Chapter 19
Development of an E-Health Strategic Framework for Vietnam

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Abstract Vietnam has a population of 91.5 million with 70 % living in rural areas. Much of the population is not well serviced by infrastructure of any form that would support e-health. There is no defined e-health infrastructure or management strategy, however Vietnam does have a number of population health issues that could be somewhat addressed by e-health initiatives as has occurred in so many other similar geographies. The key problem is how to develop and manage a sustainable e-health strategy and implementation framework. A number of significant barriers have been identified including a lack of infrastructure to enable e-health delivery, poor strategy development, a lack of co-ordinated effort towards defined goals, skills shortages in critical areas including health information management, mobile technologies and security and a lack of cultural sensitivity by current research groups and funding bodies. Breaking down these barriers is critical to any future progress towards an e-health platform. This paper discusses the Vietnamese health environment, the e-health barriers, drivers and opportunities in Vietnam and outlines a framework for future progress towards a time where e-health is an integrated part of the healthcare system.

19.1 Introduction

The trend in modern healthcare is towards making health ubiquitous to enable equity in accessibility and delivery of quality healthcare services. By providing sustainable, standardised primary healthcare options to whole populations there are considerable benefits to be realized. Enabling centralized data collection and analysis, integrated patient management and evidence based clinical and operational decisions are unfamiliar concepts and beyond the ability of the current healthcare system in Vietnam to envisage.

The very nature of e-health initiatives call for a ubiquitous solution and there has been huge success in such technology applications around the world. The healthcare environment in Vietnam and South East Asia as a whole however is highly fragmented

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Table 19.1 Comparison of healthcare environments

Context	Vietnam	Thailand	Laos	Indonesia	Philippines	Australia	U.S.	Norway
Urbanisation %	30	34	33	44	49	89	82	79
Health workers per 1000	1.22	0.3	0.27	0.29	1.15	3	2.7	4.1
Maternal deaths per 100k	59	48	470	220	99	8	24	7
Child mortality per 1000	19.61	15.41	56.13	20.06	18.19	4.55	5.98	3.5
Health spend as % of GDP	7.2	3.9	4.5	2.6	3.6	8.5	16.2	9.7
Hospital beds per 1000	3.1	2.1	0.7	0.6	0.5	3.82	3.1	3.52
Years of education/literacy	10/94	12/92.6	9/73	13	12/92.6	21/99	16/99	17/100

Statistics from [5]

and presents a number of unique issues that have to date prevented any real progress towards implementation of e-health solutions. Given the advancements in technology training and investment in healthcare by the government and health insurance providers in Vietnam the time is now ripe to start developing such solutions.

A current project by the Health Research Group (HRG) within RMIT International University Vietnam is investigating the potential for e-health solutions in Vietnam and is working towards development of a strategic framework for e-health implementation in the country. The first milestone for this work was in identifying if there is a feasible mobile technology and transmission foundation upon which to launch e-health solutions. The ability to transmit data over some communications channel is a critical requirement for most e-health systems and without this capacity any further work would be futile. This paper presents the current state of understanding in this area and presents early findings that will inform future work.

19.2 The Vietnamese Health Environment

Vietnam has a long history of traditional medicine. Seventy percent of the population live in rural areas and represent a number of separate cultures each with their own beliefs, some of which are very isolated such as the Hmong people in the northern hills area. Many have little or no access to modern healthcare facilities or clinicians so the traditional ways are retained for those people. Healthcare provision and knowledge across Vietnam is frequently received through community elders and family. This results in fragmented populations and practices. A significant proportion of these people are also very poor (Vietnam's per capita income was just $ 1,270 in 2012) and cannot afford high quality treatments or insurance policies or most significantly for this project, technology. A comparative overview of the Vietnamese context against other locations is provided in Table 19.1.

Fig. 19.1 The 4 tiered Vietnamese healthcare structure

Table 19.1 identifies a number of foci for healthcare improvement in Vietnam. The most obvious is maternal and child health where according to the CIA [5] Vietnam is doing better than many other Southeast Asian countries but is well behind the rest of the developed world. Viet Nam News on July 11th, 2012 reported that while the statistics had improved dramatically over the past 12 years there was still a significant difference between urban and rural rates of maternal and newborn deaths. This is believed to be due to limited access to healthcare and far lower rates of trained obstetricians in rural areas compared to cities. This is identified as an area for greater investment by government and presents a viable area of focus for research in this country.

The formal healthcare system in Vietnam has a four tiered healthcare model as shown in Fig. 19.1. Patients are usually diagnosed within a commune level healthcare institution and are then referred up through the tiers until they reach a National Hospital which specialises in the treatment of a particular serious or chronic illness such as late stage renal failure, AIDS or cancer. These National Hospitals also provide some palliative care support but this is not a common practice. Some patients may move several times

from their rural homeland until they are admitted for treatment. This can take months and cover great distances resulting in dislocation and isolation. Vietnamese culture is very strongly family oriented and hence the potential for dislocation in particular is a significant deterrent to accessing healthcare services even if available.

Unfortunately even when a patient is diagnosed and admitted for treatment often their situation does not improve. Hospitals are very overcrowded and under staffed across the country in both rural and urban locations. There are several reports that suggest patients cannot even assume basic rights as there are not enough beds to allow for one for each patient and doctors see on average 100 patients every day and hence often do not have time to even inform patients of their diagnosis or treatment options. Recent work by the HRG with the Ho Chi Minh Cancer Hospital revealed that there were up to 300 new diagnoses per day, an average of greater than two patients per

bed, 10,000 outpatients to be managed, long queues waiting in hot buildings or sitting on floors outside or in stairwells and most alarmingly, less than 60 % of patients are told their diagnosis. These observations are common around the country.

The healthcare system has at best a tenuous ability to adequately meet the needs of the people it is designed to serve. This presents a very complex and unconstrained environment in which to introduce any new population health initiative.

19.3 The Vietnamese Technology Environment

19.3.1 Capability

Vietnam has approximately 1,000 software outsourcing and IT businesses with most being small-sized businesses of 10–30 employees. There were 120,000 employees working in software and IT services in 2011 which was a twenty-fold increase compared to 2002 [3]. "In developed economies like the U.S. and European nations, IT accounts for some 7 % of gross domestic product (GDP), while the figure in Vietnam is less than 2 %" [4]. Although behind the world figures for GDP the annual growth rate was reportedly 25–35 % over the past 10 years for this industry segment [3]. Due to this growth, the demand for IT specialists by outsourcers including IBM, Intel and Apple in particular has far exceeded the supply. Many outsourcing companies have been involved in global e-health technology development. These companies are gathering the best graduates and experienced staff available in Vietnam and hence have the experience, knowledge and skills to provide healthcare solutions for Vietnam. The question is whether there are sufficient numbers of qualified Vietnamese to fill the need.

To meet the need for skilled professionals the number of universities and colleges offering a computing focused program has grown over the past 10 years. There are currently 277 institutions with a total enrolment of 169,000 students, with 56,000 fresh students enrolling annually [3]. Whilst skills are becoming available, especially in the area of mobile technologies, there is currently no identified opportunity to specialise in health systems development or informatics. This is an obvious issue that needs to be addressed if Vietnam is to take and maintain control of this important public service sector.

19.3.2 Technology Adoption

Research suggests that mobile phones are the most widely adopted form of technology in the world, including in developing countries. Data from Vietnam showing that there are 143 mobile phones per 100 people clearly supports this claim. Of those using mobile phones 30 % use their phone to access the internet and 35 % use it for

Table 19.2 Mobile technology adoption [2]

Metric	Value
Total domestic connection bandwidth	425,538 Mbps
Users per capita	35.58 %
Users	31,304,211
International connection bandwidth	346,997 Mbps
Domestic connection bandwidth	460,374 Mbps
Total VNIX network traffic	134,850,152 Gbytes
Dot VN active domain names	229,815
Allocated IPv4 addresses	15,551,232
Allocated IPv6 addresses	73,015,820,288/64
Total broadband subscribers	4,325,995
3G phone subscribers/100 people	8.5
3G service coverage	30 cities and provinces
Number of 2G/3G cell sites in the south west	7,100

social networking [1]. Data for fixed line internet access shows that only 8/100 people across the world are connected and in Vietnam the level is much lower at 4.3/100. There is a significant skew towards younger users with a reported 95 % of those aged 15–24 having internet access of some form [1]. This is an important statistic in the context of the research presented here as it has already been identified that most health information comes from older members of the community and family members, especially parents. The data on technology adoption suggests that these are the people least likely to have access to current, clinically accurate (if the correct sources are accessed) and appropriate information to counsel others with. Table 19.2 provides an overview of mobile technology adoption in Vietnam.

The reliability of Vietnamese networks has been evaluated as 'suitable'. Testing shows that metrics such as successful call rate and service availability achieve over 99 % and complaints are measured at less than 0.1 % with 100 % response rate within 24 hrs.

There are a number of government initiatives that aim to strengthen the mobile/Internet technology context in Vietnam by 2015 including:

- The licensing of 4G services
- Ensuring 40–45 % of households have a telephone and Internet access
- Providing mobile coverage to 90 % of the population

Since becoming officially connected to the global internet network in 1997 the industry has grown significantly to currently support 19 Internet service providers, 1,064 licensed websites and 335 social networking sites. 3G Internet users account for 18 % of the population.

Vietnam is a good fit for the application of e-health technologies given that it has reasonably good literacy rates as shown in Table 19.1, the number of University technology graduates in the workplace is growing and there is a high level of technology uptake and reliability of infrastructure is good. Most importantly Vietnam is experiencing a strong drive towards technology adoption and social equity with other countries in the health domain.

19.4 Barriers to E-Health

Given that early findings suggest that the foundations in terms of skills, technology and connectivity are all either well developed or being developed, the question arises regarding why we are not seeing e-health implementations in Vietnam. The reason is a number of significant barriers including Vietnamese culture, lack of coordinated international interest and investment and the physical geography of Vietnam.

19.4.1 Vietnamese Culture

As discussed in the section on the Vietnamese healthcare environment, there are significant cultural differences to be considered when looking at any new healthcare initiative especially one as innovative as e-health. Given the reliance on traditional medicine and the low level of technology adoption by older Vietnamese there is little prospect for successful implementation of a public e-health solution. Many Vietnamese have little or no contact with the healthcare system or technology during their lives so expecting a high level of buy-in is unrealistic. There is a similar story with clinicians who have little in terms of formal IT training or experience. Clinician input is critical to the development of any technology driven health system. Informed input is the only way to have any confidence in a successful outcome. Untrained or novice users cannot hope to fully engage or be able to influence technology design decisions.

The Vietnamese culture, political system and history have led to a people who do not feel comfortable questioning anyone in a perceived position of power, doctors included. The following quote by a doctor in the cancer hospital is both a reason for concern and a clear demonstration of the lack of empowerment patients accept.

> If the patient is diagnosed with cancer, the doctor generally keeps it a secret from the patient. The family is told first, and it is the family's decision whether or not to tell the patient. . . . Patients sometimes undergo treatment for prolonged periods of time without knowing the real cause of their illness.

This leads to some significant barriers to the use of e-health solutions. If the patient never knows what their diagnosis is, how do they know what questions to ask? How do they find information to inform themselves? How do they comply when they have no knowledge of what is being done and why? If they are not made aware of the seriousness then expecting them to comply with an at home solution for example will not succeed. Their first instinct will be to return to their family and care for them in their usual manner, either nurturing or working. The extra burden of monitoring or learning new technologies will not be integrated into their already busy lifestyle.

19.4.2 International Interest and Investment

There has been little investment in e-health in Vietnam. The RICE project is definitely the exception. Most projects have been concerned with preventing disease,

vaccinating children and providing basic necessities such as clean drinking water. Vietnam is a country that is evolving and in some respects is still third world and raising the status of the country has taken precedence over other initiatives. These foundational improvements are not questioned but they have been fragmented, urban focused and not whole of population initiatives. Without a level playing field the divide between rural and urban healthcare may grow leaving rural areas even further disadvantaged.

Until the early 1980s there was little open access to Vietnam and there are still some perception problems from foreigners regarding access, business operations, investment processes and research potential. There are also barriers with the Vietnamese who are a proud people who want to maintain control over their country and also do not understand how to attract overseas investment or work with western attitudes and processes. This presents a critical barrier to progress in many fields, health included.

19.4.3 Geography

Many large areas of Vietnam are inaccessible due to rough terrain and insufficient transport infrastructure. Installation and management of mobile technologies and relay stations is an almost insurmountable problem where the only access is by foot. The key barrier to e-health implementation in this context is therefore infrastructure enablement. Most infrastructure projects are managed and financed by external investors used to working in far different geographies. Little local expertise is used or developed thus removing control from the Vietnamese people, increasing expenses and lowering sustainability.

These barriers are not unique to Vietnam and have been met and addressed in other locations such as Africa and Korea however they are not currently being managed in Vietnam. These barriers must be reduced or removed before any investment of time, people, technology or finance to e-health. Any strategy must ensure that these issues are managed at the outset and consideration is given throughout the lifespan of a healthcare reform program. Failure to do this will result in fragmented, divisive solutions that cannot be implemented to solve the population health issues that they could provide most benefit to.

19.5 E-Health Drivers and Opportunities

Although there are a number of barriers there are also many opportunities available and a number of important drivers that provide motivation for developing a focused research effort towards e-health solutions in Vietnam. These opportunities and barriers will require input from internal and external stakeholders to provide momentum and sustained progress.

19.5.1 Opportunities

- There is a growing technology maturity and increased training options will build skills capacity required to build e-health solutions. Vietnam needs help to realise a higher state of maturity in health management and technologies and this will require significant international expertise on the ground in the medium to long term. This presents a number of opportunities for training providers and healthcare technology mentors.
- The government is ready to invest and there is sufficient demand to ensure that action will be taken, but it needs to be guided, cost effective, culturally sensitive and sustainable.
- There is a government awareness of mobile solutions and technology driven initiatives and there is a realization of the potential for technology solutions to overcome several of the biggest health issues facing Vietnam now and into the future. The Health Ministry and clinical stakeholders will need expert input to design and deliver measurable solutions.
- External investment and interest in the region and Vietnam in particular is increasing. There are millions of dollars being invested in technology and health projects. There is however a need for an integrated, unified approach to prevent fragmented solutions and repetition as has been seen in the past. There is also a need to have a defined focus on e-health strategies and technologies as they offer a feasible solution to a number of endemic issues.

These opportunities demonstrate that Vietnam has likely reached a tipping point for e-health. There is investment potential and key stakeholders are realizing there are solutions to critical health issues but there is currently no roadmap or strategy to progress.

19.5.2 Drivers

- The current healthcare model is clearly failing and some method of providing broad scale health improvement programs, chronic disease management outside of the hospital system where possible and public health monitoring is critically important.
- Internal migration from rural to urban areas means that there are condensed populations that have open access to technology and broadband connectivity. It also means extra pressure on urban health services leading to a pull for innovative solutions given that real estate is limited in terms of an ability to expand but greater service provision is demanded.
- There is a defined government policy direction towards equity in healthcare but the current situation is one of great disparity. Any solution that aims to create more equitable access to healthcare and health information must be broad scale to ensure that the gap between rural and urban healthcare services does not become more endemic.

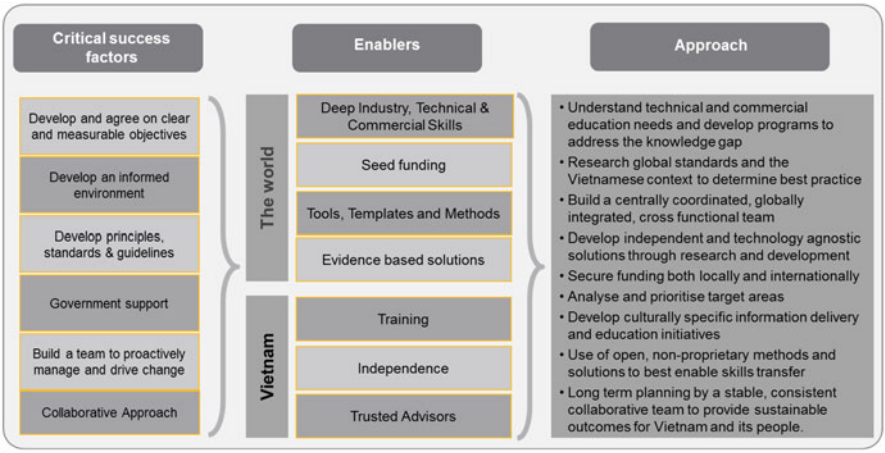

Fig. 19.2 Strategic framework for e-health in Vietnam

The healthcare system in Vietnam is not sustainable in its current form and while there is limited opportunity to expand hospitals or provide more beds, e-health provides a proven tool to take advantage of a number of these drivers and improve healthcare provision for all Vietnamese as a result. E-health has been demonstrated elsewhere to be able to outsource some treatment to community health providers and to be an important tool in preventative health programs to reduce the burden on an already overstretched system. These opportunities and drivers should inform any future national e-health strategy.

19.5.3 Strategic Framework

A number of success factors and enablers have been identified that will influence and guide future progress in Vietnamese e-health research and developments. These constructs are the foundations upon which a strategic framework for e-health solutions in Vietnam have been built. This strategic framework is shown in Fig. 19.2. Standardisation, sustainability, education and funding are the most critical factors to consider and must be the measures of success for any initiative. These measures can only be achieved by a collaborative, international engagement by experts across a number of domains including technology, commerce, public health, government and education. Whilst international collaboration is vitally important it must include Vietnamese representatives at all levels to ensure long term support and sustainability.

As discussed in this paper, any solution must be implemented within the specific cultural and political environment that Vietnam presents. Achieving, sustainability and population support will require large scale education from three angles:

- To inform the general Vietnamese population on the technology, benefits and personal impact of e-health
- To increase the skills and knowledge of Vietnamese technology developers and managers
- To inform external parties of the Vietnamese environment and technology landscape.

Only with empowerment of the Vietnamese people through education can there be an accepted, comprehensive, sustainable solution to any issue in any domain.

Vietnamese technology and health graduates are trained in global skill sets. Vietnam is at a level of low maturity, however for change to be sustained they must adhere to global standards for health and technology developments. The Vietnamese are a proud people that are ready to move forwards and embrace the best the world has to offer however they have generally had little opportunity to demonstrate what they have to offer or be exposed to standards and healthcare technologies. Any external collaborator must be ready to be open and transparent in all communications and be ready to enforce global best practice and standardized tools and methodologies to ensure long term maintainability.

Significant funding will be required to provide a solid base upon which to develop wide scale solutions. Too often small projects have been implemented with minimal impact then have no strength to be maintained or extended overtime. The healthcare issues raised in this paper are widespread and require national attention. Little will be achieved in terms of population health or e-health acceptance by further small, localized attempts at proving the concept is of value. For real progress to be made it must be a focused approach with collaboration across geographic boundaries and skill sets with local and international funding.

19.6 Conclusion

Vietnam is a country experiencing a period of economic and social transition following a time of prolonged unrest and stagnation and its embrace of the technology age where its people are learning to live with new found freedom, peace and comparative wealth. It is a country offering many opportunities both to its own people and overseas interests. It has a complex cultural context that informs everything that occurs, including healthcare. There is a trend is towards greater investment in Vietnamese Health initiatives and technology but little expertise in actually delivering innovative, technology driven solutions. Collaboration between internal and external stakeholders is seen as a critical factor for the future of e-health as it is not a well understood concept in Vietnam.

This complex environment presents both barriers and opportunities and significant investment has been made in both research and infrastructure projects although there has been little directed towards e-health research. A major limitation to progress is that there are no national solutions, no consensus on direction and little local expertise, strength or strategy. A high level strategic framework has been developed

that highlights the following critical activities to promote progress and facilitate future success:

- Develop and promote a centralised, co-ordinated effort to identify research opportunities rather than follow a fragmented, narrow focused approach.
- Have a coordinated internationally funded strategic approach. This will reduce the reliance on a single source of funding and ensure program longevity.
- Implement and manage a structured, strategic approach to solutions development instead of a trial and error, isolated attempt by those who enter the country, test an idea and leave or do not gain the support they require for continued research and hence have their work curtailed.
- Apply and monitor internal control and external collaboration. The Vietnamese must be an integral part of any project team at all levels and must be empowered to ensure projects are implemented, championed and sustained in a culturally sensitive way. External collaborators are required to ensure rigor, global standards and sufficient expertise is applied.
- There should be a ubiquitous solution to health research. Too much work only solves part of a problem or benefits a very small subsection of the population and little measurable value is delivered. This creates reluctance for further investment and leaves projects with an unfinished or low impact outcome.

The building blocks required for successful e-health implementation are available and have been tested around the world. The technology platforms, skills and infrastructure to support e-health are available in Vietnam. It is now time to create a positive environment and develop global collaborations in which to plan to build and test broad scale e-health solutions in Vietnam for the benefit of all Vietnamese people and South East Asia as a whole.

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