DEVELOPING BUSINESS MODELS FOR USING MOBILE PHONES TO STRENGTHEN PREVENTATIVE HEALTHCARE IN SOUTH AFRICA

Frans J Snyders, MEng1, Liezl Van Dyk, PhD1

1Department of Industrial Engineering, Stellenbosch University, South Africa

Abstract

Background: South Africa’s health sector has not yet shown enough improvement to reach the Millennium Development Goals related to health. One of the problem areas is the low infant and child vaccination coverage in certain areas of South Africa. The use of mobile phones in health care (mHealth) has the potential to strengthen the primary health care system through improved information management. Objectives: Possible business models are proposed for a Mobile Health Solution for Vaccination (MHSV) within the public health sector of South Africa. Methods: Osterwalder and Pigneur’s Business Model Canvas is applied to an MHSV, with the support of literature. Findings are validated through interviews with experts in relevant fields. Results: Business models were developed for the public and private sectors. The possible effect of the National Health Insurance (NHI) on these models was also anticipated. Conclusion: The design of a business model for an MHSV depends on the health system context. The key partners, value proposition, customer segments, key resources and revenue streams in a public healthcare system differ from those in a private healthcare system or a hybrid of these systems.

Keywords: telemedicine; mobile health; public health; business model; public health informatics.

Introduction

In the South African census of 20111 it was found that 89% of South African households owned at least one mobile phone. A study published by Research ICT Africa in 20132 showed that the mobile phone ownership of the poorest socio-economic group in South Africa was 75%. This significant uptake of mobile phones in South Africa has created a platform for mobile healthcare service delivery to households. The use of mobile phones for healthcare services and information, known as mHealth,3 can strengthen healthcare delivery by providing an additional interface for patients to access healthcare.4

South Africa’s healthcare sector has not yet shown enough improvement to reach the Millennium Development Goals related to healthcare.5 One of the problem areas is the low infant and child vaccination coverage in certain areas of the country.6 Various mobile healthcare projects that track vaccination information3,7 exist in other countries, but not in South Africa.

In this study, a healthcare solution or service that uses mobile phones specifically for vaccination purposes is referred to as a mobile health solution for vaccination (MHSV). An MHSV can be used to improve information management regarding vaccinations, which in turn can improve vaccination coverage. However, possible business models for such an MHSV in the South African context do not exist.

A Business Model has been defined as a description of “how an organisation creates, delivers, and captures value”.8 In the business sector, although debated, it is common to first develop a business model, and thereafter develop a business plan. The business model is a means of describing what services a venture might offer specified ‘clients’, and the reciprocation of funds for those services. Once the venture has been conceptualised, the business plan provides the details of how the model will be realised. Here, the Business Model Canvas (BMC) developed by Osterwalder and Pigneur is used for business model creation.8 This paper focuses on the conceptual phase of the proposed mHealth solution; i.e., developing business models to understand how an MHSV might provide value in different settings (public and private healthcare sectors). In the future it will be necessary to validate assumptions in the business model, and to
develop business plans and the required economic analyses.

Initially such an mHealth solution will target low-performing areas through pilot programmes. The aim of the solution is to replace existing paper-based reporting systems regarding vaccination. Ultimately the solution can be expanded to include all data entries for nurse-patient contact. The greatest advantage of such a solution lies in improved information management for nurses and healthcare management.

As an example, with an MHSV care-takers could view the vaccination records of their children, probably via Unstructured Supplementary Service Data (USSD), showing which vaccinations have been done. They could also receive automatically generated SMS notifications about when vaccinations are due, and to remind them to visit a nearby clinic. This information would be based on when the child was born and the schedule for vaccinations.

Similarly, healthcare workers, the main users of the system, would be able to input information, register care-takers and log into the system to record when a child had been vaccinated (via USSD or Internet). Managers and administration staff would be able to view reports generated by the system regarding the vaccinations done by nurses. These reports could then be used for performance monitoring and to identify problem areas regarding vaccination coverage.

In the context of this study the organisation referred to is the healthcare system. South Africa, like many other countries, has two distinct healthcare systems, namely a public and a private healthcare system. These systems differ in the way in which they create, deliver and capture value. Hence, the business models for these systems will differ. Initiatives are in the process of combining these two systems by means of the so-called National Health Insurance (NHI), which will require a different business model.9,10

The purpose of this paper is to propose business models as the first step in considering an MHSV within the context of the different healthcare systems.

For the purposes of this paper, the BMC developed by Osterwalder and Pigneur is used to develop business models for the public and private healthcare sectors. The paper is structured as follows: the methodology used for the work is presented, followed by the background on the BMC.8 Two business models are presented based on the BMC and are used to project a possible business model under the planned NHI. Structured interviews were used to validate the developed models.

Material and Methods

Using the BMC, business models for an MHSV in the South African context were developed. The process was informed by literature from various sources (journals, grey literature, conferences on mHealth and telemedicine and, to a lesser extent, news reports).

The business models were internally validated by showing the conformity of the ‘business models’ to common business themes, their relevance to the eHealth sector, and widely accepted theory.8,11,12 External validation was done by conducting structured open-ended interviews with a total of six experts representing the following fields of healthcare and mobile phone solutions: software development, mobile health solutions, public healthcare systems analysis and public healthcare research. Respondents were asked to provide feedback regarding relevance, clarity, accuracy, comprehensiveness, and generalizability of each of the business models.

Business models

Zott et al. reviewed 103 publications on business models.11 They found that the reviewed literature had developed largely in isolation from one another, with no agreement on the definition of a business model. Despite this, they were able to identify the following common themes or functions. Business models:

1. Are a method of analysing a firm or network
2. Explain business operations holistically on a systems level, both the ‘what’ and the ‘how’
3. Describe business activities
4. Define how ‘value’ is created and captured.

In the field of telemedicine, Chen et al. reviewed the business models of eight successful telemedicine ventures by using the BMC to describe each telemedicine service.8,12 The reasons given by Chen et al. for using the canvas for telemedicine business models were as follows. The BMC:

1. Describes both the activity systems and cost/revenue architectures
2. Uses value creation as a basis
3. Describes how value is delivered and captured
4. Reflects the current consensus in business model conceptualizations.12
The BMC was originally developed as a tool for describing, analysing, and designing business models, and has been applied worldwide in organisations such as IBM, Ericsson, Deloitte, the government services of Canada, and others. The BMC describes a business model through nine building blocks (elements). These elements encompass the four key areas of business: customers, offering, infrastructure, and financial viability and are shown in Figure 1.

Results and Discussion

The BMC was used to create business models for the public and private healthcare sectors in South Africa. Thereafter, a business model was developed to reflect the possible effect of the NHI on an MHSV.

Public healthcare business model

A business model for an MHSV in the public sector is proposed (Figure 2). The key customers (seen on the right-hand side) are advertisers, care-takers - the parent or guardian of a child who requires vaccination, a mobile operator, and the government.

In this model revenue is generated from advertising to care-takers through the service. Products from advertisers can create brand awareness in a specific market of care-takers (e.g., baby products for those with infants). Health statistics are brokered to the government (a key partner), with the government gaining value through improved information management, prevention of sickness, and predictions of where vaccination will be needed.

The value to care-takers would be that they gain relevant information regarding their child’s health and could receive health information via SMS. Basic features of the mobile service would be available for free, while a premium version with more features could be bought. Customer relationships with the care-takers could include self-service and an automated service.

Mobile operators (a key partner) could be involved to reduce mobile usage costs for care-takers. A mobile operator would benefit from an MHSV by gaining customer subscriptions if the MHSV is presented as an exclusive value added service. Payment for the service (or app) could be done through the mobile operator. Service could be ‘pay-as-you-go’ or an addition to a new or existing handset subscription.

Channels used to deliver the service would mainly be through mobile operators, but also at the healthcare facility (recording of data). A sales force would gain customers for the service via public channels, mobile operators, and healthcare facilities.

Major costs for the MHSV are the development of the platform and maintenance during service. Another cost would be the training of and continual support for healthcare workers to use the MHSV. These would include hospital staff (including administrative staff), and doctors and nurses administering the vaccinations. Creating public awareness (via marketing) and training of care-takers would also incur costs.
From the proposed business model, it can be seen that many stakeholders are involved and that, potentially, value can be created for each stakeholder. By generating value for a variety of stakeholders, it may be possible to offer the service to care-takers at no cost or at reduced subscription fees.
The application of the BMC to an MHSV for the private sector is summarized in Figure 3. The difference in the business model for the private healthcare sector and that for the public healthcare sector is that the role of the government is taken over by health insurance companies. The benefit to these companies is that they gain a value-adding service for their customers. Additionally, healthcare statistics can be brokered.

Because private care-takers have greater access to the Internet, an additional customer relationship in the form of an online community can be provided. Other stakeholders function similarly to the business model proposed for the public healthcare sector.

**Effect of the National Health Insurance**

The proposed National Health Insurance (NHI) aims to give the public access to private healthcare facilities and increase available funding for public healthcare. With the NHI still under discussion, final details on its funding structure are not yet certain.

The prediction on the effects of the NHI on an MHSV are based on the following assumptions:

- **Opportunity:** That the NHI creates an opportunity for an MHSV, e.g., providing an MHSV for public healthcare outreach teams.
- **Funding:** That funding for an MHSV can be secured within the NHI financial structure.
- **Outsourcing:** That private healthcare is involved in providing immunization services.
- **Mandatory:** That coverage under NHI is mandatory for all South Africans.

A business model for an MHSV with both the public healthcare sector and part of the private healthcare sector participating in the NHI is given in Figure 4.

If the MHSV is made mandatory by the government, the Competition Act would prevent a single mobile operator from providing the entire service. As a result, mobile operators would most likely not provide reduced costs for the MHSV in order to gain customers. No additional value proposition would be provided for private healthcare because they would already make use of NHI funding.

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**Figure 4. Proposed business model for an MHSV for public and private sectors participating in NHI.**
and the NHI’s client base.

With the mandatory use of the NHI, every citizen would receive an NHI card, which would increase the need for more effective information management. An MHSV could address this need and provide a scalable solution for the entire population of South Africa.

With such a large reach, revenue from advertising would increase significantly. A paid version of the service (an app, or Internet-based service) can still provide additional features. The online community from the private business model is included because there will be more users with Internet access.

**Comparison**

The key differences of the business models that were developed are compared in Table 1.

**Table 1.** Comparison of developed business models.

<table>
<thead>
<tr>
<th>Models</th>
<th>Customers</th>
<th>Key partner(s)</th>
<th>Key channels</th>
<th>Key value proposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>Public healthcare</td>
<td>Government</td>
<td>Public healthcare facilities</td>
<td>Prevention and information management</td>
</tr>
<tr>
<td>Private</td>
<td>Private healthcare</td>
<td>Healthcare insurers</td>
<td>Healthcare insurance</td>
<td>Information access to customers</td>
</tr>
<tr>
<td>NHI</td>
<td>Public healthcare</td>
<td>Government</td>
<td>Public and participating private healthcare facilities</td>
<td>Prevention and information management</td>
</tr>
</tbody>
</table>

The public healthcare and NHI business models are almost identical. The key difference being that under the NHI, participating private healthcare facilities would be incorporated into service delivery for public healthcare. For the private healthcare business model, healthcare insurance companies would be the key partners and channel, with a value-added service to private healthcare customers.

**Implementation**

If deemed appropriate, future implementation of these business models would require a client to provide funding for the development of the MHSV, and discussions with relevant regulatory bodies would have to be initiated and key partnerships established. End-user surveys, business plan development, and a complete economic analysis would also have to be conducted.

Change management on all levels would be critical in the development of the MHSV. Furthermore, an MHSV requires buy-in from multiple stakeholders and it is vital to procure this before development can commence. Specifically, buy-in from the Department of Health (DoH) should be secured from the outset.

**Conclusion**

The design of a business model for a MHSV depends on the health system context. The key partners, value proposition, customer segments, key resources and revenue streams in a public healthcare system differ from those in a private healthcare system or a hybrid of these systems. In this paper the Business Model Canvas was used to conceptualize business models for an MHSV for the public and private healthcare sectors of South Africa. The effect of the proposed NHI was incorporated into a third business model. Creation of these business models showed how an MHSV could be made economically feasible through value creation and revenue streams in different settings. In the future it will be necessary to validate assumptions in the business model, and to develop business plans and the required economic analyses.

**Conflict of Interest:** The authors declare no conflicts of interest.
Corresponding Author:
Liezl van Dyk
Department of Industrial Engineering
Stellenbosch University
Stellenbosch
Private Bag X1
Matieland
7602
South Africa
E-mail: lvd@sun.ac.za

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