



The 14th International Conference on Mobile Systems and Pervasive Computing  
(MobiSPC 2017)

# Consumerisation of Outpatient Informatics with Mobile Health Framework: A Case Study

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## Abstract

Consumer IT is a concept often associated with Smartphones, as people are more familiar with the tools and applications which they use in their personal life on their devices. As mobile internet usage surpasses that of the PC, it is becoming the core of business enterprise transformations today. The current trend of mobile business is unique as it is dependent on the individual consumer level of Smartphone devices and applications. This is caused by the unprecedented advancement in Smartphones functionality, operating systems and wireless technologies. The paper employs a framework to help decision makers understand this trend and assists in maximising the benefit of mobile and guide the process of planning to provide a comprehensive solution. The paper outlines a mobile based solution which is designed for an outpatient clinics for a hospital located in the capital city Riyadh of Saudi Arabia, and the results were positive if the proposed solution is implemented. This includes the estimated reduction in waiting time by 30%, and improvement of patient satisfaction by 10%, and medical professional satisfaction by 4%.

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Peer-review under responsibility of the Conference Program Chairs.

*Keywords:* IT Consumerisation, Mobile Health, Mobile Solution, Outpatients Clinics, Saudi Arabia;

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## 1. Introduction

In today's world, there are over 7.6 billion mobile connections (4.7 billion subscribers), with more than 1 billion 4G connection in 150 countries, with an estimated global subscribers base to reach 5.6 billion by the end of the decade, covering over 70% of the world's population<sup>1</sup>. According to the independent website of an analytics company StatCounter, mobile internet usage worldwide has already surpassed the PC, and particularly in Saudi

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Arabia where the case study took place, mobile and tablet internet usage accounts for 60% of internet traffic and has surpassed the PC since April 2014<sup>2</sup>. Additionally, benefits of mobile applications are recognised in reports such as The King's Fund report, in which, in a list of technologies which are going to revolutionise healthcare, the Smartphone was ranked number one<sup>3</sup>. Cost reduction, improving outcomes and proactive and targeted care is achieved with help of Smartphones applications such as real-time patient monitoring and analytics<sup>4</sup>. Improving Elective care and Outpatient Clinic's is vital for the future for various reason including financial cost reduction. In the UK for example, Elective care accounts for about 18% of providers' total annual expenditure, and if Outpatient is included, reaches 30%. In acute specialist trusts, it represents 34% of the activity, 23% in acute teaching trusts and 21% in district general hospitals<sup>5</sup> respectively.

The selected case study outlined in this paper is in a well-recognised hospital is Saudi Arabia, that is representative of the situation in the Ministry of Health (MoH) and it is well ranked medically but lags in the provision of integrated information tools. The Kingdom of Saudi Arabia (KSA) has a land area of approximately 2.15 million km<sup>2</sup>, with a population of 29.5 million people and has 256 hospitals with 49.000 beds in government hospital and 14.000 beds in the private hospital sector<sup>6</sup>.

The Saudi health care system ranks above many other international healthcare systems such as Canada, Australia, and New Zealand with a ranking of 26th among 190 of the world's health systems according to the World Health Organization. However, there is increasing concern about the underutilization of electronic health systems in spite of the Ministry of Health (MoH) allocating about US\$ 1.1 billion for the development of electronic services<sup>7,8</sup>.

Due to the large landmass of the country, and the resultant dispersed distribution nature of health care services and health professionals across the geographical areas in KSA<sup>8</sup>, the demand is high for electronic medical services and elective health including outpatient clinics<sup>9</sup>. Patients can experience long waiting lists and a dearth of services issues, particularly in groups such as the elderly, adolescents and people with special needs especially in rural areas where many people have difficulty to access healthcare facilities<sup>8</sup>. The remainder of this paper is structured as follows, in Section 2, we present the concept of mobile health and application, with an outline of the potential integration between the proposed framework and the MoH framework. Section 3, outlines the proposed framework, followed by the case study application in Section 4. Section 5 shows the results which are discussed and analysed using the Balanced Scorecard (BSC), followed by the conclusion outlined in Section 6.

## 2. Mobile Health

Crucial health informatics is essential in order to manage the corresponding supply of services and is a fundamental requirement which would include the potential available level of capacity of elective care service supply, as well as the flow of patients into outpatient services on a weekly basis<sup>10</sup>. Mobile health applications are expected to generate a revenue of US\$23 billion worldwide in 2017, an increase from US\$ 15.3 billion in 2016<sup>11</sup> and these applications spans the spectrum of medical and operational services at medical organizations<sup>12,4,13,14</sup>. In addition to the applications provided by vendors as components of complete solutions offers, 165,000 mobile health apps are also currently available on major commercial application stores, with about 46.000 reviewed apps<sup>15</sup>.

One major use of Smartphones apps is in outpatient clinics, where the focus over the last decade has been on the effective, uninfluential factors on waiting times, preparing for uncertainties and risks, better support for individuals who are dealing with workload, and dealing with variation in the demand and supply in the provision of elective care<sup>10</sup>. The prevalence of basic phones services, Short messages service 'SMS' have been used in supporting services such as appointment bookings, which reduced the fail to attend cases from 23.4% to about 14.2%<sup>13</sup>. Presently with the advancement in hardware and software developed for mobile business applications and wireless network, it is expected that there will be 500 million users of mobile health apps in 2016. In another survey it was suggested that 75% of web users in the UK search for health information, and more importantly, 90% would like to use an online GP appointment booking service and a service allowing them to ask a clinician's questions<sup>4</sup>. In Saudi Arabia, where the case study was undertaken, 84% of consumers find technology important in managing their health, and 40% use mobile health apps<sup>9</sup>. VitruCare for example is an application that reduced clinical practice contacts in outpatient's departments and A&E and reduced the acute admissions contacts, which declined by 53% after implementation, reducing cost in this case from £97,534 to £42,752<sup>4</sup> and other applications with similar positive results include apps such as Ginger.io<sup>3</sup>, MyOps IBM<sup>16</sup>.

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