of these factors will make people hesitate to use the helpline.

Achieving all CSFs will encourage the callers to continue using m-health services. If CSFs are maintained to be lasting, m-health enterprise's prosperity will be sustainable in the future.

5.0 Opportunity Business Model: Employing OBM in M-health in Myanmar

> *"A telehealth program must have a business planning process and produce a business plan to detail these products and relationships in a cohesive way to generate revenue"* (Darkins and Cary, 2000, p.210).

Based on the findings from data analysis, an OBM was constructed which addresses primary research question in a comprehensive manner.

5.1 Drivers

Drivers underpinning this new venture opportunity have been indirectly explained in Chapter-2. The most relevant driver is **technology** (Section-2.6.3), followed by **societal** (Section-2.6.2) and **commercial** (Section-2.6.1) drivers. Highlights of three interacting forces driving the opportunity are recapitulated in Figure-25.

Under weak and uncertain legal framework, the government has enacted no specific legislation on m-health yet. Lack of robust *Data Protection Act, Intellectual Property Act* and *Companies Act* even impedes the opportunity exploitation.

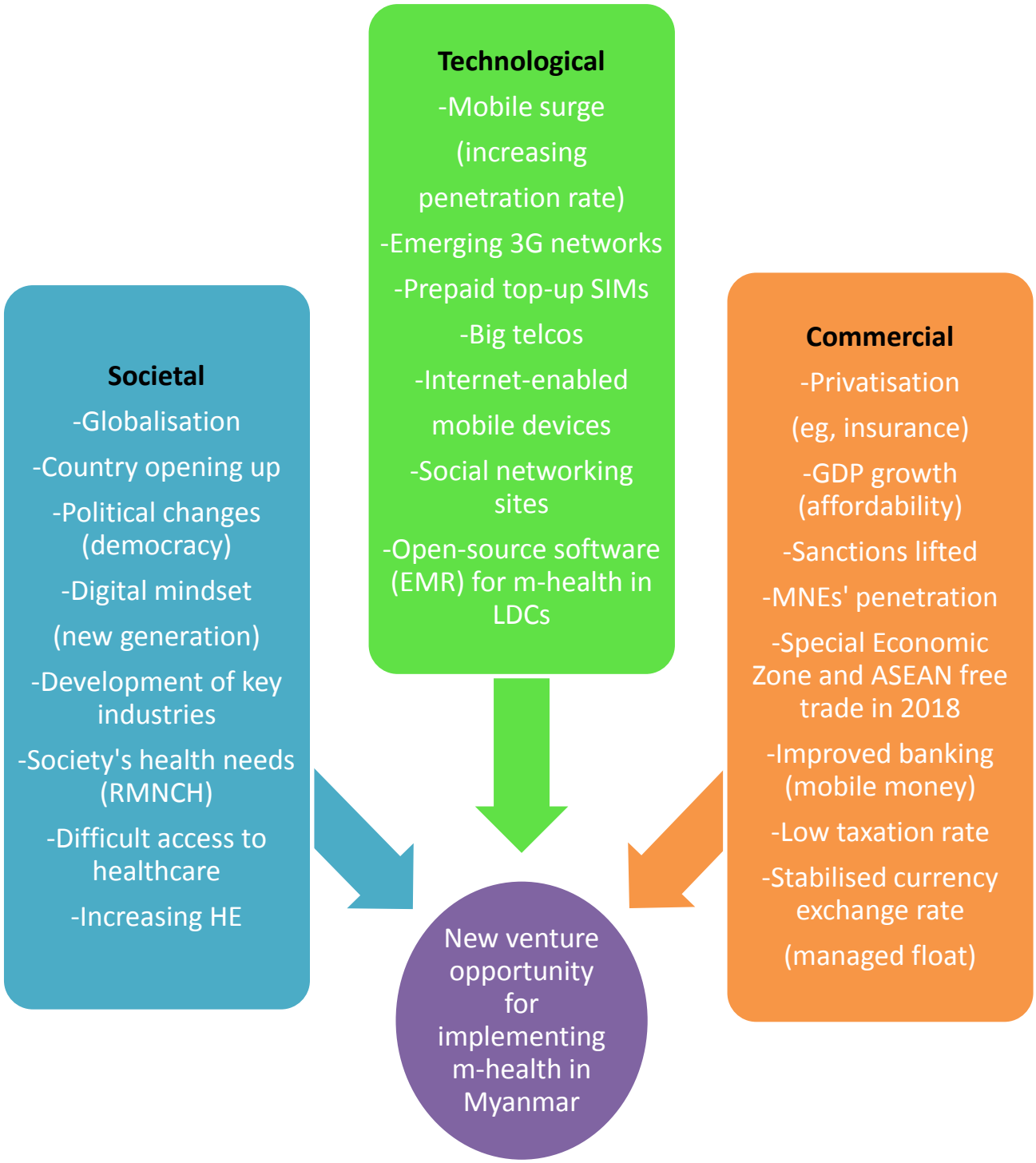


Figure-25. Summary of three relevant drivers behind the opportunity

5.2 Dimensions

Core components of OBM were analysed systematically to illustrate the extent of feasibility of realised opportunity and facilitate comparison with other models like NHS Direct.

5.2.1 Proposition

The vision is *to become a leading provider of remote medical assistance via mobile devices for every citizen throughout Myanmar. This digitally-delivered healthcare will make use of a world-class health-specific phone service*.

The primary mission is *to remotely provide effective and consistent health information and expert advice, and/or timely referral to recommended healthcare units.*

'**Reliability, Safety, Confidentiality'** constitutes core value of the venture.

5.2.2 People

The entrepreneur, who will face substantial risks, must have an extensive social network to garner local support and advanced ICT from developed markets. For instance, the author's mother, an executive member of MMCWA, introduced him to CEO of '1212' call centre who then promised to help launch his start-up. His social network in Myanmar healthcare sector including his two sibling doctors would support this m-health implementation.

According to multiple expert interviewees in both countries, it is impossible without any form of **partnership**. UKE#3 asserted, the start-up should link and work with large hospitals. UKE#4 alleged, call centres may also be partners as similar service providers can complement each other. MME#2 supported the need to deal with MOH and MPT. UKE#2 urged that the enterprise should establish:

> *"…a partnership with someone else who's got a license to develop it in Myanmar. Constructing these things from nothing is really challenging."*

In conformity with the interview responses, four types of potential partner were discovered (Figure-26).

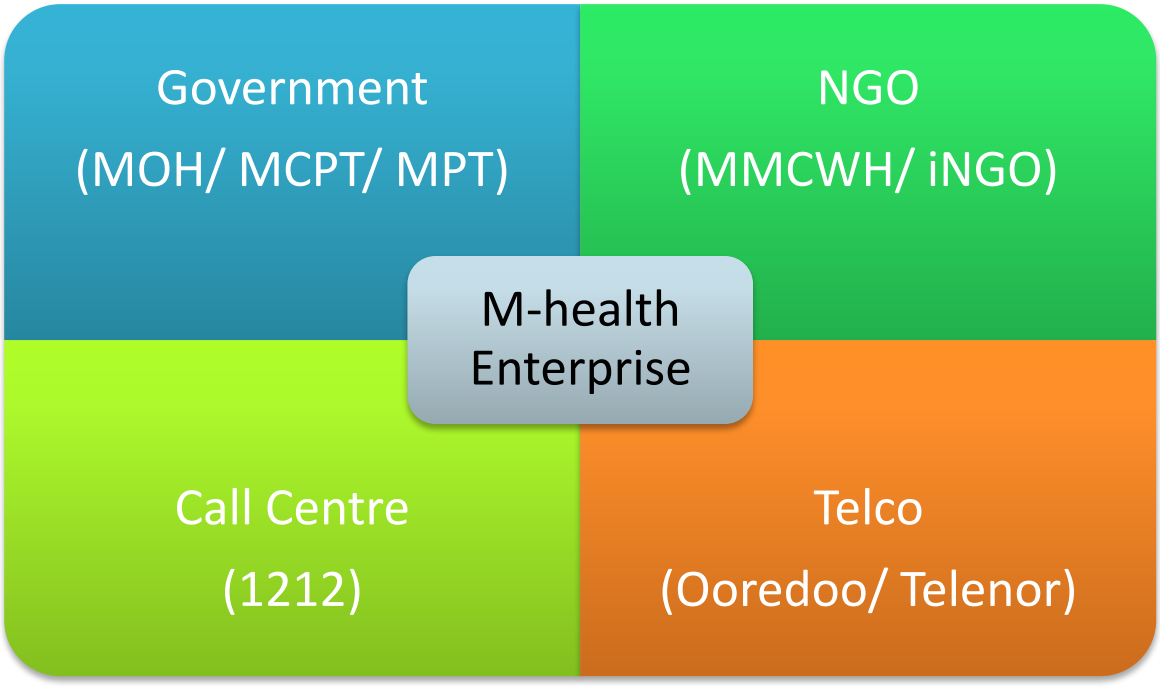


Figure-26. Four types of potential partner (Public/ Private)

The government's motivation is to reduce the cost of national healthcare. If m-health enterprise can be of assistance, the government will fund it (UKE#5). These policy makers are the first stakeholders. Taylor (2012, p.235) articulates, in Myanmar:

> *"Many of the problems which plagued earlier regimes persist. The bureaucracy is constrained by unwieldy and often contradictory rules and regulations. Initiative is rarely taken for fear of chastisement if a decision results in a negative outcome."*

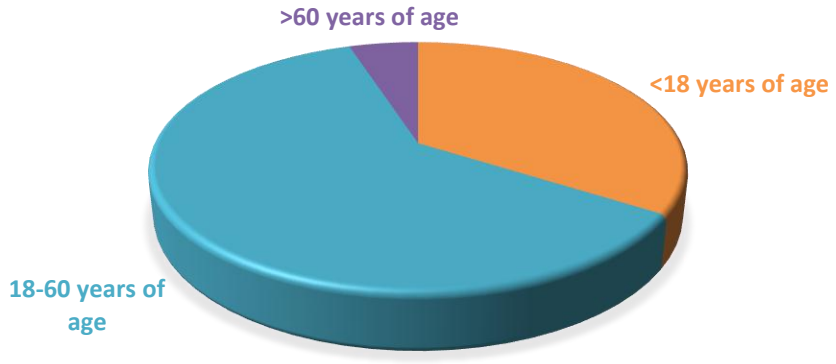
Since m-health concerns the safety of public health, the consequences are tremendous. M-health venture will not materialise without the approval of all regulatory processes.

5.2.3 Place

It can be assumed as a *Blue Ocean Strategy* (Kim and Mauborgne, 2005) because some m-health initiatives are still uncontested in Myanmar. This market is attractive due to potential 60 million customers who require m-health services. First target customers are urban dwellers, extending to rural areas as mobile density rises. The customer is the person who pays for the service. Hence, our customers are end-users, charged slightly above normal call rate (Appendix-10C) through mobile money system like 'M-Pesa' or monthly phone bills under MPT or prepaid top-up cards with the aid of a partner.

Regarding customer segmentation, **young** adult **women** are targeted because female participants in Myanmar were noticed to be more inquisitive, and easier to gain trust than male interviewees. They *want* and *need* reproductive and maternal healthcare information. Furthermore, female population is slightly greater in Myanmar (Table-2).

Figure-27. Proportion of Myanmar population (WHO, 2011)



In Section-2.4, Shah and Cook (2008) reported, the aged telephoned NHS Direct less, although they mostly need healthcare services. Old Myanmar interviewees were observed to be less familiar to m-health services and electronic gadgets (handset functions) with lesser usage of mobiles. As stated by Myanmar participants, the callers who enquire about RMNCH would be their descendants.

In analysis of industry, all physical healthcare units are indirect competitors (alternative sources). Directly, there are a handful of companies and individuals striving for m-health with unsuccessful outcomes. These include health sections of general call centres (*1875, 1876* and *1212*), and RH hotlines under MOH and some NGOs. However, the former cannot pay enough attention to the health industry, and the latter lacks CSFs (eg, 24-hour service). Poor marketing also resulted in low awareness. Thus, many potential customers and m-health initiatives remain underserved by the incumbents. This forms the gap for the enterprise to exploit.

5.2.4 Process

M-health enterprise is structured as a 24-hour call centre where key employees are medical personnel who will work as telephone operators. Certified nurses who have considerable clinical experience and communication skills are employed as front-line staff on flexible shifts to avoid sedentary lives. Registered GPs and specialists are hired as consultant doctors on a part-time basis to reduce cost. Intensive training for verbal skills is delivered beforehand and then monthly.

When receiving calls, an available nurse answers and records the callers' personal information (after introducing herself and explaining to them about maintaining their confidentiality) in a central database (OpenMRS), followed by history-taking using decision support systems. Preset computerised protocol then automatically generates medical advice. In difficult cases identified after triage, nurse operators can consult a related specialist and call the patient back instantaneously.

Workload will be distributed as necessary during busy and quiet hours. Aside from monthly wages, highly-rated medical personnel, about whom customers can give feedback without charge after their call, earn a bonus.

The main services involve information enquiries about healthcare facilities, and RMNCH consultation. To prevent legal consequences, the helpline itself does not diagnose the patient, and **ePrescription** is available only for common ailments and emergencies.

However, there are contract agreements with third party organisations (eg, polyclinics, GPs) across the country. Should any face-to-face physical examination and/or laboratory investigation be required, the patient is referred to recommended healthcare units nearby providing a full address. These units are notified about patient arrival passing patient details recorded in EMRs, thereby saving 'golden minutes'.

Moreover, third parties' physical medical records can be transferred to our system. Their jobs to send messages (eg, **follow-up/appointment reminders**) to their patient list in the database are accepted. Commission fees are charged, including pharmacies from which the helpline recommends patients to buy. Other m-health applications like **monitoring NCDs** will also be implemented when the drivers are approving and CSFs are sustained.

The whole process of proposed m-health enterprise is depicted as the following conceptual framework.

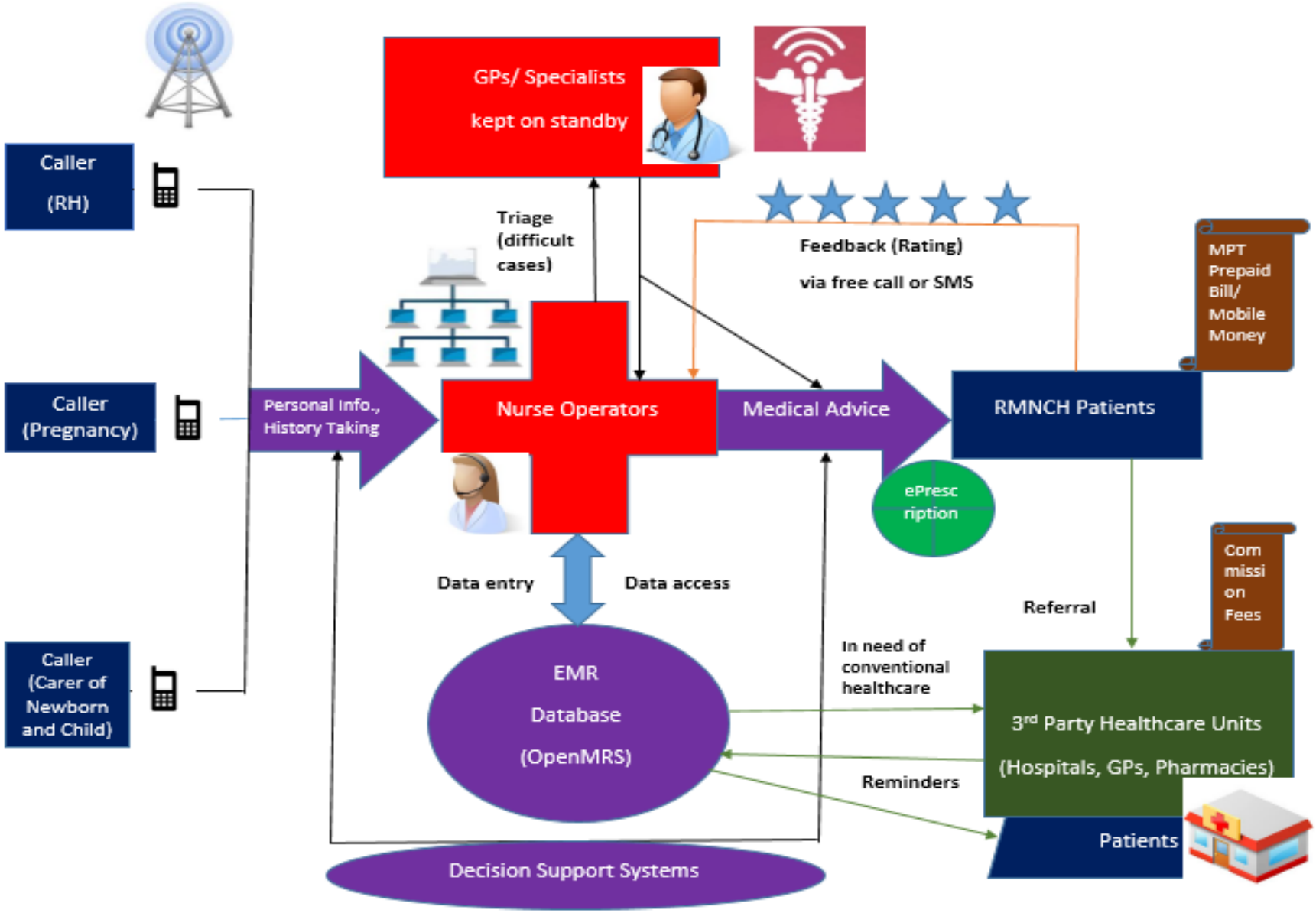
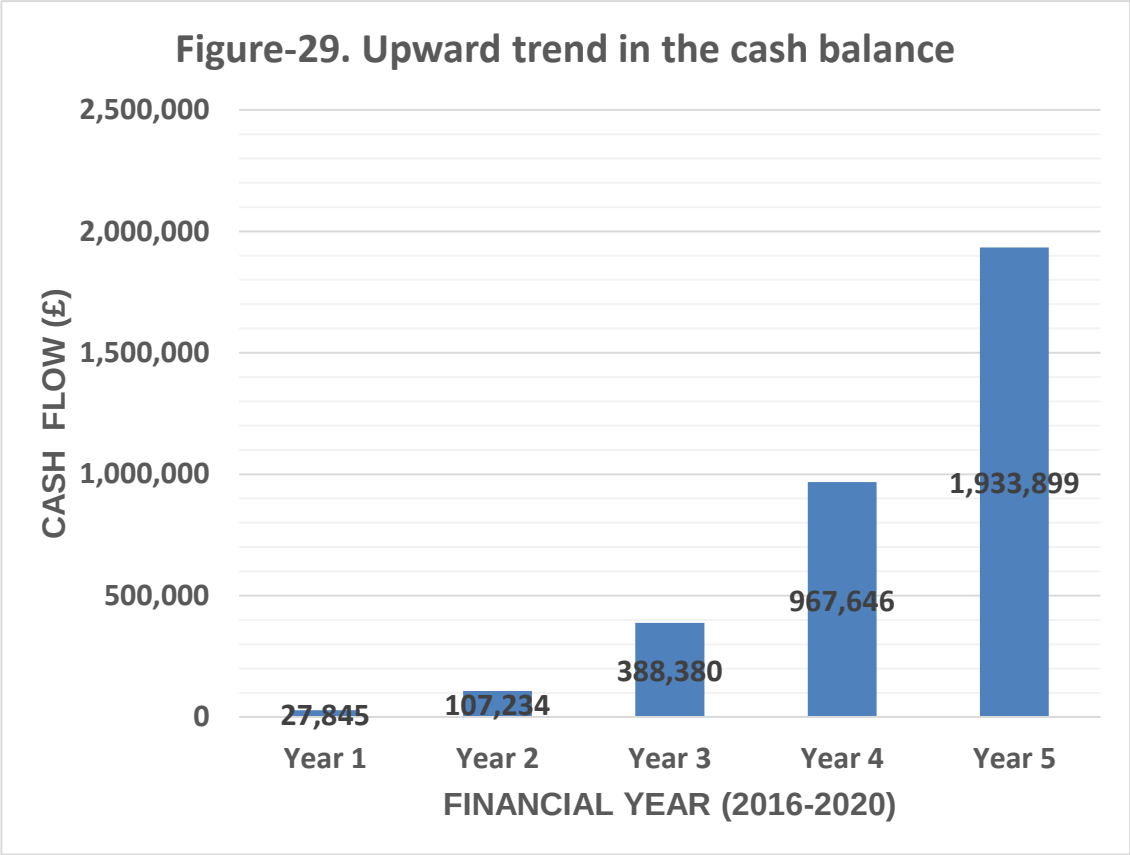


Figure 28. Process (Conceptual Framework) of 24-hour m-health service provision in the form of a call centre

5.2.5 Profit

Without healthy profit potential as in health e-commerce companies (Appendix-10A), investors may not finance this m-health project which requires a massive capital. The enterprise will strive to raise at least £100,000 by the possible sources of finance including the government (Appendix-10B) by the end of 2015. In *budgeting*, expenses entail high-grade employees, computers, marketing, training, rent (premises) and other resources. Based on **financial analysis**, *Assumptions Sheet* and *Cash Flow Forecast* were produced (Appendix-10C).

The revenue projections are considerably impressive, indicating an upward trend along with the increased helpline usage. In the first two years with low earnings, the start-up must struggle for its survival. Nonetheless, it is assumed to be followed by a dramatic rise in cash from revenue, partly contributed by third party organisations, reaching above £1.9 million *closing bank balance for the year ended 31 December 2020*, as demonstrated in Figure-29.



Additionally, the social returns from satisfying the health needs of 60 million populace in a low-income nation like Myanmar will be even more gratifying.

The financial benefits must outweigh the cost. Otherwise, it will not be sustainable, as claimed by UKE#3. Huge start-up investment and IT infrastructure make exit barriers high in this industry. Once implemented, the m-health enterprise should continue servicing no matter what barriers to success it may face.

In summary, Chapter-4 and OBM of data analysis part have addressed the research questions by means of the data collected. The participants' responses have helped accomplish the aims and objectives of this dissertation.

6.0 Conclusions

Overall, the previous chapters serve to support the answer that the realised new venture opportunity for implementing m-health in Myanmar **can** and **should** be exploited. The enterprise is recommended to help diminish the leading clinical gap in Myanmar (RMNCH) by the promise of m-health according to the outcomes of this research.

6.1 Limitations

Nevertheless, before implementing m-health relying on this study, its imperfections have been discerned.

(a) Data collection in Myanmar was assisted by other interviewers owing to the distance of the two locations which the research scope encompassed. Despite their previous experience, the interviewees' responses may vary according to individual approach of interviewers, which will not occur if there is only one interviewer.

(b) Poor internet connection in Myanmar delayed the transfer of voice recordings, and communication and coordination between the author and four interviewers, thereby limiting research progress.

(c) The sample size is disproportionate amongst four strata. Only three users in the UK is too few to enable comparison with 22 users/potential users in Myanmar.

(d) With purposive sampling method, the participants in Myanmar will not fully represent 60 million population.

(e) The researcher, being a national of the country researched, might lead to unconscious bias towards the feasibility of own business model.

6.2 Forthcoming Steps

In order for a m-health venture to be launched and developed successfully in Myanmar, the following set of next steps are recommended for exploiting this realised opportunity of interest. The m-health entrepreneur must:

(1) Conduct *further* quantitative and latest market *research* in Myanmar to calculate the risk.

Prepare a detailed business plan taking into account all the relevant issues this study has highlighted, and formulate a viable **proposition** judiciously for long term.

(2) Use '**people** in his/her social network' calling attention to both international and domestic investors to raise the required capital.

Establish a partnership with a public and/or private organisation to get funded or complement each other. Even with a potential competitor like 1212, collaboration should be made before competition. This can be achieved, for example, by the author's extensive social network containing family support.

Act as an advocate of m-health potential to acquire the steadfast commitment from policy makers and obtain legislative endorsement. The m-health project will be of benefit to all stakeholders creating a 'win-win' situation.

(3) Take no delay because the competitors, regarding **place,** might have already exploited this attractive opportunity.

Publicise m-health benefits via those mass media marketing strategies (Table-6) countrywide.

Sensitise prospective customers and some medical professionals' traditional mindset to adopt m-health as a routine procedure of conventional healthcare towards outpatient culture.

(4) Allocate the firm's resources and employ nurses, doctors and a technical team capable of operating the EMR system to run the **process** of OBM.

Commence training to improve digital literacy and communication skills of the medical operators.

(5) Accomplish other CSFs to overcome the barriers to success, and sustain them to generate both healthy financial and social **profit**.

Become a fruitful entrepreneurial service provider that fulfils the healthcare needs of the poor.

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8.0 Appendices

Appendix-1

Acronyms and Abbreviations

Abbreviation	Expanded Form
3G	Third Generation mobile telecommunications
4G	Fourth Generation mobile telecommunications
A&E	Accident and Emergency
AIDS	Acquired Immunodeficiency Syndrome
BIRT	An open source technology platform used to create data visualizations and reports that can be embedded into rich client and web applications
CHW	Community Health Worker
CIAWCH	Commission on Information and Accountability for Women's and Children's Health
CSFs	Critical Success Factors
DALY	Disability-Adjusted Life Year
e-health	Electronic health
EMR	Electronic Medical Records

GBP	British pound sterling
GDP	Gross Domestic Product
HE	Health Education
HIV	Human Immunodeficiency Virus
HL7	Health Level Seven (a standard for exchanging information between medical applications)
HTML	Hyper Text Markup Language
ICT	Information and Communication Technologies
IMF	International Monetary Fund
LDCs	Less-developed Countries
MAMA	Mobile Alliance for Maternal Action
MCPT	Ministry of Communications, Posts and Telegraph, Myanmar
m-health/ M-health/ mHealth	Mobile health
MMCWA	Myanmar Maternal and Child Welfare Association
MMK	Myanmar Kyat
MMR	Maternal Mortality Rate
MOH	Ministry of Health, Myanmar
MPT	Myanmar Post and Telecommunications
NCDs	Noncommunicable Diseases
NGO	Non-governmental Organisation
OBM	Opportunity Business Model

OECD	Organisation for Economic Co-operation and Development
PHS	Pfizer Health Solutions
RH	Reproductive Health
RMNCH	Reproductive, Maternal, Newborn and Child Health
SIM	Subscriber Identity Module
SMS	Short Messaging Service
SQL	Structured Query Language
STIs	Sexually-transmitted Infections
TB	Tuberculosis
TOTESC	Telecommunication Operator Tender Evaluation and Selection Committee
UK	The United Kingdom
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
US	The United State of America
WHO	World Health Organization
XML	Extensible Markup Language

Appendix-2

An Example of NHS Direct Protocols

(Turner et al., 2007, p. 28)

Managing some 999 calls by NHS Direct nurse advisers

Consent protocol for category C calls selected for transfer to a nurse advisor

For calls with study AMPDS codes fulfilling entry criteria and selected for a nurse assessment response.

EMD

'From the details you have given it may be better to speak to a nurse adviser at NHS Direct. We are doing some research on this at the moment and I can transfer you directly. If the nurse believes an ambulance is necessary one will be sent to you. May I transfer you now?'

If YES		**If NO**	
'I will transfer you to NHS Direct. Just hold the line while I pass your details to the nurse.' If picked up by nurse within 90 seconds give handover details and end call. If not picked up in 90 seconds return to caller: 'Hello, I am afraid all the nurses are busy at the moment so I'm organising help for you now. However, to help our research we would like to send you a questionnaire in a few days to ask you what you think about our service. Is that OK?'		'That's OK. I'm organising help for you now.' After post-dispatch instructions: 'To help our research we would like to send you a questionnaire in a few days to ask you what you think about our service. Is that OK?'	
If YES	**If NO**	**If YES**	**If NO**
'Thank you. If you would like more information about the research I can send you some details.' Take contact details (name, postcode, house number and telephone number) for follow-up questionnaire and end call.	'That's fine.' End call.	'Thank you. If you would like more information about the research I can send you some details.' Take contact details (name, postcode, house number and telephone number) for follow-up questionnaire and end call.	'That's fine.' End call.

where:

Category C (non-urgent or low-priority calls) which do not require an immediate ambulance response, and may be potentially appropriate for a range of alternative responses (p. 17);

AMPDS stands for the Advanced Medical Priority Dispatch System, the EMD system for call prioritisation used in all the study ambulance services (p. 14); and

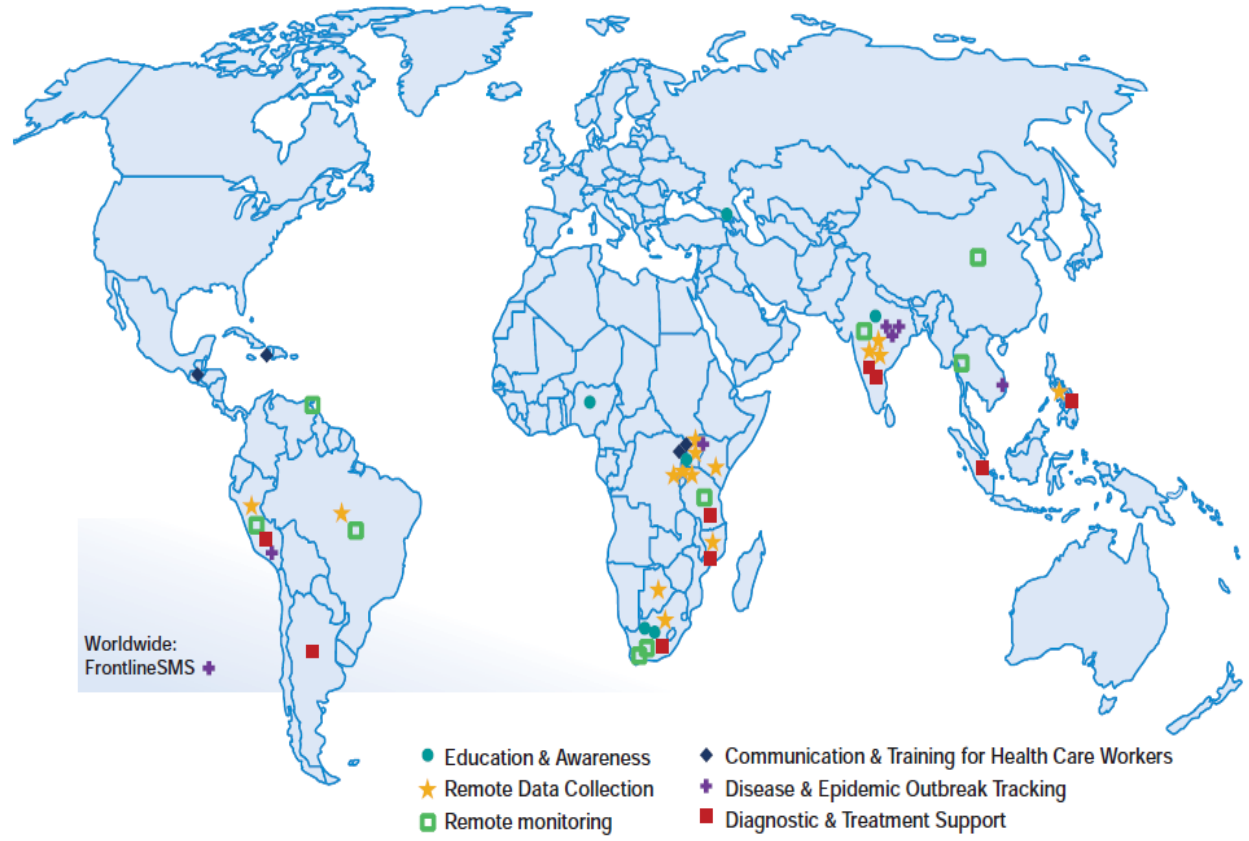
Computerised Emergency Medical Dispatch (**EMD**) systems provide a structured set of questions which call-takers use to assess the urgency of the call. At the end of the call a dispatch code is assigned based on clinical condition and urgency. This is then used to direct the type of response required. This means that services now identify calls classified as non-urgent, allowing exploration of alternative methods of management of these calls (pp. 9-10).

Source: Turner et al. (2007)

Appendix-3

Distribution of M-health Programs by Location and Application Area

(Vital-Wave-Consulting, 2009, p.10)



"The mHealth project case studies are organised by primary application area, from least specialised (education and awareness) to most specialised (diagnostic and treatment support). Although several projects offer multiple applications, they are categorised here by their more specialised function, along with their examples of practical interventions.

Education and Awareness

SMS messages are sent directly to users' phones to offer information about testing and treatment methods, availability of health services, and disease management…SMS message campaigns can be set up either as one-way alerts or interactive tools used for health-related education and communication…to promote maternal health and educate youth about reproductive health.

1. Learning about Living, Nigeria
2. Project Masiluleke, South Africa
3. **Text to Change (TTC)** – HIV Prevention through SMS Quiz, Uganda

Remote Data Collection

In the developing world, collecting field information is particularly important since many segments of the population are rarely able to visit a hospital, even in the case of severe illness. The data collection process is more efficient and reliable if conducted via smartphones, Personal Digital Assistants, or mobile phones rather than paper-based surveys that must be submitted in person and manually entered into the central health database.

1. Community Health Information Tracking System (CHITS), Philippines

2. Integrated Healthcare Information Service through Mobile Telephony (IHISM), Botswana

3. Media Lab Asia – Shared Resource for Rural Health Management and Information Infrastructure, India

Remote Monitoring

Remote monitoring opens new possibilities for treating patients in an outpatient setting, a crucial capability in developing countries where access to hospital beds and clinics is limited. This group of applications consists of one- or two-way communications to monitor health conditions, maintain caregiver appointments, or ensure medication regimen adherence.

Remote monitoring applications are being implemented on a relatively limited basis in developing countries, but they are gaining traction in the developed world, particularly for chronic diseases.

1. Chinese Aged Diabetic Assistant (CADA), China

2. Mobile Phones for Health Monitoring, India and the United Kingdom

3. Phoned Pill Reminders for TB Treatment, Thailand

Communication and Training for Healthcare Workers

Connecting health workers with sources of information via mobile technology is a strong basis for empowerment, as it provides the support they need to perform their functions effectively and self-sufficiently.

Mobile phones can help bridge these communications gaps that in the health context can often mean the difference between lives lost and lives saved.

1. Enhancing Nurses Access for Care Quality and Knowledge through Technology (ENACQKT), the Caribbean
2. HealthLine, Pakistan
3. Mobile HIV/AIDS Support, Uganda

Disease and Epidemic Outbreak Tracking

Deployment of mobile devices, with their ability to quickly capture and transmit data on disease incidence, can be decisive in the prevention and containment of outbreaks…as an early warning system, allowing public health officials to monitor the spread of infectious diseases.

1. FrontlineSMS, Worldwide
2. Handhelds for Health, India
3. Remote Interaction, Consultation, and Epidemiology (RICE), Vietnam

Diagnostics and Treatment Support

mHealth applications in this area are designed to provide diagnosis and treatment advice to remote healthcare workers through wireless access to medical information databases or medical staff. With mHealth-enabled diagnostics and treatment support, patients are able to receive treatment in their villages and homes, averting the need for expensive hospital visits, which are beyond reach for many.

Diagnostic and treatment applications use the phone as a point-of-care device. Health workers' phones are typically equipped with specialised tools, such as built-in software that leads the worker through a step-by-step diagnostic process. Once data are entered into the system (e.g., symptoms and an image of a patient's injury captured on the mobile phone), remote medical professionals can diagnose the illness and prescribe treatment. By eliminating the need for patient travel, these applications have the potential to dramatically increase access to care.

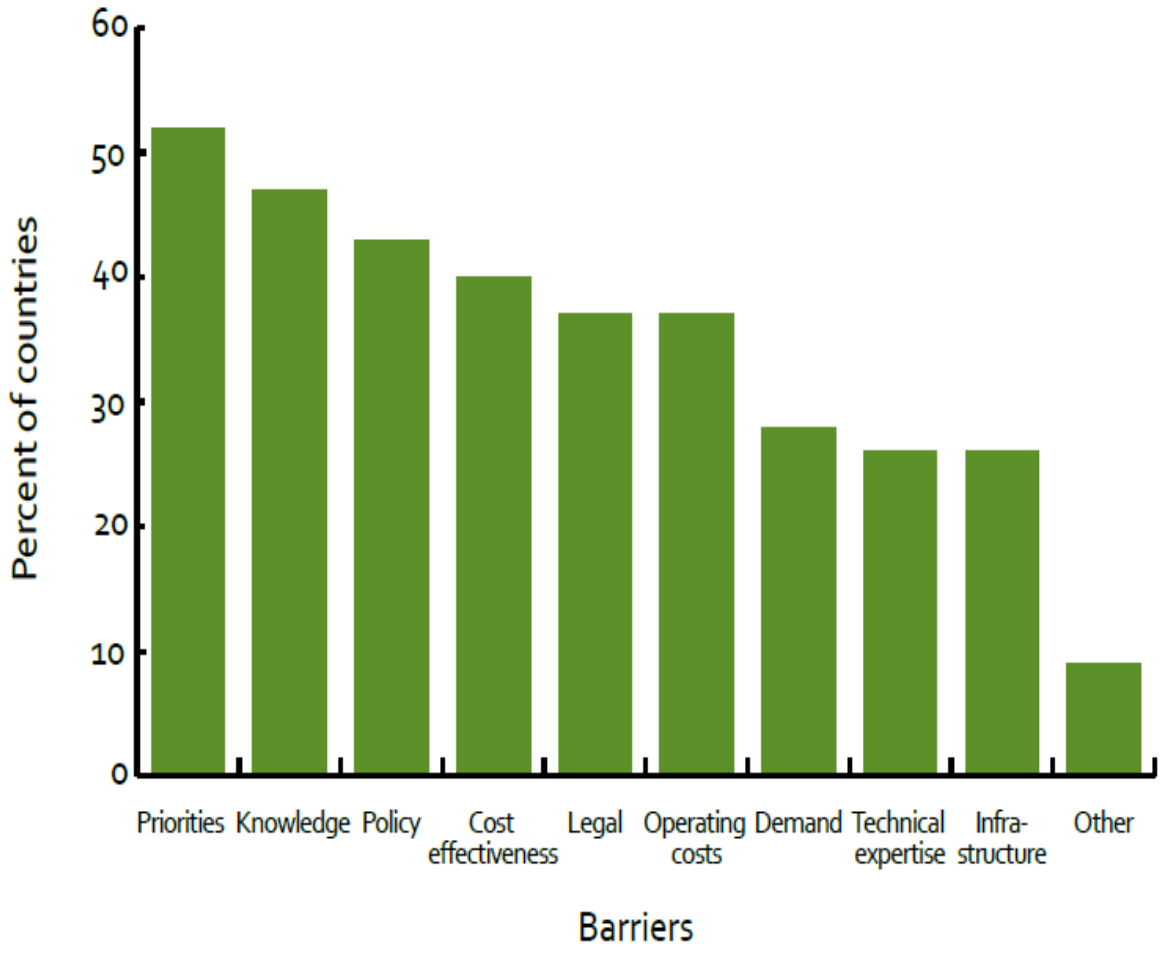
1. Ericsson and Apollo Hospitals Initiative, India
2. Mobile Telemedicine System, Indonesia
3. Teledoc - Jiva Healthcare Project, India"

Source: Vital Wave Consulting (2009, pp. 9-14; 39-40)

Appendix-4

Barriers to M-health Implementation, Globally

(WHO-Global-Observatory-for-eHealth, 2011, p. 64)



One hundred and twelve countries (58% of all WHO Member States) participated in the m-health section of the 2009 global survey, where the UK responded and Myanmar did not. The responding countries were asked to choose the four most important barriers to m-health implementation in their respective countries out of nine options as shown in this bar chart.

"Key findings

- Approximately half of responding Member States (53%) reported competing health system priorities as their top barrier.
- Globally, infrastructure was cited as the least important barrier (26%).
- Similar trends were found in countries in the high, upper-middle, and lower-middle income groups; they all reported competing priorities, cost-effectiveness and lack of knowledge as their most important barriers."

"Most health systems are severely overburdened. This means they are constantly challenged by the need to make difficult decisions about **competing priorities** ... funding is allocated to other programmes ahead of m-health, or can reflect a lack of general interest or understanding of the field."	"The **lack of knowledge** concerning the possible applications of m-health and public health outcomes … highlights the need for evaluation studies of m-health applications across a range of settings and target groups."
"…country or regional e-health **policy** not recognising m-health as an approach to health-related issues … m-health is still in a relatively early stage of adoption and development … health information security, patient confidentiality, standardised metrics, and interoperable systems were identified as pertinent policy challenges to overcome before the consideration of m-health as a strategic initiative."	"Most responding countries at the time of the survey did not know the **cost-effectiveness** of available m-health solutions … requires resources alongside operating costs, infrastructure, knowledge, and technical expertise. Most m-health solutions to date are independent, local initiatives. Integrated, interoperable systems are more likely to be the cheapest to deploy and operate, as well as having the most significant impact."

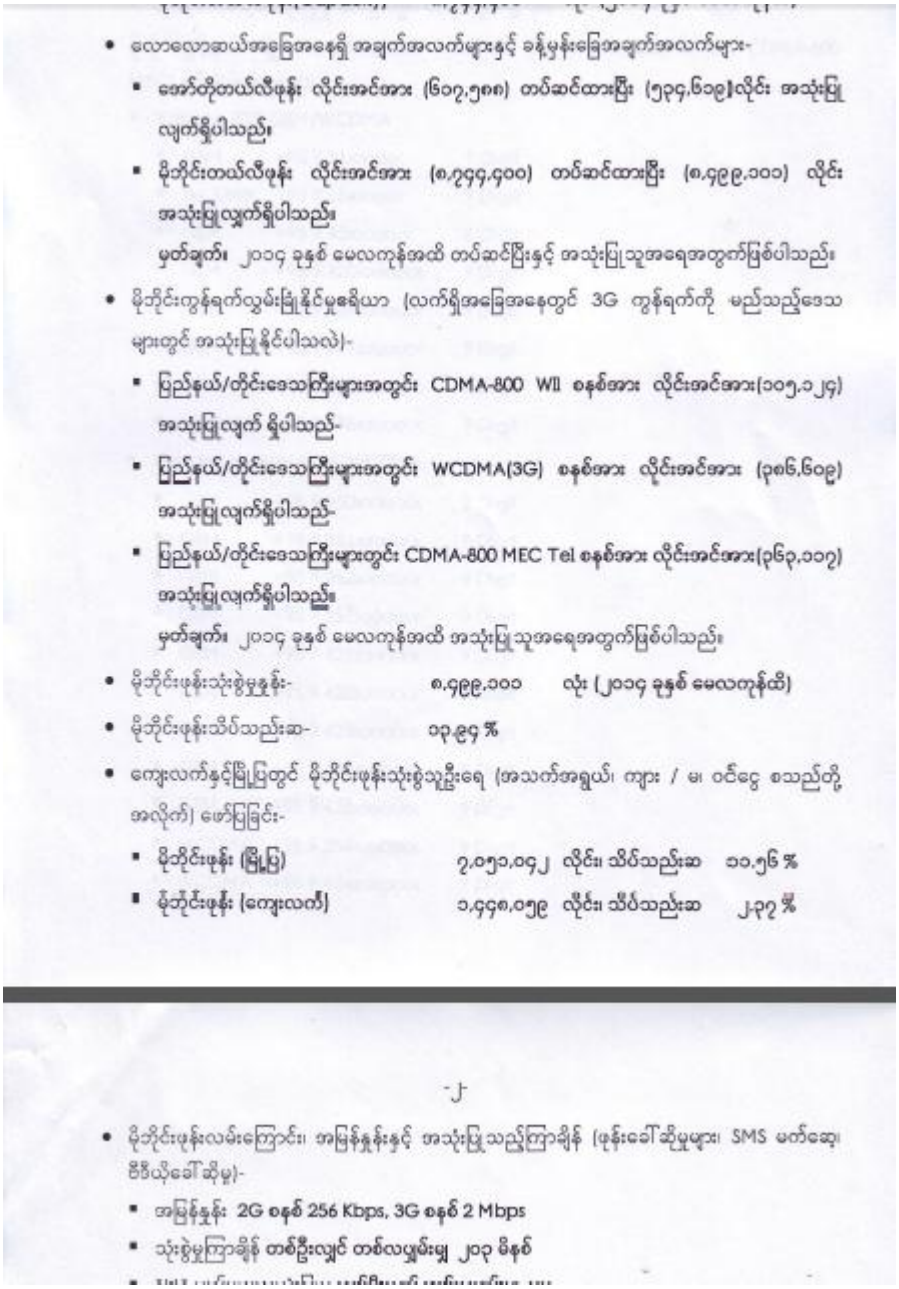
The major four barriers

based on the findings of the global e-health survey

Source: WHO-Global-Observatory-for-eHealth (2011, pp. 63-65)

Appendix-5

Email-attached Data in Burmese, Requested from *the Ministry of Communications, Posts and Telegraph (MCPT)* via Parental Network



- လောလောဆယ်အခြေအနေရှိ အချက်အလက်များနှင့် ခန့်မှန်းခြေအချက်အလက်များ-
  - အော်တိုတယ်လီဖုန်း လိုင်းအင်အား (၆၀၇,၅၈၈) တပ်ဆင်ထားပြီး (၅၃၄,၆၀၉)လိုင်း အသုံးပြုလျက်ရှိပါသည်။
  - မိုဘိုင်းတယ်လီဖုန်း လိုင်းအင်အား (၈,၇၄၄,၄၀၀) တပ်ဆင်ထားပြီး (၈,၄၉၉,၁၀၀) လိုင်း အသုံးပြုလျှက်ရှိပါသည်။

    မှတ်ချက်။ ၂၀၁၄ ခုနှစ် မေလကုန်အထိ တပ်ဆင်ပြီးနှင့် အသုံးပြုသူအရေအတွက်ဖြစ်ပါသည်။
- မိုဘိုင်းကွန်ရက်လွှမ်းခြုံနိုင်မှုဧရိယာ (လက်ရှိအခြေအနေတွင် 3G ကွန်ရက်ကို မည်သည့်ဒေသများတွင် အသုံးပြုနိုင်ပါသလဲ)-
  - ပြည်နယ်/တိုင်းဒေသကြီးများအတွင်း CDMA-800 WII စနစ်အား လိုင်းအင်အား(၁၀၅,၁၂၄) အသုံးပြုလျက် ရှိပါသည်-
  - ပြည်နယ်/တိုင်းဒေသကြီးများအတွင်း WCDMA(3G) စနစ်အား လိုင်းအင်အား (၃၈၆,၆၀၉) အသုံးပြုလျက်ရှိပါသည်-
  - ပြည်နယ်/တိုင်းဒေသကြီးများတွင်း CDMA-800 MEC Tel စနစ်အား လိုင်းအင်အား(၃၆၃,၁၀၇) အသုံးပြုလျက်ရှိပါသည်။

    မှတ်ချက်။ ၂၀၁၄ ခုနှစ် မေလကုန်အထိ အသုံးပြုသူအရေအတွက်ဖြစ်ပါသည်။
- မိုဘိုင်းဖုန်းသုံးစွဲမှုနှုန်း- ၈,၄၉၉,၁၀၀ လုံး (၂၀၁၄ ခုနှစ် မေလကုန်ထိ)
- မိုဘိုင်းဖုန်းသိပ်သည်းဆ- ၁၃.၉၄ %
- ကျေးလက်နှင့်မြို့ပြတွင် မိုဘိုင်းဖုန်းသုံးစွဲသူဦးရေ (အသက်အရွယ်၊ ကျား / မ၊ ဝင်ငွေ စသည်တို့အလိုက်) ဖော်ပြခြင်း-
  - မိုဘိုင်းဖုန်း (မြို့ပြ) ၇,၀၅၁,၀၄၂ လိုင်း သိပ်သည်းဆ ၁၀.၅၆ %
  - မိုဘိုင်းဖုန်း (ကျေးလက်) ၁,၄၄၈,၀၅၉ လိုင်း သိပ်သည်းဆ ၂.၃၇ %

-၂-

- မိုဘိုင်းဖုန်းလမ်းကြောင်း၊ အမြန်နှုန်းနှင့် အသုံးပြုသည့်ကြာချိန် (ဖုန်းခေါ်ဆိုမှုများ၊ SMS မက်ဆေ့၊ ဒီဇီယိုခေါ်ဆိုမှု)-
  - အမြန်နှုန်း 2G စနစ် 256 Kbps, 3G စနစ် 2 Mbps
  - သုံးစွဲမှုကြာချိန် တစ်ဦးလျှင် တစ်လပျမ်းမျှ ၂၀၃ မိနစ်

Appendix-6

Four Sets of Interview Questions and Protocol

M-HEALTH RESEARCH PROJECT

MSc DISSERTATION

INTERVIEWS

JULY 2014

These interviews are conducted by/ on behalf of [redacted], in order to complete his dissertation in part fulfilment of the requirements for the degree of Master of Science Management in September 2014. For any concern or query, the researcher can be reached via [redacted]. The responses shall be kept as anonymised quotes in publications.

Motivation and summary of this study

A large proportion of Myanmar population in rural areas (70% of more than 60 million) have limited access to healthcare services. **Mobile Health (m-health)** is mobile ICT for healthcare which is an emerging wireless electronic health system via 2.5G, 3G and 4G mobile networks (Istepanian et al., 2006). Simply speaking, it is the provision of healthcare services through mobile devices.

M-health is assumed by the researcher as a nationwide-accessible tool to leapfrog and rapidly improve the entire healthcare system. Overcoming geographical boundaries, patients can consult urban medical professionals about any health-related issue and obtain interactive advice through real-time information system. Even a health call centre would change the lives of many Myanmar citizens, as proved in other developing countries (eg, in Africa).

Some examples of m-health applications involve counselling, treatment support and consultation in psychiatry, pregnancy, reproductive and sexual health, emergencies, remote monitoring of chronic diseases, vaccination, photo diagnosis in dermatology, pharmaceutical information enquiry, health education, hospital follow-up, appointment reminders, training of community health workers, epidemic outbreak tracking, etc.

1st Stratum

QUESTIONS FOR M-HEALTH EXPERTS IN THE UK

(SERVICE PROVIDER PERSPECTIVES)

For the purpose of personal identification

1. First of all, please tell me your experience in m-health (job position).

Futuristic benefits

1. What are your views on current m-health/ telehealth/ e-health in the UK?

   What could be the next market trend? What does the future scenario look like?

2. To what extent do you think the development of ICTs in health will be of significant benefit to the rural community in developing countries?

   How long will it take to adopt m-health by all stakeholders including the government and general public?

3. Where is m-health more advantageous and effective, developed or less-developed countries (LDCs), and urban or rural areas?

4. (Refer to the last paragraph on page 1 and let them read the examples of m-health or read them out to the expert.)

Of these m-health applications, in which area will m-health implementation be the most useful and successful in a LDC like Myanmar? What is your opinion of m-health in Reproductive Health, Maternal, Newborn and Child Health (RMNCH)?

5. The usage of a wide variety of apps is growing every day in advanced economies. How will you predict this trend in a LDC like Myanmar?

Critical Success Factors (CSFs) and barriers to success

Although m-health enterprises can range from health call centres (helplines) to firms developing apps, advanced technologies and wearable devices, the researcher tends to think that, m-health implementation via basic voice calls and SMSs might be the most feasible in Myanmar at the moment as the internet coverage is still very low.

6. What are the CSFs for a m-health helpline like NHS Direct?
   Which one is the most important?

Probe: Which CSFs you've just mentioned may help it in developing countries too?

7. M-health (telehealth/ e-health) has been widely implemented in the developed world, but many projects barely meet the targets.
   Why? What are the major barriers to success?

Probe: Which barriers here may apply to developing countries too?

8. What do you consider the impact of traditional face-to-face treatment on m-health implementation?

9. How important is patient confidentiality issues in m-health?
   How can they be controlled effectively?

Privatisation of m-health

10. Most m-health projects in developing countries are related to public health, and not-for-profit organisations or the government. How can they be applied in a private company and generate profit? Will new enterprises in m-health be beneficial?

11. In the implementation and setting up a m-health enterprise, what is your opinion on the need of technical expertise and healthcare professionals at the enterprise?

12. Which factors will make new m-health call centre sustainable for longer term?

2nd Stratum

QUESTIONS FOR M-HEALTH EXPERTS IN MYANMAR

(SERVICE PROVIDER PERSPECTIVES)

(Translation)

For the purpose of personal identification

1. First of all, please tell me your experience in ICT/ Health (job position) and/ or experience with counselling via the phone at work {only for telephone counsellors}

Futuristic benefits

2. To what extent do you think the development of ICT in health (m-health/ telehealth/ e-health) will be of significant benefit to the rural community in Myanmar?

   How long will it take to develop such advanced ICT in Myanmar and to adopt m-health by all stakeholders including the government and general public?

3. What could be the market trend of m-health in Myanmar?

   What does its future scenario look like?

   Can you predict the extent of mobile development Telenor and Ooredoo will bring next year? Will they really accomplish their promised targets committed countrywide in time? (eg, 90% mobile penetration)

4. Where is m-health more advantageous and effective, developed or developing countries, and urban or rural areas?

   Which will be more useful, voice calls or SMSs?

5. (Refer to the last paragraph on page 1 and let them read the examples of m-health or read them out to the expert.)

   Of these m-health applications, in which area will m-health implementation be the most useful and successful? What is your opinion of m-health in Reproductive Health, Maternal, Newborn and Child Health (RMNCH)?

Critical Success Factors (CSFs) and barriers to success

Although m-health enterprises can range from health call centres (helplines) to firms developing apps, advanced technologies and wearable devices, the researcher tends to think that, m-health implementation via basic voice calls and SMSs might be the most feasible in Myanmar at the moment as the internet coverage is still very low.

6. What are the CSFs for a m-health helpline?

   Which one is the most important?

7. What could be the major barriers to success to implement m-health helpline in Myanmar?

8. What do you consider the impact of traditional face-to-face treatment on m-health implementation?

9. How serious is patient confidentiality issues in m-health? How can they be controlled effectively?

Privatisation of m-health

10. Most m-health projects in developing countries are related to public health, and not-for-profit organisations or the government. How can they be applied in a private company and generate profit? Will new enterprises in m-health be beneficial?

11. In the implementation and setting up a m-health enterprise, what is your opinion on the need of technical expertise and healthcare professionals at the enterprise?

12. Which factors will make new m-health call centre sustainable for longer term?

3rd Stratum

QUESTIONS FOR M-HEALTH USERS IN THE UK

(CUSTOMER PERSPECTIVES)

Please first explain the ***Motivation and summary of this study*** mentioned above to the participant to introduce m-health to him/ her.

Personal identification

1. First of all, can you tell me a bit about yourself (Demography: occupation, education, (income), age, city of residence?

   Tell me briefly about your residential area nearby in terms of telecommunications, healthcare facilities and transport.

Mobile phones

2. Do you usually use mobile phone?

   Is your mobile device smart phone or simple one?

   How often do you use it each day (making phone calls/ messaging)? Do you prefer talking on the phone or texting?

   Apart from these, do you use your mobile for other purposes? Do you like to install apps {only for smart phone users}?

Probe: What about healthcare apps?

Healthcare behavior

3. Do you or anybody in your family have to go to healthcare centres regularly?

   Do you often enquire health-related information? What kind of healthcare service do you often want?

4. When you get sick, what do you usually do to relieve the symptoms?

   What about a 24-hour health call centre, which remotely provides healthcare information, charged slightly more than normal call rates? Will you ring it straight away instead of the options you have mentioned?

Experience with m-health

5. Have you ever called a helpline (eg, NHS DIrect) before?

If 'no': Are you even aware of its presence?

How many hotline numbers do you know?

If 'yes':For which reasons did you call it?

Why didn't you go to a doctor?

Did the service help and satisfy you? How should it improve?

How often do you call it?

6. Under which kind of situations will you use the helpline?

   (Refer to the last paragraph on page 1 and explain the examples of m-health to the user.)

   Of these examples of m-health applications, which category will be the most useful to you? What about the cases of pregnant women, infants and adult reproductive health?

Critical Success Factors (CSFs) and barriers to success

7. While m-health saves time and money, how important is the traditional face-to-face treatment or doctor-patient relationship to you?

   Which one will you prefer if you can get required medical advice through a phone call?

8. How serious is your confidential information to you? Will you mind if a private company keeps your personal medical records? Will you trust it and the operator to disclose your personal information?

9. Which factors of a health call centre will make you satisfy with it? (CSFs)

10. Which factors will make you continue using those m-health services next time? (Sustainabililty)

11. Which factors will make you hesitate to use those m-health services? (Barriers to success)

    Will you believe the medical advice given by a so-called-nurse on the phone and exactly follow her instructions later on?

Customer feedback

12. For satisfactory cases, will you share the good news of the helpline with your friends?

    For serious mistreatment, will you sue the helpline and operator responsible?

13. Will you be usually patient to wait for a few minutes on the line to get healthcare advice? How many minutes in maximum can you wait for it? How about calling back period?

14. How importantly does the operator being doctor, nurse, or ordinary person matter to you despite providing healthcare information through computerised system?

15. Do you think your responses represent most of your community members around you? Will they have the same opinions on m-health as yours?

4th Stratum

QUESTIONS FOR M-HEALTH USERS/ POTENTIAL USERS IN MYANMAR

(CUSTOMER PERSPECTIVES)

(Translation)

Please first explain the ***Motivation and summary of this study*** mentioned above to the participant to introduce m-health to him/ her.

Personal identification (only to distinguish Socio-Economic Status high/middle/low and urban/ rural residence)

1. First of all, can you tell me a bit about yourself (Demography: occupation, education, (income), age, city/village of residence?

   Tell me briefly about your residential area nearby in terms of telecommunications, healthcare facilities and transport.

Mobile phones

2. Do you usually use mobile phone?

If 'yes':Is that your own or shared one with others?

Is your mobile device smart phone or simple one?

How often do you use it each day (making phone calls/ messaging)?

If 'no': Do you want to use it, if you afford it and network covered in your residential area?

{Current user: Do, Potential users: Will}

Do/ Will you prefer talking on the phone or texting? Apart from these, do/ will you use your phone for other purposes? Do/ Will you like to install apps {only for smart phone users}?

Probe: What about healthcare apps?

Healthcare behaviour

3. Do you or anybody in your family have to go to healthcare centres regularly?

   Do you often enquire health-related information? What kind of healthcare service do you often want?

4. When you get sick, what do you usually do to relieve the symptoms?

   What about a 24-hour health call centre, which remotely provides healthcare information (ie, to answer your queries about all health-related topics and give medical advice as soon as possible), charged slightly more than normal call rates?

   Will you ring it straight away instead of the options you have mentioned?

Experience with m-health

5. Have you ever called a helpline (eg, 1875) before?

If ‘no’: Are you even aware of its presence?

How many hotline numbers do you know?

If ‘yes’:For which reasons did you call it?

Why didn’t you go to a doctor?

Did the service help and satisfy you? How should it improve?

How often do you call it?

6. Under which kind of situations will you use the helpline?

   (Refer to the last paragraph on page 1 and explain the examples of m-health to the user.)

   Of these examples of m-health applications, which category will be the most useful to you? What about the cases of pregnant women, infants and adult reproductive health?

Critical Success Factors (CSFs) and barriers to success

7. While m-health saves time and money, how important is the traditional face-to-face treatment or doctor-patient relationship to you?

   Which one will you prefer if you can get required medical advice through a phone call?

8. How serious is your confidential information to you? Will you mind if a private company keeps your personal medical records? Will you trust it and the operator to disclose your personal information?

9. Which factors of a health call centre will make you satisfy with it? (CSFs)

10. Which factors will make you continue using those m-health services next time? (sustainability)

11. Which factors will make you hesitate to use those m-health services? (Barriers to success)

    Will you believe the medical advice given by a so-called-nurse on the phone and exactly follow her instructions later on?

Customer feedback

12. For satisfactory cases, will you share the good news of the helpline with your friends?

    For serious mistreatment, will you sue the helpline and operator responsible?

13. Will you be usually patient to wait for a few minutes on the line to get healthcare advice? How many minutes in maximum can you wait for it? How about calling back period?

14. How importantly does the operator being doctor, nurse, or ordinary person matter to you despite providing healthcare information through computerised system?

15. Do you think your responses represent most of your community members around you? Will they have the same opinions on m-health as yours?

Consent Form

New Venture Opportunity for Implementing

M-health in Myanmar

[redacted] MSc Management, Leeds University Business School

1. I confirm that I understand what the research is about and have had the opportunity to ask questions.

2. I understand that my participation is voluntary and that I can withdraw at any time without giving a reason.

3. I agree to take part in the research.

4. I agree to my interview being audio-recorded.

5. I agree to the use of anonymised quotes in publications.

Name of participant: Signature:

Name of researcher: Signature:

Date:

Appendix-7

A Complete Transcript (of a Rural Potential User)

(generated via NVivo 10)

Name: Internals\\MMR#1

Created:	8/4/2014 10:47:27 PM
Created By:	SWAM
Modified:	8/6/2014 1:44:52 PM
Modified By:	SWAM
Stored in file:	E:\Dissertation VOICE RECORDINGS\MMR#1.mp3
Format:	MP3
Duration:	29:06.8
Size:	31 MB
Transcript Entries:	15

Question	Timespan	Responses
1	0:00.0 - 3:15.3	*I'm now 25, and I've passed the Matriculation examination. I work in the farm, and live in Myo Gone Village. We use mobiles phones from MPT. The network connection is sometimes poor at home.* *Our place is pretty distant to healthcare centres.* *Transportation is not bad in summer, but in the rainy season, we can't go out in those muddy paths. One of my friends once had abdominal pain, but took 6 hours on the way because of the difficult transportation. And he had that rupture of appendicitis and had to undergo the operation. The doctor said, if he arrived there earlier, the appendicitis can't rupture.*
2	3:15.3 - 5:23.6	*Yes, it's our own mobile, but the whole family members use it at home. I don't text, but frequently make phone calls. I prefer voice calls, because it's too complicated for me to compose a message. I have no idea how to type the correct words. And these budget phones do not have Myanmar font installed. We can't send SMS in Myanmar. So, it's not ok.* *Voice call is easy. Just press the number, say hello and talk about the topic straight away.* *Here, we don't know any healthcare app. Mobiles are just for*

		communication.
3	5:23.6 - 6:17.8	*My mother is suffering from hypertension, and regularly goes to a physician at Nay-Pyi-Taw.* *Yes, I often ask my neighbours who know where to go and which doctor is good in the city. We have no healthcare enquiry centre nearby, so we can't do so anywhere else.*
4	6:17.8 - 7:52.7	*When I'm sick, I first ask a doctor-friend of mine, and he tells me what to do. I don't wait for natural recovery, and also can't go to a clinic.* *If the cost is not expensive and it's available for 24 hours, I will always call, of course. It's like a doctor at home. Small charge for call rate is fine. For example, about the call centres which charge a lot for their service, we can't afford ringing them. It's too much for us. We are just poor villagers. If it's costly, I'll ring the helpline only when it's very urgent.*
5	7:52.7 - 8:13.7	*Yes, I did so once, but it's not for healthcare. I rang a call centre once to enquire about the goal score of a football match in the morning because we don't have 24 hour electricity in the village to watch TV.*

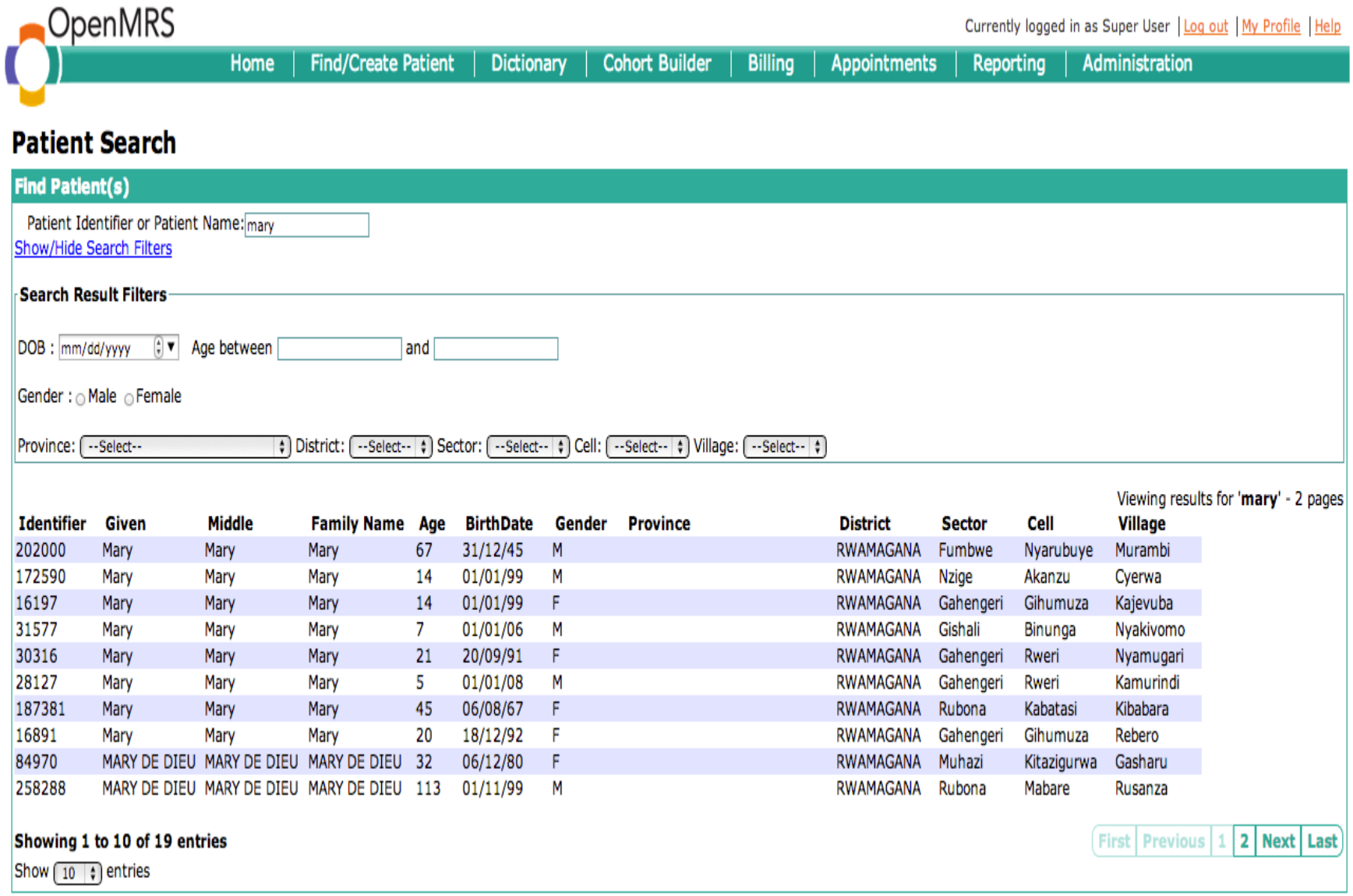
6	8:13.7 - 11:29.7	*If affordable, I'll always call it even for minor ailments eg, sorethroat. If expensive, I can't afford it and I'd be able to call it only when urgent. The operator must be an expert too. It shouldn't take too long like call forwarding in the call centre like my enquiry about the football match.* *I think it's useful. Please forgive me if my example sounds rude.* *After I had sex with my girlfriend, I saw my condom was torn. I was about to ask my friends, but afraid they would think of me badly. So, it's very good if a call centre like this can help us with these things.* *About newborns, when they get sick or get diarhroea, the operator can advise mothers what to do. As healthcare unit is far from here, the villages tend to think the disease is not serious enough to go there.*
7	11:29.7 - 12:32.6	*In common ailments, I think face-to-face is not that important. The helpline is good because it saves our money and time.* *I'll have to call it in both emergencies and common cold because I don't want to go to a doctor if possible.*

8	12:32.6 - 14:05.7	*Well, my personal information is important for me, and I don't even want to disclose it to you. But, if I don't have to mention my name, me and the operator don't see and know each other. Then, I can tell him my private issues because he doesn't know who I am.* *But, the call centre should take the responsibility to keep our confidentiality carefully. If it's not trustworthy, I'm afraid to use it.*
9	14:05.7 - 15:29.2	*I think, if it's reliable and well-known, and opens 24 hour, then I'll often ring it. Plus if they can give me effective advice, I'll be happy. But we can only use it if it's affordable. I think, everyone will use it if it charges us the current rate or just a little bit higher.*
10	15:29.2 – 16:11.4	*Well, they'd be almost the same. Like I said, if I'm happy with that call centre, I'm sure I'll use it very often.*
11	16:11.4 - 18:53.2	*Sometimes, if I have to wait for a long time, then I don't want to ring it anymore. I'll feel upset.* *The operator should disclose who they are or the call centre should announce the list earlier. If they're trustworthy, I'll follow the instructions. I normally trust doctors. If they don't identify themselves, I'm afraid to trust them.*
12	18:53.2 - 22:41.7	*Of course, I will share my experience with others.*

		If it's not deadly consequence, there won't be any problem. *If they employ expert doctors, the treatment rarely is wrong.* *But they need to be responsible.* *The operators must ask questions carefully, and we need to answer them carefully.*
13	22:41.7 - 25:01.8	*I can't wait. I'll run to the healthcare centre. I called it for help because it might be urgent.* *In minor cases, I can wait for the doctor to call me back, and I'll do other things meanwhile.*
14	25:01.8 - 26:42.2	*It's important for the operators to be the doctors. But, I won't mind as long as they're trained professionals.*
15	26:42.2 - 29:06.8	*Yes, all my villagers will feel the same as I do, but the problem is that we have to work all three seasons to survive. If we have more cash out of farming, then we can use the helpline more. Cheap SIMs are available here. And it's costly and hard to travel to get to the healthcare centre carrying patients in the rain. So, we'll use the helpline if it has everything I said.*

Appendix-8 User interface of OpenMRS (Patient search extension)

(A screenshot taken from a sample project of the actual software available at www.openmrs.org)



Appendix-9

Additional Exhibits

Appendix-9A Global health issues: Mortality and disease burden (DALYs) in females by region, age group and broad causes, 2004

Appendix-9B The User Interface features that can be changed on a modern smartphone to diminish the barrier of digital literacy

Appendix-9C Myanmar demographics data

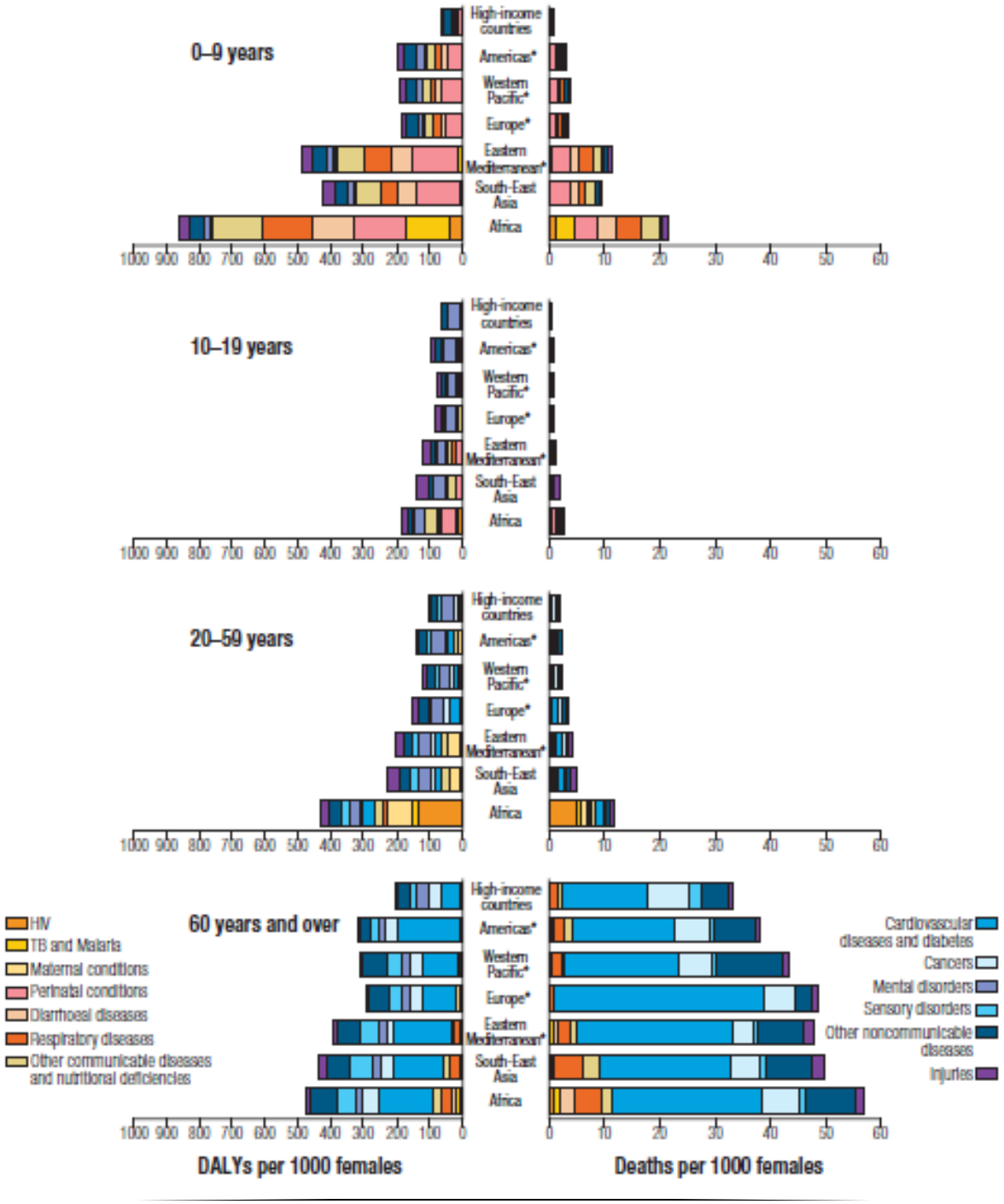
Appendix-9D Fast facts on Myanmar health issues

Appendix-9E Commitments made by the successful bidders for Myanmar mobile licenses

Appendix-9F Criteria of selection of the potential users in Myanmar in terms of socio-economic status (SES) classification

Appendix-9A

Global health issues: Mortality and disease burden (DALYs) in females by region, age group and broad causes, 2004 (WHO, 2009, p.2)



Appendix-9B

The User Interface features that can be changed on a modern smartphone to diminish the barrier of digital literacy

(Alnanih et al., 2013, p. 392)

MUI Features	Value (conditions)
Font size	Small, medium, large
Font color	An RGB color, black & white
Font format	Times New Roman, Tahoma, etc.
Background color	Auto adjust, change manually
Data entry	Typing, tapping, voice
Display information	Text, sound
Message delivery	Text, voice, alert, silent, pre answer
Brightness level	Increase/decrease
Ring volume	Low, medium, high, alert, vibration
Sound level	Mute, regular, loud

Appendix-9C

Myanmar demographics data

(Duflos et al., 2013, p. 2)

	States/Regions	Population	Population per sq km	Number of Districts	Number of Townships	Number of Villages	Population 2012
1	Mandalay Region	14%	620	7	31	5,472	8,865,858
2	Ayeyarwady Region	14%	240	6	26	11,651	8,435,786
3	Yangon Region	12%	744	4	45	2,119	7,563,377
4	Sagaing Region	10%	68	8	37	6,095	6,382,723
5	Bago Region	10%	157	4	28	6,498	6,155,173
6	Shan State	10%	38	11	54	15,513	5,952,852
7	Magway Region	9%	122	5	25	4,774	5,480,736
8	Rakhine State	6%	93	4	17	3,871	3,412,529
9	Mon State	5%	244	2	10	1,199	3,001,724
10	Kayin State	3%	61	3	7	2,092	1,848,959
11	Tanintharyl Region	3%	96	3	10	1,255	1,676,282
12	Kachin State	3%	22	3	18	2,630	1,962,748
13	Chin State	1%	16	2	9	1,355	580,451
14	Kayah State	1%	27	2	7	624	321,447
	Total			64	324	65,148	61,640,645

Appendix-9D Fast facts on Myanmar health issues

Countdown to 2015
Maternal, Newborn & Child Survival

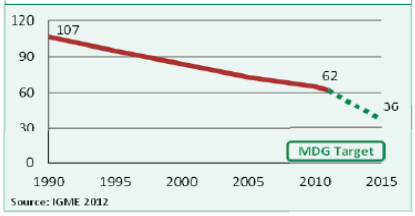
Myanmar

May 2013

DEMOGRAPHICS

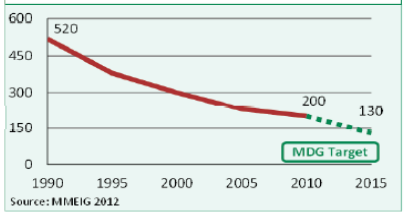
Total population (000)	48,337	(2011)
Total under-five population (000)	3,985	(2011)
Births (000)	824	(2011)
Birth registration (%)	72	(2009-2010)
Total under-five deaths (000)	53	(2011)
Neonatal deaths: % of all under-5 deaths	47	(2011)
Neonatal mortality rate (per 1000 live births)	30	(2011)
Infant mortality rate (per 1000 live births)	48	(2011)
Stillbirth rate (per 1000 total births)	20	(2009)
Total maternal deaths	1,600	(2010)
Lifetime risk of maternal death (1 in N)	250	(2010)
Total fertility rate (per woman)	2.0	(2011)
Adolescent birth rate (per 1000 women)	17	(2001)

Under-five mortality rate
Deaths per 1000 live births



Source: IGME 2012

Maternal mortality ratio
Deaths per 100,000 live births

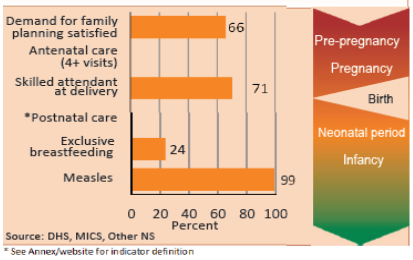


Source: MMEIG 2012

Note: MDG target calculated by Countdown to 2015.

MATERNAL AND NEWBORN HEALTH

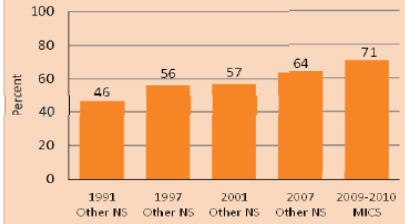
Coverage along the continuum of care



Source: DHS, MICS, Other NS

* See Annex/website for indicator definition

Skilled attendant at delivery
Percent live births attended by skilled health personnel



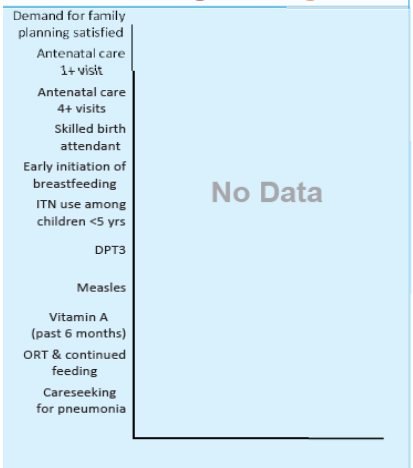
Prevention of mother-to-child transmission of HIV
Eligible HIV+ pregnant women receiving ART for their own health (%, of total ARVs)

- Percent HIV+ pregnant women receiving ARVs for PMTCT
- Uncertainty range around the estimate

Source: UNICEF/UNAIDS/WHO

EQUITY

Socioeconomic inequities in coverage
Household wealth quintile: Poorest 20% Richest 20%



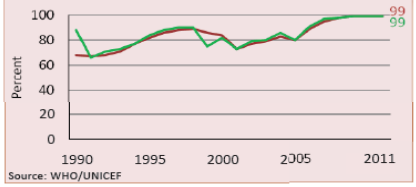
Coverage levels are shown for the poorest 20% (red circles) and the richest 20% (orange circles). The longer the line between the two groups, the greater the inequality. These estimates may differ from other charts due to differences in data sources.

Developed by Countdown to report on core indicators identified by the UN Commission on Information and Accountability, in support of the Global Strategy for Women's and Children's Health

CHILD HEALTH

Immunization

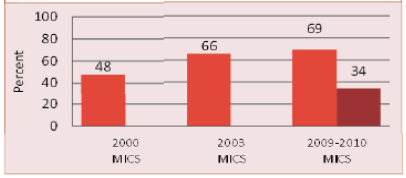
- Percent of children immunized against measles
- Percent of children immunized with 3 doses DTP
- Percent of children immunized with 3 doses Hib



Source: WHO/UNICEF

Pneumonia treatment

- Percent children <5 years with suspected pneumonia taken to appropriate health provider
- Percent children <5 years with suspected pneumonia receiving antibiotics

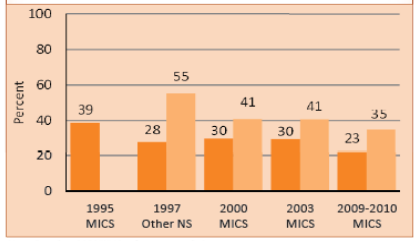


NUTRITION

Wasting prevalence (moderate and severe, %)	8 (2009-2010)	Early initiation of breastfeeding (within 1 hr of birth, %)	76 (2009-2010)
Low birthweight incidence (moderate and severe, %)	9 (2009-2010)	Introduction of solid, semi-solid/soft foods (%)	81 (2009-2010)
		Vitamin A two dose coverage (%)	96 (2011)

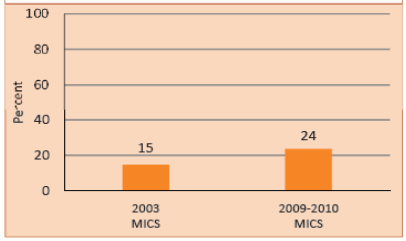
Underweight and stunting prevalence

- Percent children <5 years who are underweight
- Percent children <5 years who are stunted



Note: Based on 2006 WHO reference population

Exclusive breastfeeding
Percent infants <6 months exclusively breastfed



Appendix-9E

Commitments made by the successful bidders

for Myanmar mobile license

(Fife, 2014, p.11)

Ooredoo	Telenor
84% voice & data coverage by five year	83% voice coverage & 78% data coverage by five years
240,000 SIM sales points	70,000 SIM sales points
720,000 sales points for prepaid top-ups	95,000 sales points for prepaid top-ups
Peak prepaid voice < 35 MMK/mt (on-net) & 45 MMK (off-net)	Peak prepaid voice < 25 MMK/mt
SIM < 1500 MMK	SIM < 1500 MMK
10,000 telecenters + schools & hospitals	200 community centers with Internet
99.9% employees Myanmarese by five years	Free central government SMS channel

1 British Pound (£) = 1,590.35 Myanmar Kyat (MMK)

On 1 September 2014 at http://www.oanda.com/currency/converter/

Appendix-9F

Criteria of selection of the potential users in Myanmar

in terms of socio-economic status classification (done ethically)

that has taken into account all three determinants

based on Shah and Cook (2008)

in addition to categorisation by user/ potential user group, urban and rural settings

Socio-economic Status (SES)	Occupation (example)	Education	Income (per month)
High SES	Executive Manager	A master's degree or higher	> £126.16 > 200,000 MMK
Middle SES	Office clerk	A bachelor's degree	£31.54 - £126.16 50,000 MMK – 200,000 MMK
Low SES	Manual worker/ Farmer	Matriculation (high school examination) 'pass' or lower	< £31.54 < 50,000 MMK

Appendix-10 Financial Analysis

Appendix-10A

Financial performance of selected publicly traded health e-commerce companies, March-August 2000 (Parente, 2000, p.91)

E-health companies generally operate in four platforms with different financial structure: portal, connectivity site, business-to-business application, and business-to-consumer application, of which the proposed m-health enterprise in this study represents the last two. Even a decade ago, financial returns in e-health were attractive to analysts in the US.

Type/name of company	Market capitalization (millions)			Share price		
	March 2000	May 2000	August 2000	March 2000	May 2000	August 2000
Portal						
Medscape	$ 577.40	$ 153.50	–[a]	$12.88	$ 3.44	$ 3.19
drkoop.com	244.30	76.90	$ 43.40	8.06	2.47	1.25
OnHealth	203.10	67.50	59.40	10.00	2.81	2.41
HealthGrades.com	36.50	37.70	21.50	2.94	1.75	1.00
Total	1,601.30	335.60	124.30	–	–	–
Connectivity						
Healtheon/WebMD	4,256.90	2,898.00	2,848.00	59.00	16.50	13.00
TriZetto	1,752.50	501.80	253.30	88.50	23.69	11.88
XCare.net	297.80	96.80	57.30	19.38	6.00	3.53
Claimsnet.com	54.70	28.20	16.60	8.25	4.25	2.13
Total	6,307.20	3,496.60	3,158.60	–	–	–
Business-to-business						
Neoforma.com	3,409.90	562.70	241.80	59.00	8.69	3.50
Medical Manager	3,181.80	901.50	1,298.00	90.00	25.50	31.88
Allscripts	1,714.40	888.30	710.10	71.00	35.88	26.78
eBenX	865.40	265.60	251.50	57.50	16.50	15.50
Total	9,171.50	2,055.30	2,259.30	–	–	–
Business-to-consumer						
drugstore.com	857.20	425.90	324.40	18.63	8.19	6.22
PlanetRx	569.70	113.90	34.00	10.94	2.19	0.66
HealthExtras	205.30	120.80	122.50	7.44	4.38	4.44
Total	1,632.20	660.60	480.90	–	–	–
All companies	$18,172.20	6,548.10	6,023.40	–	–	–

Appendix-10B

Goal	Category	Intervention	Sources of finance					Sources of revenue			
			Donors	Governments or public-private partnerships	Corporate social responsibility funds	Cost sharing/ funder subsidies	Venture capital or angel investors	Member, license, or subscription fees	Product sales	Transaction charges	Consulting
Improve quality of and access to healthcare	Treatment support	TxtAlert	X		X						X
		WelTel	X								
	Patient tracking	ChildCount+	X		X	X					
	Supply chain management	mPedigree	X						X		
		Stop Stock-outs	X								
	Health financing	Arogya Raksha Yojana	X	X							
		Changamka Healthcare				X			X		
Increase efficiency of health sector human resources	Electronic medical records	iChart	X		X						
		PEPFAR/ Solutions HMIS	X								
	Clinical decision support	Clinton Health Access Initiative/Hewlett-Packard			X				X		
		HMRI 104 Advice		X	X						
		Ziquitza Healthcare/1298		X			X		X		
Capture and use real-time health information	Surveillance	Datadyne's Episurveyor		X							X
		Pesinet			X			X			
Improve public health and prevent disease	Disease prevention	Dr. SMS		X							
		mDhil					X	X			
		Voila/RedCross Public Health Advisories	X								
	Education and awareness	Text to Change/FHI M4RH	X								
		Voxiva Txt4Baby	X								

Overview of finance and revenue sources for various electronic health business models (Qiang et al., 2012. p. 51)

The above table summarises sources of funding and specific mechanisms used to finance documented m-health business models. It includes an overview of revenue sources, showing the models for which users or other actors in the health system are willing to pay.

Interventions here refer to applications/ initiatives/ programs of m-health(Please see Appendix-3) eg, the 'Text to Change' intervention that was explained in Section-2.5.

Other interventions may include health financing apps in mobile devices. For example, "Kenya's Changamka allows users to deposits funds into health savings accounts using **mobile money (mMoney) services** such as **M-Pesa** and then use the accounts to pay for health services"

Source: Qiang et al. (2012, p.10)

Appendix-10C

Cash Flow Forecast for the years ended 31 December 2016 - 2020						
		Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)
		£ (1 GBP = 1,500 MMK)				
Opening balance (A)		**100,000**	**27,845**	**107,234**	**388,380**	**967,646**
Revenue	Cash from phone calls	214,176	481,896	963,792	1,740,180	2,891,376
	Commission fees from 3rd party organisations	0	100,000	150,000	225,000	337,500
Total cash inflows (B)		**314,176**	**581,896**	**1,113,792**	**1,965,180**	**3,228,876**

Expenses						
Wages	Nurses	72,000	162,000	324,000	606,000	1,090,800
	Doctors	36,000	72,000	135,000	244,800	408,000
	IT technicians	7,500	16,800	32,400	59,400	105,300
	Back office staff (including the management team)	13,000	19,500	29,250	43,875	65,813
Computers and headsets Other electronic equipment		9,000 + 3,000	4,500	6,900	10,200	15,300
Internet (MPT Fibre Internet Access Service) Initial set-up		56,000 +1,000	56,000	56,000	56,000	56,000
EMR software charge (Open-source)		0	0	0	0	0
Light heat power Generator (24-hour electricity)		3,000 + 14,000	4,500	6,750	10,125	15,187

Rent	80,000	80,000	80,000	80,000	80,000
Office mobile phones	16,520	23,760	35,640	53,460	80,190
Marketing expenses	20,000	17,000	13,000	9,000	4,000
Training cost	20,000	20,000	20,000	20,000	20,000
Taxation (25% of profit)	9,281	26,447	93,696	193,054	322,033
Total cash outflows (C)	**286,301**	**502,507**	**832,636**	**1,385,914**	**2,262,623**
Closing balance (A + B - C)	**27,845**	**107,234**	**388,380**	**967,646**	**1,933,899**

*The format based on McLaney and Atrill (2012); *The figures in each category are explained in the Assumptions Sheet.

Assumptions Sheet

The above Cash Flow Forecast for five financial years was calculated on estimated current monetary values albeit based on the underlying assumptions. The assumptions were made according to the findings of this research as well as the current facts and figures on the market in Myanmar. The latest statistics were requested from Ministry of Health and Ministry of Communications, Posts and Telegraph. These data have not been officially published, but was generated from their monthly internal office reports.

In the main body of this dissertation, Myanmar Kyat (MMK) was converted to GBP (£,p) using the exchange rate (£1 = 1,590.35 MMK on 1 September 2014) at http://www.oanda.com/currency/converter/ (the website recommended by UK Border Agency, Home Office).

Here, in 2016 and onwards:

Currency exchange rate is predicted to be at £1 = 1,500 MMK due to the potential strengthening of Myanmar currency.

Hereinafter, all the figures are shown in GBP (£), a well-known currency.

Assumptions about each category in financial analysis have been made in the order as per the Cash Flow Forecast.

Opening balance

On 31 December 2015, a start-up capital of £100,000 will have been raised by the government or other partners/ foreign angel investors or venture capitalists/ family support.

Cash from phone calls

Mobile penetration rate is predicted to reach 20% in 2016 (Current mobile density is 13.94%, but the government aims to "…increase the overall tele-density of the country to 75% to 80% by 2015-2016". Additionally, Telenor promised to achieve 90% mobile penetration five years later (Telenor, 2014), which is more possible and prudent.

The actual population of Myanmar seems to be far greater than the current official figure mentioned in the literature review. Population census is being undertaken countrywide at the moment properly for the first time since 1983. Its population in 2016 is estimated to be 65 million.

RMNCH issues concern with the group aged 0-59 years which represents 91.2% of the population (59.28 million) (See "Population estimates (2011-2012)" in Table-2 on Page-22). Of this figure, 50.56% female (Age of women at menopause = 45-55 years) (Female will call more according to the interview responses) and half of male (24.72%) together will make 44.62 million (29.97 million + 14.65 million) market for RMNCH.

The number of potential callers is assumed to be 20% of that of total mobile users (Only five callers to health call centre were detected out of 22 Myanmar potential user participants (approximately 1:5 or 20%)). Another 10% will be added to the previous figure every year due to greater awareness induced by marketing strategies including word-of-mouth of satisfied users as well as increased acceptance by the stakeholders within 5 years as predicted by most Myanmar experts.

Hence, the projections for five financial years will be:

	2016	2017	2018	2019	2020
Mobile penetration rate	20%	30%	45%	65%	90%
Number of potential callers	20%	30%	40%	50%	60%

Suppose each potential caller will use the helpline once three months (4 times a year) (either general enquiry or illness) and make a call which will last around 5 minutes.

This incoming call will be charged **4p/min (60 MMK)** which generates a revenue of 0.6p/min (10 MMK). 50 MMK will go to the mobile service provider MPT.

For example, in Year 1, revenue from phone calls will be:

*44,620,000 (RMNCH market) * 20% (mobile density) * 20% (number of potential callers) * 4 (times/ year) * 5 (mins/ time) * 0.6p/ min*

Commission fees

The enterprise will charge no commission fees from 3rd party organisations in Year 1 for marketing purposes. They will, however, account for a revenue of 100,000 in 2017, increasing by 50% each year.

Wages

The number of nurse advisors required may significantly vary with the context. Twelve nurse care managers were trained in PHS (2007) while NHS Direct employed 3,000 staff, of which 40% were trained nurses (Smith, 2012).

The author has been to the headquarter of 1876, one of the current call centres in Yangon. It is assumed that the venture should recruit total 80 nurse operators on four shifts in 24 hours, that include periods of 6-hour work at a time (to avoid sedentary lives). At least 20 nurses must be present at the call centre during day time. These operators will be distributed as necessary according to the enquiry traffic and their meal breaks.

Likewise, at least 5 RMNCH specialists must be present at the call centre during day time. The enterprise, therefore, must employ 20 doctors on four shifts in 24 hours.

Five full-time IT technicians will be kept on standby only between 9.00 am – 5.00 pm.

The number of all three kinds of employees is assumed to increase by 50% each year along with the rising mobile penetration rate.

A nurse's average monthly salary is around 100,000 MMK currently, projected to be £100 per month in 2016.

A doctor's average monthly salary is around 200,000 MMK currently, projected to be £150 per month in 2016.

An IT technician's average monthly salary is around 150,000 MMK currently, projected to be £125 per month in 2016.

All their total annual wages are projected to increase by £600 every year.

	2016	2017	2018	2019	2020
A nurse's salary (£)	1,200	1,800	2,400	3,000	3,600
Number of nurses	60	90	135	202	303
A doctor's salary (£)	1,800	2,400	3,000	3,600	4,000
Number of doctors	20	30	45	68	102
An IT technician's salary (£)	1,500	2,100	2,700	3,300	3,900
Number of IT technicians	5	8	12	18	27

Computers and headsets

It is expected to cost £300 to purchase a set of computer and its accessories in 2016. The number of total staff in 2016 who will be kept on standby at the call centre is at least 25. Hence, the firm will purchase 30 computers in 2016. Other electronic equipment required for networking (eg, cables) in the initial installation process is expected to cost £3,000. However, along with the annual growth in employee number, more computers will be added accordingly, assuming that the price will remain the same. Thus, the following number of PCs must be added to accompany the firm's growth.

2016	2017	2018	2019	2020
30	45	68	102	153

Internet (MPT Fibre Internet Access Service)

The government-owned MPT's internet service will be selected on the purpose of **public-private partnership**. After initial set-up which will cost £1,000, annual charge by MPT will be 56,000 for the five consecutive years.

EMR software charge

As the enterprise will deploy Open-Source software including OpenMRS, which is freely available online, this cost, which can be tremendous otherwise, will be saved.

Light heat power

To guarantee 24-hour electricity in Myanmar for the server to run round-the-clock services (a CSF), a generator at the cost of approximately 14,000 will be purchased.

Energy, oil and electricity are estimated to be charged £8000/year, again, increasing by 50% assuming the amount of consumption will grow with the size of the call centre.

Rent

Land and building prices are considerably high in big cities in Myanmar. The enterprise will rent a hall-type two-storey building in Yangon to attract both employees and customers. It will cost around 80,000, negotiating the contract for the same price for five consecutive years. After 2020, the venture will afford to purchase its own building.

Office mobile phones and charges

Twenty mobile phones will be kept for office use in 2016.

Currently, a SIM card costs nearly £1. A low-end handset price is around £33.

Assume a mobile phone whose calls bring a phone bill to pay £66 per month in 2016:

*[{£1 (SIM) + £33 (handset)} + {£66 (amount of charge/ month) * 12 months}] * 20 mobiles*

It is also predicted to increase by 50% every year.

Marketing expenses

A substantial amount of budget will be spent on intense marketing in the first few years to rapidly penetrate the market, but it will be reduced steadily as the awareness rises. Later marketing will be mostly via word-of-mouth.

Training

As the findings of this research indicated training as a CSF, a significant amount of budget will be spent on employee training and development regularly and continually.

Taxation

"A 25 percent corporate tax rate per annum is applied to all companies incorporated in Myanmar under the Myanmar Companies Act and Foreign Investment Law" (Invest-in-Myanmar, 2013).

Closing balance

Overall, at the end of each financial year, the cash balance will be reinvested in the business as the young enterprise needs more cash to grow, take a larger market share, and be sustainable.