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An Study of the Use of Mobile Apps and its Implications for Internal Business

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Mariam Taki

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Supervisor:

Dr.Raheel Asghar

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An Study of the Use of Mobile Apps and its Implications forInternal Business

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I. Abstract

This is a qualitative study that aims to explore the use of mobile apps as an innovative technology in the internal business processes of healthcare establishments in the *emirate* of Dubai, UAE. This study is an attempt to fill a gap in literature in order to understand the local healthcare industry and the uptake of mobile apps in Dubai. The study is quite relevant particularly in the context of the Year of Innovation (2015) in UAE. The Year of Innovation has certainly paved the way for UAE organizations to integrate mobile apps into business operations for smart solutions.

This study focuses on private healthcare organizations in Dubai operating under the auspices of the regulation of DHA or DHCC, and having 30 employees or more. The study's unit of observations includes managers and key decision makers in those establishments.

Following the tradition of qualitative research, eight structured interviews were conducted. Analysis was done via a simple form of constant comparative method (CCM) with a specific approach to categorize data bits, connect them, and discover patterns which could provide an explanation and understanding of the issues of interest.

This study concludes that mobile apps have become an unescapable 'hard trend' in healthcare industry essential for businesses to acquire a competitive edge and excel, and that the use of mobile apps can be considered to be the norm in healthcare industry as we are witnessing a major shift in customers' behavior.

This study assesses the technical infrastructure of selected establishments and the general attitudes towards the adoption of mobile apps. Thus, predictors for the readiness of businesses to adopt mobile apps into their internal operations were identified, from which recommendations for decision making were drawn. Moreover, the study provides a glimpse at some examples of mobile apps used in Dubai to facilitate internal business processes at a few healthcare businesses.

Key Words:

Dubai. Innovation. Mobile Apps. Healthcare Industry. Business Restructuring. Qualitative Study.

Word count: 15,947 (including Abstract)

II. Introduction

Background

The use of mobile apps becomes inevitable with the ubiquity of Smartphones (Krieger, 2013). Nowadays, Smartphones have become the standard of communication, and their consumers are increasing; with more utilization of their 'smart' functions and platforms than making calls (Kaufman, 2011). It is due to this global uptake of mobile apps that this study seeks to assess their utilization in certain models; particularly healthcare institutions.

Being aware of the vast number of patient-facing mobile apps that help inform the public about certain diseases and track their health conditions, this paper aims to explore the utilization of mobile apps in restructuring the internal operations within healthcare facilities. This exploration takes two forms: exploring what is already known from literature, and surveying our target population- the different types of healthcare settings in the *emirate* of Dubai, United Arab Emirates (UAE).

This paper explores literature in three healthcare areas: innovation, mobile apps, and business restructuring. The paper also suggests certain ideas of mobile apps to be realized in healthcare settings, as well as using examples of mobile apps to illustrate the unseen opportunities that can be seized and realized, because through examples critical thinking can be triggered (Bredican, et al., 2013). For the purpose of this study, healthcare settings will include in-hospital (e.g. hospitals) and out-patient (e.g. clinics).

This qualitative study tries to understand the utilization of mobile apps within the operations and *internal business processes* of Dubai's healthcare settings, which are defined herein by the activities and key internal processes, sequential or parallel, that build core competencies of healthcare settings which enable them to provide effective medical and non-medical services (and products) that greatly impact their patients' satisfaction (Paton, et al., 2011). It also provides a

coherent review of literature on what is expected and required from institutions, whether in healthcare or other industries, in order to integrate mobile apps into their internal operations.

Other than press releases, literature review has identified a gap in scientific research on the case of Dubai and innovation in its healthcare settings; therefore, the present study is believed to be the first that examines mobile apps in Dubai's healthcare operations.

Contextual Setting for the Study

Ranking 16th on the recently released Dubai Innovation Index (DII) of 2016, Dubai now has the vision to be the smartest city in the world by 2021 (Emirates News Agency, 2016). Its vision to become a sustainable smart city indicates the utilization of innovation in its governmental and social services (Government of Dubai, 2015), and since this announcement, residents of Dubai started to notice a surge in different government mobile applications (*aka* apps) to be used via Smartphones. Dubai residents now can download one application 'DubaiNow' which is sponsored by the government from Apple and Android stores. 'DubaiNow' is a comprehensive app where customers can access 53 government services from 22 governmental entities.[1] In fact, the year 2015 was marked as the Year of Innovation in UAE (Masdar, 2015).

Once a historical hub for pearling industry, Dubai now is a strong emerging market which holds a growing economic power, manifested by its strong infrastructure. Situated on the southeast cost of the Arabian Gulf, Dubai is the second largest *emirate* of UAE, and also second in authority in terms

[1] Source: a message received by the author from 'DXBSmartGov' on her personal smartphone. Dated: December 13, 2015.

of political and economic high-level decisions in the country. Ranking 74th on the Mercer index[2], this metropolis promises to be a 'happiest nation' for its vastly diversified people of 200 nationalities.

The current population of Dubai reflects the huge growth it enjoyed over the last ten years, with almost one million increase from 1,4 to 2,4 million, 85% as expatriates (Woodman, 2012; Dubai Government, 2015), with a projected population of 3.5 million by 2020 (Colliers International, 2014). This growth is well reflected in an annual growth rate of its GDP of 3.9%. With a GPD of US $24,155,563 as of 2015, foreign trade of 0.65 trillion, and an inflation rate of 2.8%, Dubai is set to achieve great heights of socio-economic development (Dubai Government, 2015).

Dubai is reputed for its entrepreneurial spirit and an excellent environment to incubate a diversified, expanding economy. While the majority of Dubai's economic enterprises are within non-oil industries; tourism, real estate, and global financial services are its top revenue-generators (Woodman, 2012). This all due to its strong strategic infrastructure of a busy, modern and large-scale operations international airport[3], a major manmade port of over 120 shipping lines, a modern and sophisticated transportation system, and clusters of free trade specialized zones hosting a wide range of diversified industries- ranging from media to electronics, and including healthcare (Sampler & Eigner, 2013; Krane, 2010).

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[2] Source: www.imercer.com (Accessed 20 Dec., 2015). This index measures the quality of living in different cities around the world, with Vienna being number one for several years.

[3] A second airport, The Al Maktoum International Airport, which is projected to be world's largest airport when fully operational, has already been established and opened to serve few airlines on its first stage.

Enjoying a global competitive purchasing power parity, almost half the consumption expenditure of Dubai's residents is on housing (43%), and only 1.08% on healthcare costs (Dubai Statistics Center, 2015). Health insurance is optional up to the date of this study, but Dubai Government has announced an initiative to be implemented in strategic phases that makes health insurance mandatory for all its residents. This is expected to create a strong economies of scale and increase the competition on rising premium prices (Sahoo, 2014).

Since 1930s Dubai had been an attraction for expatriates, but in modern times, it hosted around 8 million tourists in 2010 and by the end of 2015 this number is projected to reach 15 million[4] (Woodman, 2012). Medical tourism has become recently a major revenue generator worldwide with an effectively large market. Due to the relatively lower costs of key medical procedures in Dubai compared to Europe and the US, Dubai has turned into an international destination for medical tourism. Moreover, Dubai is a tourism magnet which makes it the perfect choice for those who are willing to blend tourism with medical care (*ibid)*.

Dubai's strategic plan of 2021 has put its people first through six themes and corresponding KPIs to accomplish. Two themes of importance to this study are enhancing the living experience, and becoming "a smart and sustainable city". In efforts to enhance the experience of living Dubai Government is aiming to provide high quality education and healthcare services that are affordable for all socioeconomic classes. The second theme aims to have a smart, fully integrated and connected infrastructure that maximizes levels of efficiency and accessibility to services, and

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[4] No data is published yet, up to the date of this paper, for 2015 on Dubai Statistics Center, but official data available for 2014 shows a total number of 9,322,419 guests at hotels in Dubai. Source: www.dsc.gove.ae Accessed 24 December, 2015.

ensures sustainability and further growth (Dubai Government, 2015). This is yet to trigger more innovative ideas to be fully realized.

Dubai's Healthcare Architecture

Healthcare enterprises in Dubai are governed by three main entities: the federal Ministry of Health (MoH), the local Dubai Health Authority (DHA), and the free zone of Dubai Healthcare City (DHCC). With an estimated market of US $12 billion in 2015, DHCC is the largest medical hub in the world and its first free trade zone dedicated for healthcare industry. The well-established free zone has attracted half a million patients in 2011 from around the world, with top nationalities being from the US, UK, India, France, and Philippines. Its implied vision is to excel in healthcare service through recruiting highly qualified professionals and providing cutting-edge medical technologies. This is manifested by the multi nationality medical community it incubates of around 2,500 licensed professionals in different 80 medical specialties, speaking 40 languages (Sampler & Eigner, 2013; Woodman, 2012; Krane, 2010).

The DHCC is viewed as a one-stop shop offering a wide range of medical services in several hospitals, outpatient clinics and state-of-the-art diagnostic laboratories; among which they incubatecenters of excellence in complementary and alternative medicine, cosmetic treatment, dermal and hair transplant, dentistry, orthopedics and sports medicine, endocrine and weight management, eyecare, and cardiology. Moreover, they established strategic partnerships with international research and development companies in medical and pharmaceutical industries, which are believed to have an impact on healthcare innovation (Woodman, 2012).Attracting top international healthcare providers, the DHCC community is strictly regulated byan independent oversight entity-The Center for Healthcare Planning and Quality (CPQ) that was established jointly with Partners Harvard Medical International, in order to ensure quality of care and patient safety. All DHCC members are obligated to adhere to stringent CPQ licensing criteriaand maintain international standards of best healthcare practice (*ibid*).

III. Literature Review

Conceptual Foundations

In efforts to build a conceptual framework for this study, we reviewed literature in three main areas: innovation in healthcare, mobile apps, and business restructuring. Despite the fact that our study will survey all types of healthcare facilities, this study finds that the focus of literature was mainly on hospitals, since they reflect the most mature form of healthcare settings due to their scale and operational size (Marceau & Basri, 2001). Although it is realized that prehospital settings and emergency medical services (EMS) are a vital part of the wider continuum of healthcare, we did not find any theoretical or empirical study on innovation in this field. We identify this as a gap in literature.

While this study acknowledges that innovation can also be non-technological (Djellal & Gallouj, 2007), its focus is solely on technological aspects of innovation; in particular, mobile apps. This view of innovation is supported by the economic theory which favors technologist innovation (*ibid*). Strategically, other industries have extensively utilized information technology (IT) as a tool for innovation in their operations (Putzer & Park, 2010). Examples of such industries are banking systems (Bredican, et al., 2013; Böhmer, et al., 2011), finance and commerce (Hu, et al., 2008), hotels (Bredican, et al., 2013), education (Godwin-Jones, 2011), and healthcare technology management (HTM) (Vasquez & Christopher, 2013).

Why Do We Need Innovation in Healthcare?

Innovation is critical for survival in any business. It allows companies to succeed as it provides them with a full view of opportunities and new ideas to be exploited for further growth (Akenroye, 2012; Sawhney, et al., 2006). It is a way to outperform competitors as new technologies evolve in societies and change consumers' preferences (Sutton, 2004), and at an organizational level,

innovation can enhance employees' capabilities, as it can include fundamental changes and improvements in services provided and processes implemented (Bredican, et al., 2013; Akenroye, 2012). At a larger scale, innovation is the key for the thrift and growth of economies and the development of nations in the new circumstances (Marceau & Basri, 2001).

Linear changes in business are progressive and happening over time as a result of constant human innovations (Burrus, 2014). Burrus identifies two types of trends that happen over time: hard trends, which are predictable cyclic changes that *will* happen and cannot be stopped; and soft trends which *may* happen in the future and are subject to changes in the environment. The later can be influenced and adjusted, but it is the former, i.e. hard trends, that needs to be observed in order to identify linear changes as opportunities and capitalize on them. He argues that our world is entering a "period of transformation" in relation to technological changes, pointing to the necessity to anticipate change- through innovation- rather than just react to it in order for any business to survive (Burrus, 2014).

It was projected as early as 2010 that mobile gadgets would be the main access to the internet by 2014 (Kaufman, 2011), which is the practice by the date of writing this thesis, indicating a strong shift on consumers' preferences and their daily habits (Bredican, et al., 2013). This shift in customers' needs, along with increasing global competition, technology advancements and shortening of product life cycle are identified as key drivers for innovation in private sector, while in public sector it is the chronic, unattained problems that drive the need for innovation (Akenroye, 2012). This can be viewed as an opportunity to capitalize on in different fields, including healthcare (Kaufman, 2011).

Innovation in Healthcare

The perception of hospitals as solely productive units, technical hubs, or information systems predominates the perception of them as a complete service provider hub. The later provides a holistic approach of what hospitals really are, and allows for exploiting abundant innovative opportunities (Djellal & Gallouj, 2007).

Based on the impact of innovation on an organization, three levels have been identified: incremental innovation (i.e. minor changes), radical innovation (i.e. major breakthrough), and transformative innovation (i.e. with significant impact on the entire structure of organization) (Akenroye, 2012; Paton, et al., 2011). Radical innovation in medicine has been witnessed through myriad historical inventions and discoveries. Indeed, innovation in healthcare mainly comes from clinical practice, but not much from organizational level, i.e. hospitals (Akenroye, 2012). In fact, it is until this date that the main breakthroughs in healthcare are stemming from the disciplines of medicine and clinical practice, as in the case of the emerging strategic technologies (EST), such as nano- and biotechnologies, as well as the controversial cognitive enhancement technology (Al-Roudhan, 2015).

Transformative innovation, on the other hand, is believed to be more at an organizational level. While medical innovations are well known in history, it is necessary to distinguish them from innovation in hospitals; a concept that is usually underestimated, but if taken into consideration it includes a wider range of potential innovations as well as wider range of actors in the innovation process in healthcare rather than just focusing on medical profession (Djellal & Gallouj, 2007). This implementation of innovation at an organizational level requires systematic revisions by the management team in order to be successful (Akenroye, 2012).

Innovation in healthcare can be influenced by non-medical factors such as funding policies, budget organizing principle (Marceau & Basri, 2001), increasing costs, complexity of supply chain, and sustainability concerns (Akenroye, 2012). While investing in healthcare technical innovation is perceived as costly (Djellal & Gallouj, 2007; Coughlan, 2006), it can facilitate supply chain and enhance healthcare efficiency (Akenroye, 2012; Marceau & Basri, 2001). In terms of sustainability, some studies argued the life cycle of medical innovations to be of short lifespan, while others suggest that medical innovations do not go obsolete, but rather they are built on previous innovations and support their function (Djellal & Gallouj, 2007).

The NHS has identified innovation as a tool for improvement in healthcare (Akenroye, 2012). Due to the huge size of operation the NHS has, service reliability and excellence are required to effectively meet the constant shifts on demand and customers' needs, which can be effectively achieved through innovation (*ibid*). Meanwhile, the impact of this tool, i.e. innovation, on healthcare improvement needs to be measured against technical effectiveness, which refers to improvements in mortality and morbidity rates (Djellal & Gallouj, 2007).

The Revolution of Mobile Apps in Healthcare

Smartphones appeared in 2000 (Putzer & Park, 2010); nonetheless, the use of mobile apps in healthcare started to appear in literature from 2008, with almost total absence before that year. However, the term 'telemedicine' is well known in literature way before 2008, and one can presume that we can classify Smartphones and their mobile apps into this category.

Among the driving forces of innovation are technological and customer changes (Akenroye, 2012). Smartphones, with their installed apps, nowadays have redefined our societies as they are not just tools for voice communication anymore (Kaufman, 2011). It is the convenience Smartphone apps provide to customers that is shifting the market towards this new business model (Bredican, et

al., 2013). Burrus suggested a new Golden rule in business in which companies must be "transformation agents" that create the need for customers rather than reacting to their wants (Burrus, 2014). This urges healthcare industry to utilize mobile apps in their services provided for their ever-changing customers, as more consumers are adopting mobile apps into their daily lifestyle (Kaufman, 2011).

Our conceptualization of Smartphones and their useable apps as tools for innovation is consistent with the multiple definitions of innovation. Innovation is widely known as the introduction of previously unknown tool, a new idea, concept, product, or service that helps in changing the way a process, service, practice is used to be (Anthony, 2012; Paton, et al., 2011). However, innovation can be a wider concept than just being the first to introduce a new product. It can be the adoption of an already existing technology in a new context or environment (Paton, et al., 2011; Sutton, 2004), by understanding its essential meaning and application possibilities, i.e. "epiphany" (Verganti, 2011), in order to create a competitive edge through a meaningful solution that satisfies customers (Anthony, 2012).

The majority of mobile apps in healthcare are focused on medical application with apps facing patients (patient-facing apps) and those geared to clinicians which facilitate clinical decision support (monitoring, diagnostic, communication with patients, etc.) (Bredican, et al., 2013; Vasquez & Christopher, 2013; Akenroye, 2012; Putzer & Park, 2010). There is little literature; however, on the application of mobile apps within operations and internal business processes of healthcare settings that facilitate workflows. Even before the introduction of mobile apps into healthcare, literature that focuses on organizational innovation in hospitals are relatively fewer than on medical innovation (Djellal & Gallouj, 2007).

Generally, business managers in different industries are reluctant to integrate and utilize mobile apps in their internal business processes, despite what is being called as "software revolution" in

which mobile apps are leading our lives through Smartphones and mobile devices, which predicts an uptake of mobile apps within internal operations soon (i.e. hard trend) (Burrus, 2013). In healthcare industry, there is an underutilization of new technologies as they are not maximized to their fully potential gains in efficiency, and the processes of adopting new technologies are considered relatively slow (Kerleau & Pelletier-Fleury, 2002)

While innovation in terms of medical software systems is already available, it is believed that the use of mobile apps is superior to the traditional computer interfaces already installed at hospitals. This is due to a general state of frustration of the current medical software systems that results in the tendency to prefer Smartphones use in clinical decisions as a "quick fix" (Charani, et al., 2014). This state of frustration is supported further by Krieger (2013), who indicates an inefficient model of the current healthcare system that urges innovative technological solutions (Krieger, 2013).

The big data generated from extensively changing data set forced medical professionals to be dependent on technology to an extent they would feel their loss of control over the exchanged information (Krieger, 2013). This prompts the necessity for more reliable and efficient exchange of those complex input (Yurov, et al., 2007); allowing for data and pictures exchange between medical professionals (Kerleau & Pelletier-Fleury, 2002).

Efficiency and reliability from users' perspective can be achieved with the portability and wireless accessibility features of Smartphones, as well as many other capabilities to be discussed later. From strategic point of view, it was estimated that Smartphones will be the norm in healthcare settings by which healthcare members can access and document patient information (Logan, 2012; Putzer & Park, 2010), which is observed nowadays as more and more healthcare professionals are adopting accessible mobile apps during their working hours (Burrus, 2013; Logan, 2012).

In order to justify the use of mobile apps in healthcare, literature review has evolved into three major perspectives: marketing perspective, operations perspective, and strategic perspective.

Marketing Perspective

For a long term and sustainable revenue generation companies need to have new markets penetration, targeting new segments, and master a competitive advantage over their rivals; by anticipating unsatisfied needs customers may be unaware of (Fahy & Jobber, 2012; Sutton, 2004). This is only possible by exploring new ideas; inventing and experimenting with new technologies and products (Sutton, 2004). When healthcare facilities adopt more innovative technologies, not only they attract more clients, but also they can attract good physicians (Djellal & Gallouj, 2007); thus creating a vicious cycle by recurrently attracting more clients.

End users have been identified as the major source, or 'push', of innovation in medical devices (Logan, 2012; Marceau & Basri, 2001). With the increasing awareness and utilization of Smartphones in their daily living, customers' wants and needs are drastically changing, and the demand for patient-focused healthcare plan has been increased (Akenroye, 2012; Logan, 2012). Remote patients' engagement in their healthcare plans is the new need for many, and the nowadays mobile platforms, social media and apps are significantly improving this engagement (Logan, 2012; Kaufman, 2011), and enhancing the sense of ownership and control over their interactions (Bredican, et al., 2013). In UK, it was recognized that a market-driven approach has improved NHS by making it more responsive to customers' needs (Akenroye, 2012). In fact, it is believed that adopting market-based practices is required for an effective healthcare management (Coughlan, 2006), where the end user is considered right from the beginning of the design of the application in order to make it meaningful and usable, thus widely accepted and easily adopted (Logan, 2012).

Operations Perspective

Smartphones and their apps are considered innovative due to its portability, convenience, wireless connectivity, instant response capabilities, individual use, identifiability, uptime, versatility, GPS and accelerometer capabilities (Bredican, et al., 2013; Logan, 2012; Putzer & Park, 2010); and due to their integration of multiple technological functions, they have the power to change how healthcare business is being done (Putzer & Park, 2010).

It is the immediate notification, i.e. push notification, of a transaction or activity that makes mobile apps especially superior to the traditional IT systems, as well as the unique constant synchronization of data back and forth from server (Bredican, et al., 2013). This can enhance efficiency and performance, thus improving customers' (i.e. patients') experience. This feature can also be utilized, and already have been, with remote patient monitoring, where physicians would have immediate feedback on their remote clients in real time (Krieger, 2013; Logan, 2012).

The logic behind their perceived opportunity in healthcare operations is the need for 'streamline productivity' and saving time (Coughlan, 2006), which can be achieved by the genuine characteristics of mobile apps. And because of this logic, mobile apps have found its way in the out-patient clinics, acute care settings, and rehabilitation centers as well (Logan, 2012).

The introduction of new IT into healthcare resulted in shifts in the nature of services provided by healthcare employees. For example, nurses turned to be more like secretaries due to the data entry and administrative tasks required. This is of a special concern because it may reduce the quality of healthcare provided to clients and actually dehumanizes it (Coughlan, 2006), especially when literature has revealed a shortage of bedside computers inside hospitals and less time of direct patient care by healthcare providers (Djellal & Gallouj, 2007); (Coughlan, 2006). However, new technologies in medicine help in deciding on the product-service mix provided by specialists, and

rethink their clinical strategies in terms of procedures used and products purchased (Marceau & Basri, 2001).

Strategic Perspective

To improve performance and gain a competitive edge in the dynamic industry of healthcare, healthcare settings can effectively benefit from economies of scope by quickly adopting new technologies and therefore expanding the scope of their services (Yurov, et al., 2007). In fact, the capacity of healthcare organizations to adopt innovation within their business is crucial to their growth (Kerleau & Pelletier-Fleury, 2002). It is believed that integrating mobile apps into the internal business processes would increase businesses' competitive advantage in their industries, but the trick is to develop unique apps that are tailored specifically for the business rather than using readymade ones (Burrus, 2013).

Although paperless systems in healthcare, for example, are still a faraway dream to achieve due to the perceived opportunity costs of investing in mobile apps (Charani, et al., 2014), many hospitals have adopted the paperless policy as a strategy to improve work efficiency. However, this strategic step can only be realized through improved technological innovation (Akenroye, 2012).

The increasing level of awareness of the importance of patient's decision as the focal point of healthcare led to the adoption of "patient-led NHS" in UK, which contributes to a fundamental redesign in the service provided (Akenroye, 2012). Therefore, accessing healthcare services from patients' homes, under their finger steps as in the case of mobile apps, can also be viewed as innovation. This can contribute massively to the reduction in waiting time and congestion in queueing while seeking simple medical services (Akenroye, 2012).

The Impact of Mobile Apps on Healthcare

Accessibility of healthcare, both physical and moral, is a quality criterion for medical innovation that has an impact on well-being. It can contribute to both organizational innovation by reducing hospitalization rates, and technological innovation that facilitates healthcare services by utilizing telecommunication (Djellal & Gallouj, 2007). While Djellal and Gallouj's survey was done in 2007, one year before the introduction of mobile apps, it can be assumed that mobile apps can be a type of "telecommunication". This assumption can be supported by authors' statement that "*[a]ny improvement in [accessibility] is regarded as a contribution to healthcare quality and increased well-being, even if it has no effect on technical effectiveness*." (*ibid*, Pp. 185).

Innovative solutions can contribute to the productivity in healthcare settings (Logan, 2012), by positively impact their workflow in a way that was not known before, thus contributing to the effectiveness and efficiency of services, reducing cost of unit, enhancing overall quality, and improving patient outcome (Vasquez & Christopher, 2013; Akenroye, 2012; Logan, 2012; Djellal & Gallouj, 2007; Kerleau & Pelletier-Fleury, 2002; Marceau & Basri, 2001); as access to patient data necessary for decision making will be more swift than before (Logan, 2012).

Moreover, tools of healthcare information technology (HIT), such as mobile apps, can contribute to lower costs of healthcare services through better coordination between different sectors, the support they provide for existing functions, and further quality improvement through reduction in medical errors (Logan, 2012; Putzer & Park, 2010; Coughlan, 2006). It is believed that mobile apps at an organizational level, such as hospitals, would have a good long-term return on investment as they enhance lean productivity and replace bulky technologies (Vasquez & Christopher, 2013). Labor costs saving can also be achieved as healthcare sectors relay more on technologies (Bredican, et al., 2013; Coughlan, 2006). What is even superior to cost efficiency is the operational efficiency that can effectively be achieved by smart technologies that improve

business processes and healthcare procedures, as well as increasing the surveillance of those processes and reliability of medical records (Bredican, et al., 2013; Akenroye, 2012; Coughlan, 2006). Therefore, it is believed that concerning on costs more than benefits gained by advanced HIT will hinder the ability of organizations to improve their industrial capabilities (Marceau & Basri, 2001).

Innovative HIT also has positive impact on employees due to enhancing their scope of work and creating new specialties within (Logan, 2012; Djellal & Gallouj, 2007). While one relatively old study has predicted that innovations in HIT will impact the relationship between clients and their healthcare providers (Marceau & Basri, 2001), innovative technologies, such as Smartphones, can help minimize medical errors by reducing the time spent by nurses at nursing stations while performing extensive documentation, and allowing them to document and access data while being bedside, right next to their patients, or even outside their wards, with convenient, wireless, and portable devices (Putzer & Park, 2010).

Risks

The risks of integrating mobile apps into healthcare systems can be summarized as follows:

- There is an inherent risk in innovation due to the possibility of high failure rate and the use of extensive resources (Sutton, 2004), as it requires heavy investments in assets.
- As confidentiality and security of patients' medical information are top priority in healthcare, the major concern would be breaching confidentiality of such data (Charani, et al., 2014). This concern is valid due to the vulnerability of any device when connected to open networks (Vasquez & Christopher, 2013).

- Despite the opposite claims, it is suggested that more technology adoption into healthcare settings can hinder the quality of patient care provided due to less time dedicated for actual patient contact (Coughlan, 2006).
- In spite of the advantage of making operations less complex, integration of mobile apps, if done without a clear and coherent plan, can increase complexity of workflow and create new stresses overwhelming medical staff (Logan, 2012).

Challenges

Challenges for integrating mobile apps into internal processes can be summarized as follows:

- There are skeptic voices on the sustainability and lifespan of mobile apps, but the stronger critics stem from the fragmentation of those apps (Charani, et al., 2014), which imposes the challenge of centralizing medical apps at one institution, or perhaps in the entire national healthcare system to free hefty memory from mobile devices, reduce unit costs (Vasquez & Christopher, 2013), and allow for effective centralized regulation.
- Integrating mobile apps fully into healthcare systems is a costly decision, and it depends on funding and heavy investments (Marceau & Basri, 2001), which triggers the question whether it will pay off in the quality of care and services provided (Bredican, et al., 2013). However, the true evaluation of the outcome can only be possible after a good period of time (Coughlan, 2006). This prompts a coherent feasibility study that accurately analyses costs and benefit.
- Healthcare system is a complex animal which makes it difficult to work in harmony in terms of innovation and organization; as a result, one can easily identify gaps and fragmented approaches towards innovation and its applications in healthcare (Marceau & Basri, 2001).

- At operational level, one challenge would be to make sure the integration and deployment of mobile apps happen in a seamless manner that does not negatively impact the patient; who is the center of any healthcare system (Logan, 2012).
- Sometimes challenges can be from the unexpected, as employees themselves can be barrier to innovations. Reportedly, nurses have resisted new technology adoption for several reasons; some of them are valid points (Coughlan, 2006).
- From technical point of view, one challenge of integrating mobile apps into a healthcare system is the interoperability between the different devices. Indeed it is a time consuming process as aligning the different parameters can take several months to be completed (Logan, 2012).

What is Needed?

In healthcare settings the issue of confidentiality and data security is essential and should be of a top priority when developing and integrating mobile apps within healthcare institutions' networks (Logan, 2012). Therefore, penetration testing protocols (pen-testing) are required to secure mobile devices within the setting (Vasquez & Christopher, 2013).

The notion of "infrastructure" from a technical perspective is mentioned in several articles (Vasquez & Christopher, 2013; Logan, 2012; Putzer & Park, 2010). In their technical paper, Vasquez and Christopher describe a "visionary" mobile bench stock database, which is the standard nowadays for all unified healthcare systems that is accessible through mobile devices of one healthcare setting, as well as other healthcare settings within the same network (Vasquez & Christopher, 2013). This approach can be effective with the case of prehospital care, i.e. EMS, where accessibility to patients' files is not always possible. Consequently, a team of technical support is a must to fix unexpected twists and bugs, especially at the beginning of the integration

and during the transition between the current and the new system, as well as a mobile computerized management maintenance system (Vasquez & Christopher, 2013).

Technically, integrating mobile apps into a healthcare system requires a coherent IT plan that specifies the type of capability of connection (LAN vs. 3G or 4G), bandwidth, quality of service, security and level of access (Logan, 2012). In their research model to explain intention and attitude towards adopting a Smartphone, Putzer and Park (2010) identify several innovation factors. One specific factor, "compatibility", has a significant *P* value indicating a strong positive link between the adoption of a new innovation and its compatibility with the current system an organization uses (Putzer & Park, 2010).

For an innovative concept to be adopted and get diffused within healthcare facilities, it is necessary to have certain preconditions that support such diffusion. When adopting mobile apps within the internal business structure of any setting, it will be necessary to carefully plan for this major shift through pre- and post-evaluation of performance (Vasquez & Christopher, 2013). A qualified team that is especially trained on such innovation must exists in any healthcare facility that wishes to adopt that innovation. But this will not be sufficient if the medical and healthcare population within that facility do not accept the new concept, understand the effects of its integration on their workflow, nor start to adopt it as part of their daily practice (Logan, 2012; Djellal & Gallouj, 2007).

Policies and organizational arrangements that affect funding and purchasing decisions are also powerful players in innovation adaptation (Marceau & Basri, 2001). In addition, it is the establishment of robust governmental standards and governance frameworks that contribute to the safety, control of access, and confidentiality of these technologies (Charani, et al., 2014; Djellal & Gallouj, 2007). The need for centralized evidence-based guidelines that can be bestowed onto the

entire healthcare sector is believed to protect patients against unreliable and inefficient innovations in healthcare (Coughlan, 2006).

From a behavioral point of view, the adoption of new technology depends on the positive attitude toward it, end users' perceived usefulness and necessity, as well as its ease of use and convenience (Vasquez & Christopher, 2013; Logan, 2012); which can especially enhance healthcare employees' involvement (Logan, 2012; Putzer & Park, 2010). Therefore, it is highly recommended to have adequate training to employees who will be the end users of such apps (Vasquez & Christopher, 2013).

This thesis will not dig deep into behavioral attitudes and intentions models, but it is these behavioral researches that support our survey in which we ought to ask healthcare managers about their "willingness" and "readiness" to integrate mobile apps within their organization's operation. It is found that management support of the adoption of Smartphones and their mobile apps has a positive effect on the overall organizational attitude towards adopting new innovations in the future (Putzer & Park, 2010). Other factors that increase innovation's uptake in healthcare settings include its compatibility with the existing system's interface; i.e. universality, supportive attitude from top management, and a supportive internal environment towards adopting and encouraging new technologies (Bredican, et al., 2013; Putzer & Park, 2010).

Finally, and usually overlooked, is an up-to-date IT technical team that has the right mindset, training, and expertise to integrate mobile apps into the traditional IT system, which can be challenging as the traditional controlled IT environment may not apply well to mobile apps, urging for extensive IT support models. Moreover, a thorough experience and knowledge in mobile app development is a must in order to develop own mobile apps. (Logan, 2012).

Medical Apps in Action

Clinically, it is envisioned that mobile apps would replace the bulky medical equipment used for assessment with readily available extensions to be connected to mobile devices (Vasquez & Christopher, 2013), such as the innovative blood glucose monitoring app 'iBGStar' (Tran, et al., 2012).

Literature review has revealed many examples of brilliant medical and healthcare related apps that are already on action. The audio-visual features of Smartphones are exploited by many mobile apps, including 'Doctor Mole', a free app that allows for self-examination of moles for melanoma, using augmented reality technology in real time to analyze images sent by end users (Bredican, et al., 2013). Another app is 'Mobile Wound Analyzer', which utilizes camera feature of Smartphones to provide evaluation and suggest treatment based on the image sent of the wound (Vasquez & Christopher, 2013).

'Dragon Medical Mobile Recorder' is a voice recognition system that is geared towards clinicians in which it allows them to expedite the processes that require dictation. This app can be perfectly integrated into healthcare systems allowing for effective communication of the recorded data through intra- and internet (Bredican, et al., 2013). The feature of audio recording in Smartphones is also exploited by 'Test Your Hearing' free app, in which end users can undergo a simple hearing test (Vasquez & Christopher, 2013).

The GPS capability of Smartphones is already well utilized in many medical apps. 'Doctor Finder', 'PocketHealth', and 'Patient.co.uk' are all examples of medical apps which utilize GPS to allow patients search for nearby physicians' clinics, record and send their emergency information, and search healthcare databases respectively (Bredican, et al., 2013). A superior app is the one that

fully integrates as much Smartphone capabilities as possible in an effort to maximize the potentials of Smartphones (*ibid*).

Although many medical apps are found to be targeting patients and physicians as individual end users (Vasquez & Christopher, 2013), some apps are designed to fit at organizational level, such as 'MacPractice'; a full-scale app that provides different management functions within healthcare setting, allowing patients to book their appointments, complete billing and financing procedures, and search their medical records; in which these data are made accessible by the staff who can in return communicate with the interacting client (Bredican, et al., 2013).

Other mobile apps contribute to improving patient's outcome by providing the facilities to monitor and track vital information of patient's conditions, with the ability to send these data in real time to the attending physician, prompting necessary interventions as needed (Krieger, 2013). 'Medbase' is an example of an app that provide personal medication recording system which helps tracking medications taken, looking up prescriptions and sharing information with physicians and other professionals (Bredican, et al., 2013). This medical app can help the elderly and chronic illness patients who are known to be on multiple medications.

Despite being perceived as risky, all those patient-facing medical apps are not considered, yet, as a major threat to medicine practice. In general, medical technology is not in the shape yet to replace medical professionals (Krieger, 2013).

Innovation and Mobile Apps on Business Restructuring

Because hospitals are service providers as well as healthcare system hubs, mobile apps can be viewed as potential organizational and service innovations when applied in different support, non-medical functions within hospitals, thus changing the way these functions operate (Djellal & Gallouj, 2007). This is referred to as "peripheral innovation" which relates to the structure within

which healthcare services are provided, and is responsible in facilitating communication between different departments, which can lead to overall improvement of hospital performance while at the same time minimizing paper use (Akenroye, 2012; Djellal & Gallouj, 2007).

Marceau and Basri (2001) have identified several, yet limited, potential areas for innovation at healthcare settings, most of them are focusing around business operations and services provided at hospitals. Some examples of operations that can flourish from IT innovation are waste management, maintenance, cleaning, food services, rehabilitation, pathology procedures, financial services, legal services, in addition to IT services (Marceau & Basri, 2001).

Moreover, mobile apps allow for 'creative outsourcing' of non-medical services within healthcare settings to the customers through their Smartphones, such services can be scheduling, communication, billing, records management and similar services dedicated to patients (Bredican, et al., 2013). Other support operations that can be 'outsourced' to mobile apps are supply chain management, logistics such as inventory management, purchasing, maintenance, as well as administrative functions (Burrus, 2013). This type of creative outsourcing can contribute to more efficient systems by reducing pressure on clerks and call centers, better yet, replacing manpower with advanced technology. However, this is applicable only to non-medical services, as advanced technology should never replace human medical staff (Krieger, 2013).

Healthcare in Dubai

As it was officially approved, Dubai's budget for 2015 totals Dh41 billion (£7.21 billion), with 35% allocated to areas of social development, including health, with an aim to increase healthcare services efficiency (Gulf News, 2015). In 2012, it was estimated that Dh10 billion were spent on healthcare, with Dh5.8 billion spent on private sectors (Bell, 2014).

With a rapidly growing population (Dubai Health Authority, 2015), it is estimated that children below six years old and elderly above 65 years old account for only 6% of Dubai's population, being responsible of 18% of total health expenditure. This was contrary to male residents for instance, who account for 76% of Dubai's population with 53% of total health expenses (Bell, 2014).

Recently, and in alignment of Dubai's vision of launching "the smart government" initiative, DHA has launched in 2013 the "smart healthcare initiative". It aims to provide a comprehensive, sustainable smart technical solutions in healthcare sector that facilitate access to healthcare services by residents, as well as electronic access of patients' files, including diagnostic results, by healthcare professionals. This is believed to enhance efficiency and effectiveness as one of the major goals of the 2025 Dubai plan on the healthcare sector (Bell, 2014; Dubai Healthcare Authority, 2013), as well as achieve significant savings (Badam, 2013).

Moreover, in an effort to enhance customers' experience, the DHA is planning to transform its hospitals into "smart hospitals" by initially providing android tablets to be allocated at waiting areas (Ruiz, 2013). This trend is supported by study's literature as many hospitals worldwide started to distribute tablet-like devices on its medical professionals to be utilized with their hospital mobile apps (Logan, 2012). The rise of this trend is hardly ignored as it is believed that more industries are picking up with utilizing mobile apps in their business restructuring (Burrus, 2013).

The Case of Emergency Medical Services (EMS)

In prehospital settings, it is especially important to have solutions for data accessibility that are reliable and effective in the versatile functions of EMS systems. Mobile apps help EMS personnel access data instantly at any time, any place, from mobile devices, which may have positive impacts on effectiveness and efficiency of the service provided.

Despite the lack of independent scientific research on mobile apps' impact on EMS systems, literature review has revealed many websites, articles and documents interested in such topic.

One important feature of Smartphones lies on its GPS capabilities through which one can know precisely the location of a person and track them geographically (Bredican, et al., 2013). Although it is not mentioned in Bredican *et al*.s' paper as such, but this feature is of especial importance to the EMS settings, where mobile apps can be used to track ambulances and pinpoint their exact location. Moreover, the audio-visual capabilities of Smartphones can further enhance the quality of communication between EMS staff on the field and their medical directors elsewhere.

There are vast numbers of mobile apps especially dedicated to EMS personnel; however, the majority of them are ready-to-use apps that are not designed by EMS systems themselves. Reviewing the apps shows clearly how relevant they are to the nature of EMS systems and their operations. Such apps are related to tracking of ambulances, guidelines on prehospital procedures and policies, medications information, locating an AED (EMS1, 2014), and one called 'Twiage', an app developed by a Cambridge, Mass. start-up that allows paramedics while en route or on scene to communicate the critical findings of their patients in real time, including sending photographs of ECG and injuries, with the attending emergency physician in the specialized hospital before arrival. This award winning mobile app helps improving patients' outcome by innovatively (and virtually) reduces response time (Borchers, 2013).

Conceptual Model

A review of literature has certainly helped to develop a conceptual model for this study. The model starts with literature review, focusing on three main domains in healthcare: innovation, mobile apps, and business restructuring. This body of knowledge helped to construct both; the survey and research questions, in which the later forced the author to dive deeper into literature to

find more data. The survey questions were used in study's structured interviews. The findings from those interviews were further analyzed to explain certain phenomena, which in turn would answer study's research questions and feed into policy implications.

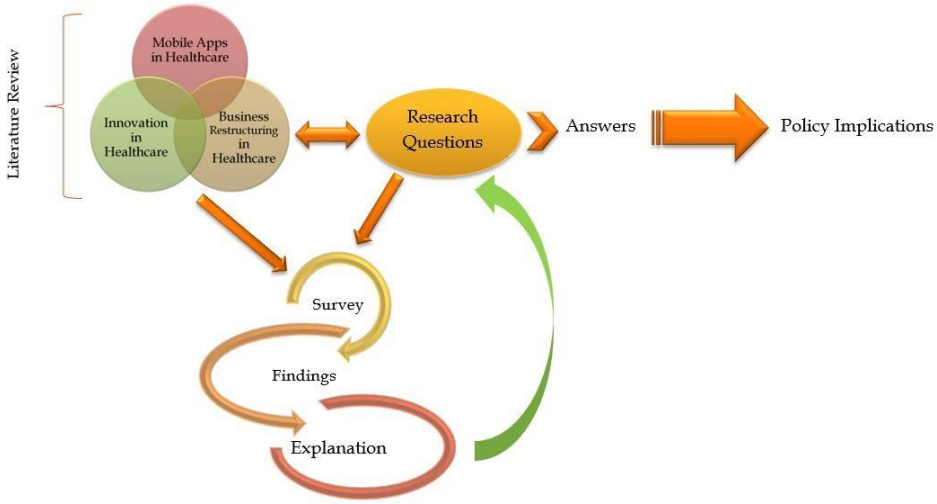


Figure 1: Conceptual Model of the Study

Research Questions

The following research questions were generated from our understanding of the three major areas of literature topics, with an emphasis on the case of Dubai:

1. Are healthcare establishments in Dubai picking up the new trend of mobile apps? In what ways?
2. Are healthcare organizations in Dubai ready at a management level to utilize mobile apps in their internal business processes and healthcare operations?
3. Do healthcare organizations in Dubai have the right infrastructure to integrate mobile apps as a new way of performing their businesses?
4. Are mobile apps utilized or simply perceived as an innovative method to restructure in-house processes of healthcare establishments; thus transform how healthcare business is done forever?

IV. Methodology

Study Design

This qualitative study is a prospective, cross-sectional, primary research aims to understand the current practice of selected healthcare organizations in Dubai towards mobile apps integration within their internal business processes. It follows a deductive approach that allows for exploring the process of integrating mobile apps in healthcare settings, and derives from this exploration a better understanding of the research issues. A review of literature (Bredican, et al., 2013; Vasquez & Christopher, 2013; Logan, 2012; Putzer & Park, 2010; Djellal & Gallouj, 2007; Kerleau & Pelletier-Fleury, 2002; Marceau & Basri, 2001) as well as technical consultations with experts have paved the way for developing a questionnaire with minimum open-ended questions consistently used for all interviewees. This form of structured interview is sufficient for this qualitative research due to highly developed literature and understanding on the topic. It further allows the researcher to focus on what is being studied with relevant questions (Explora.com, 2009; Cohen & Crabtree, 2006).

Sampling

The target population for this study includes healthcare settings in Dubai, which includes in-hospital and outpatient care.

This study's sample includes private healthcare organizations in Dubai that have direct contact with patients with at least 30 employees. Any ‘healthcare’ facility that deviates from these two criteria was excluded. Pharmaceuticals, health insurance businesses, nutritional facilities, dental clinics, skin care and cosmetic clinics are also excluded. It is assumed that a healthcare facility with less than 30 employees would have less motivation to invest in mobile apps integration due to the associated high costs.

Because this study requires disclosure of complete information on institutions by the respondents, a non-probability sampling technique is chosen due to the limited accessibility to the subjects (Explorable.com, 2009). Moreover, to maximize the representation of the general population, a mixture of "judgmental sampling" and "maximum variation sampling" is adopted, in which the researcher ensures the subjects selected maximize the diversity of healthcare community and include different types of healthcare establishments (Explora.com, 2009; Cohen & Crabtree, 2006). This is possible due to researcher's background in healthcare, which allows her to use her professional judgement on selection.

In qualitative research, there is an argument about how much sample size is adequate, with much more emphasis on the quality of analysis (Barnett, et al., 2015; Baker & Edwards, 2012). This study will have the goal of surveying as many organizations as possible, but to ensure data validity, samples will be selected carefully to effectively represent the target population.

Data Collection

Because this study targets institutions rather than individuals as its unit of analysis, the inclusive criteria caused the population size to further get smaller. To understand this small population a list of all healthcare facilities in Dubai was generated, which was derived from online directories and Google search engine, as well as government bodies such as DHA. Nonetheless, the population was difficult to be fully determined due to the following:

- There is no comprehensive, up-to-date online list of all hospitals and medical establishments in Dubai.
- Many hospitals and clinics mentioned online do not exist because they are still under construction or terminated.

- There is a duplication effect in some websites because some hospitals are found to have their old names as well as their new ones.
- Some healthcare facilities are not found in the lists provided online; rather, they were found during the field exploration phase of this study.

The next phase was to explore healthcare institutions in Dubai by field visits, which started at DHCC. Private hospitals outside the authority of DHCC were visited afterwards. The first visit was of an introductory nature in which the researcher explained the nature of the research, acquired verbal consents to participation, and exchanged contacts for further arrangements. Those who agreed to participate were interviewed on their convenience. Many respondents refused saying "we're not a good example", "your interview is not on our priorities", or "we are currently busy"; despite the explanation that the study is not biased towards those who integrate mobile apps, and that the interviewer can adjust her time to suit theirs.

Due to the study's strategic nature, it is necessary to interview top management to get the required information. Selected subjects were interviewed personally by the researcher. Each participant was provided with the participant information sheet required per SBS ethics regulation, and signed a consent form.

Information was collected via structured interviews with the presence of researcher in order to ensure a complete understanding of the topic in question and to maximize the response rate. There was no audio or video recording. A few open-ended questions were included in the survey to allow for flexibility of answers.

Each respondent’s identity is kept completely anonymous by using a simple coding system.

V. Findings

A qualitative research methodology designed for this study uniquely suited to opening the black box of a phenomenon of vast scope and constant evolution in the healthcare sector of UAE.

The Emerging Categories

Our analysis of the first few interviews revealed the following categories: general profile, IT department profile, strategy, accessibility, attitude, characteristics of mobile apps, and challenges for mobile app integration (for those who integrate mobile apps), or concerns for implementing mobile apps (for those who do not integrate mobile apps into their systems). These categories emerged from the different questions of study's survey instrument (Table 1).

The Final Sample

Our creative sampling technique has settled on eight subjects, of which five are hospitals. The very small sample size is quite common in qualitative research (Barnett, et al., 2015; Baker & Edwards, 2012; Crouch & McKenzie, 2006). And while this study surveys a hard-to-access population, i.e. high key figures on executive boards at healthcare institutions, it is justified to have a small number of subjects, as little as six, and have sufficient and valuable data at the same time (Baker & Edwards, 2012). All of the institutions are private entities that operate in Dubai; six establishments belong to DHCC, and two hospitals belong to DHA.

Category	Details from questionnaire	Corresponding research question	Corresponing question from questionnaire
Profile			
	Type of institution		
	Size (no. of employees)		
	Notes (emerged during the interview)		
IT Dep. Profile			
	No. of full-time staff	3	Part II, Q. 1
	Average experience	3	Part II, Q. 2
	Training on IT new topics	3	Part II, Q. 3
	24/7 technical support?	3	Part II, Q. 4
	Programming Language	3	Part II, Q. 5
Accessibility			
	Access from outside?	3	Part II, Q. 6
	Third party integration	3	Part II, Q. 7
	Way of access	3	Part II, Q. 8
	Data security	1,3	Part I (Y) Q.4
	Internet	3	Part II, Q. 10
Strategy			
	Budget on innovaton	2	Q. A
	Budget on IT dep.	2,3	Q. B
	Improvement?	4	Part I (Y) Q. 6
	Strategy regarding mobile apps	2,4	2,5
	Ready to integrate mobile apps	2	Part I (N) Q. 4
	Part of overall strategy	2,4	Part I (N) Q. 5
Attitude (of managers toward mobile apps)			
	Believe in mobile apps rule	4	Q. C
	Training of medical staff on mobile apps	2,3	Part I (Y) Q. 3
	Agree with necessity	2,4	Part I (N) Q. 1
	Willing to adopt mobile apps	2	Part I (N) Q. 1
Characteristics of Mobile Apps			
	What level?	1	Part I (Y) Q. 1
	Describe the experience	1	Part I (Y) Q. 2
	Product and company name	3	Part II, Q. 9
Challenges of mobile apps		2,3	Part I (Y) Q. 7
Concerns for implementing mobile apps		2	Part I (N) Q. 3

Table 1: Categories Emerging from Survey.

Results

Profile of Interviewees

The sampling method applied focused on a wide range of healthcare establishments that provide different types of services, including ophthalmology, pediatrics clinics, center of excellence,

specialty centers, day care facilities, tertiary hospitals, polyclinics and general hospitals (Table 2). Interviewees from those establishments were all from top management personnel in the executive board that are involved in strategic decision making. Such positions include medical directors, managing director, directors of IT, and operations directors (Figure 2).

Type of Institute (Level of Analysis)	A-1	A-2	B-1	B-2	B-3	B-4	B-5	B-6
Ophthalmology Clinic						●		●
Pediatric Clinics							●	
Specialty Centers	●	●	●	●			●	●
Center of Excellence		●	●	●				
Tertiary Hospital				●				
Day Care Facilities			●		●	●	●	●
General Hospital	●							
Polyclinic				●	●			

Table 2: Type of Institutions surveyed (Level of Analysis)

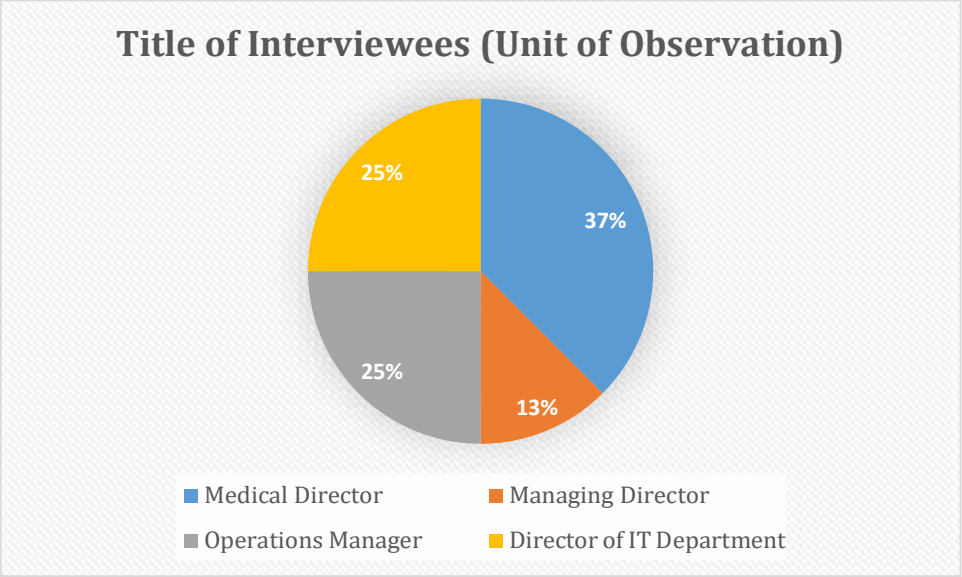


Figure 2: Title of the Interviewees (Unit of Observation)

The 'Yes' Dyad

We first analyzed the two healthcare facilities which integrate mobile apps into their internal business processes, (A-1) and (B-2), by finding similarities and differences within their answers. The first striking 100% similarity was found to be their "general profiles"; they both are specialized hospitals which belong to larger groups, with multiple specialties, and their employees count for more than 300 (one of them is 700). It is evident; therefore, that the two institutions are large healthcare facilities, which strongly influences their budget and the level of their operations.

Moving to analyze their IT departments, they both employ more than ten full-time IT technicians, with a slight difference in their average experience, and a 24/7 technical support service is found common among the dyad. However, unlike (B-2) which provides monthly training for their IT technicians, training for IT employees on new trends and innovation in technology is lacking in the other hospital due to limited budget for each department. This later hospital (A-1) is part of a local group which is relatively smaller than the other foreign, massive group of 10,000 employees.

The larger hospital (B-2) preferred to keep its programming language confidential, along with their budget percentage on innovation and IT department. (A-1), on the other hand, disclosed a percentage of 1-2% funding for IT department from total budget, and the use of Oracle, Java, and Microsoft.NET as their programming languages.

In terms of "accessibility", they are both 100% as well in line with the features under this category. Both hospitals have access to their hospital information systems from outside using virtual private network "VPN", which was described by one interviewee with an IT advance experience as the "most secure way" to access from outside of any institution. They both have an integrated interface to allow for third party application interaction, a feature that is essential as an infrastructure for mobile app integration. Moreover, both hospitals have the ability to access their

computer systems through mobile interfaces, in addition to web browser and desktop interface for (A-1). They both use data encryption method to secure medical records and maintain confidentiality, and provide all modes to access the internet: wireless LAN, 3G, and 4G, at their facilities.

Both hospitals consider mobile apps integration at the core of their strategies, with "evident improvement" on the overall performance for (B-2), and positive impacts on lowering medical errors, increasing patient satisfaction, reducing mortality and morbidity rates for (A-1). However, there is no evidence on cost effectiveness, yet. While funding innovation and IT department is confidential for (B-2), it is not accurate to conclude a superior funding on smart solutions, even if its mobile app is an in-house product. (A-1), on the other hand, disclosed a percentage funding of 1-2% on IT department, with more than 25% on innovation that could be technical or non-technical.

The obvious contradiction, on the other hand, between the dyad is their characteristics of mobile apps. With a confident attitude that mobile apps cannot be fully integrated, (A-1) has a fragmented system of mobile apps that governs selected internal operations. This attitude was reversed at (B-2) with a fully-integrated system, due to its in-house developed mobile app product. However, both hospitals have their mobile apps integrated at all operational levels: patient-facing, medical decision-support for physicians, and operating levels (scheduling, billing, etc.).

It is evident at a management level both hospitals believe in the role mobile apps can endlessly play in transforming healthcare business. In fact, this is evident among all other participants which do not integrate mobile apps in their institutions. This belief is supported by the commitment from both (A-1) and (B-2) to provide up-to-date training for their IT staff on the new trends and state-of-the-art IT topics. Albeit, (B-2) provides more frequent training (monthly), compared to less frequent (bi-annually) training for the other (A-1). This was explained by a tight budget allocation for each department at (A-1).

The major challenges for (B-2) while developing and integrating their own mobile apps were budget and the development of this in-house product. These were not of special concern for the other hospital (A-1) as their main challenges were how to finalize the provided services and requirements needed, how to integrate it back to the old in-house system (HIS), and finally the usability, design and acceptance of the mobile apps to end users.

The 'No' Gang

There are six subjects that answered 'No' when it comes to the integration of mobile apps into their institutions' operations. Except for two, they belong to bigger healthcare groups, either local or international. The sizes of their establishments range from 35 to 300 employees. The smallest establishment of 35 has no in-house IT department, and has outsourced the entire IT operations, which supports our assumption when determining the size of selected institutions as an inclusive criterion. It is the only subject that has no 24/7 technical support. The rest have at least one full-time IT staff in-house with varied years of experience, but not more than four, reflecting a relatively smaller IT department than the "'yes' dyad" (Appendix B).

By comparing their accessibility features, majority of the establishments have access from outside to their information systems, using a web browser as a main way of access. And except for one institution (B-6), they all allow for a third-party access to their systems. The only mode they provide for internet access is wireless LAN, except for (B-1) which has the three access modes: Wireless LAN, 3G, and 4G. There is only one institute (B-5) which uses mobile interface as a way of access to the in-house system.

Strategically, their funding for IT departments ranges from 1% to 15%. The only two establishments in which mobile apps integration is not part of their overall strategy also consider themselves "not ready" for this major focus. Explanations were "no technical support yet" (A-2),

and that mobile apps in healthcare is "not yet generally accepted in the market" (B-3), with a total absence of strategy for mobile apps integration. The later (B-3) is part of a large local group that believes in investing in innovative ideas only if they would lose otherwise, according to the interviewee.

However, three of the participating establishments already have a road map towards applying mobile apps into their operations, with clear short-term and intermediate strategies. One of them (B-6) is on an "exploring the market" phase while their mother company has already developed a specialized open-source mobile app to be utilized for their different operations, including decision-making for medical staff. Their strategic goals are to improve patients' experiences, allow for interconnectivity in a multisite set up, and increase accessibility to patients. Moreover, (B-5) has a short-term plan to increase sales by targeting more clients in order to purchase a "strong mobile app" that helps in "automating appointments, schedules and different sections". And despite being the smallest establishment among our sample, it believes a turnaround would happen to improve their marketing strategy as well in the long-term.

Nevertheless, the interviewed representatives of institutions with no mobile apps had positive attitude regarding this innovation; they all believed in the role of mobile apps in transforming healthcare business, agree with the necessity to integrate mobile apps within the business structure of healthcare industry, and expressed willing to adopt mobile apps in their business structure whenever an opportunity arises.

The two most shared concerns for integrating mobile apps, though, were 'uncertainty about its effectiveness and efficiency' and 'violation of safe access and confidentiality of medical records', followed by 'the huge estimated costs associated with it' and 'inability to control the workflow of the organization'. Finally the interviewees suggest least concerns for 'uncertainty about its future and lifecycle', "adjusted to [their] clinical model" and "technical difficulties from the electronic medical

record provider company". There is no evidence that mobile apps are perceived as a threat to the medical practice (Figure 3). These concerns were derived from literature and are used in our survey based on a multiple selection scheme. Subjects were given the flexibility to answer by adding more concerns under 'other' option.

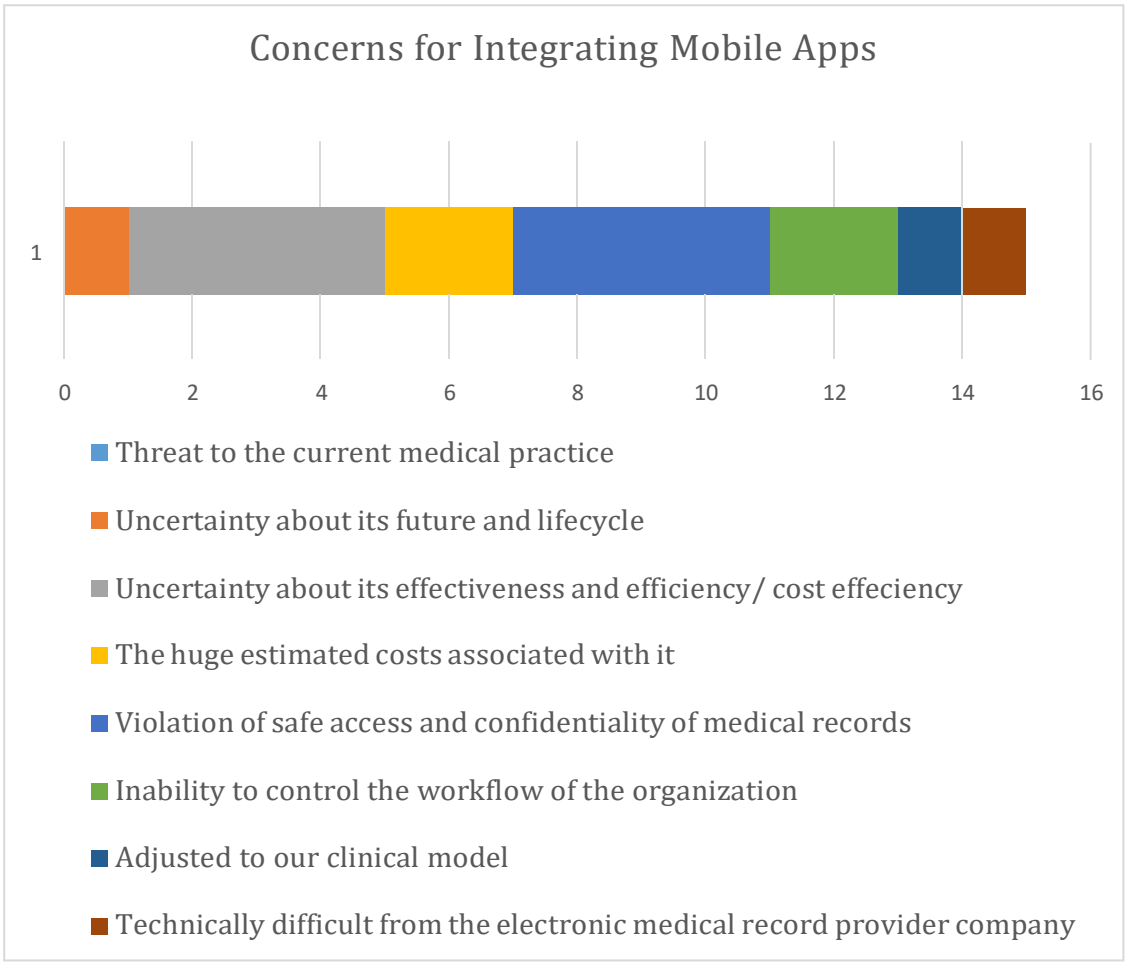


Figure 3: Concerns of participants for the integration of mobile apps into the internal business processes of their institution. (Those participants did not have mobile apps integrated in their institutions, yet.)

On Business Restructuring

This study has a very limited number of institutions that integrate mobile apps into their internal operations, which prevents us from fully exploring the current practice in Dubai's healthcare

systems regarding business restructuring. However, a single interview (with A-1) had revealed many aspects that acknowledge the actual and potential utilization of mobile apps in business restructuring. (A-1) has a strategy to "transform business" via different tools, including HR solution portal, patient-engagement solution (ex. OneView app) and mobility of business applications, including finance, planning, and enterprise, with 30% of budget geared towards business mobile applications compared to 70% to healthcare apps. (B-2), on the other hand, kept private in this matter.

To explore this issue more, we evaluated the strategies of those who do not integrate mobile apps; yet are looking forward to actualizing it (which are B-4, B-5, and B-6), and scrutinized any potential business restructuring goals using mobile apps. (B-4) stated that they "are planning to install mobile apps for appointment booking and confirmation integrated with hospitals appointments system and SMS module". (B-6), on the other hand, focuses on "interconnectivity in a multiple set up" and "increasing patent accessibility". While (B-5) is looking forward to reducing manual handling of different tasks by automating appointment booking and scheduling, as well as using mobile apps in the long run as a marketing tool.

VI. Discussion

This study originally aimed to examine the use of mobile apps in restructuring business processes and its impact on the performance. But due to the very limited number of healthcare organizations *implementing* this tool (i.e. mobile apps), it was not possible to effectively study the effects on institutions' KPIs, nor is it possible to obtain statistically significant conclusions from only two subjects which deploy it. Therefore, the study took a twist toward assessing whether Dubai's healthcare infrastructure is ready to embrace this innovative tactic to improve its internal operations or not yet, with a brief assessment of the types of mobile apps used or planned to be used.

The majority of our sample are hospitals (total of five), which is consistent with the literature in which a greater emphasis was put on hospitals due to its wide, holistic scale of operations (Marceau & Basri, 2001).

A Hard Trend

As five out of eight participants could realize the potential of mobile apps as an opportunity for growth, our research found that mobile apps within Dubai's healthcare industry points to an inevitable "hard trend" that will happen sooner or later, as described by Burrus (Burrus, 2014); thus creating the necessity to adapt to this market shift for businesses to thrive and survive. Moreover, Burrus describes a phase of "transformation", but we are no longer in that phase as technological advancements are swiftly adopted (*ibid*).

This study is consistent with the tendency in literature regarding the utilization of mobile apps as a "quick fix" in medical decision making (Charani, et al., 2014). This was recognized by the uptake of this trend among the few hospitals we interviewed, and the sheer willingness to adopt it among others. Their practice is considered up-to-date and benchmarked against the international

practice of healthcare industry, supporting the notion that mobile apps are superior to the traditional healthcare information systems (HIS) (*ibid*).

Furthermore, one of the 'yes' participants, (A-1), specifically identified "mobility, virtualization, and cloud technology" as its focal IT strategy. All of these pave the way for a scenario on the mobile apps revolution and can predict an inevitable uptake of the trend soon in the market. These results indeed support our first research question: whether Dubai healthcare industry is picking up with the new trend of mobile apps or not.

Some of the participants in our research exercise could not identify mobile apps as their prospect. According to this study's *marketing, operational* and *strategic perspectives* discussed earlier in the literature review, those organizations could miss an opportunity to gain a competitive advantage, fail to improve their performance and operational efficiency by expanding their economies of scope or industrial capabilities, and lose a capacity to grow and strategically survive in the ambitious healthcare industry in Dubai (Bredican, et al., 2013; Burrus, 2013; Krieger, 2013; Akenroye, 2012; Fahy & Jobber, 2012; Logan, 2012; Putzer & Park, 2010; Djellal & Gallouj, 2007; Yurov, et al., 2007; Coughlan, 2006; Kerleau & Pelletier-Fleury, 2002; Marceau & Basri, 2001). Moreover, the ubiquity of Smartphones is inescapable, which proves a major shift in customers' behavior (Krieger, 2013). Therefore, as time passes, their services would become obsolete and outdated, possibly leading to a state of frustration among their customers, who in turn can deviate from these institutions to those with most convenient, up-to-date, services. This assumption is supported by literature in which market-driven practices are considered a requirement for effective and improved healthcare management (Akenroye, 2012; Coughlan, 2006).

A Common Ground

In literature we found that smart apps have inherent capabilities to effectively reform healthcare business (Bredican, et al., 2013; Logan, 2012; Putzer & Park, 2010). All of our participants were in concord with this notion, believing in the potential of mobile apps to drastically change healthcare. This actually answers our fourth research question that mobile apps are perceived as innovative, transforming tool in the local healthcare industry of Dubai.

Although this study did not find enough data thoroughly to examine and analyze mobile integration into internal business processes, it has come across respondents' agreement on some evident improvements in performance. One participant pointed especially to the reduction of medical errors. The impact of innovation on medical error reduction was clearly mentioned in literature, and this improvement of quality of care was related to a lower time spent by nurses at nursing stations due to the mobility of mobile apps (Putzer & Park, 2010).

Cost efficiency, however, was not assessed by this organization. This could be due to the short period since it had integrated mobile apps into its system. Indeed, for an effective evaluation of the outcome, the implementation of mobile apps should be allowed a reasonable period of time (Coughlan, 2006).

This study found a generally positive attitude towards mobile apps integration into internal operations, as manifested by the belief in its potentials, the willingness to adopt it, and the agreement on its necessity. It suggests management support for such innovative tool, which can play a major rule in the uptake of such innovation (Putzer & Park, 2010). This answers our second research question on the readiness for mobile apps integration at a management level.

Challenges

Literature has revealed a general reluctance and doubt in integrating mobile apps into HIS (Burrus, 2013), and that new technologies are underutilized in healthcare industry (Kerleau & Pelletier-Fleury, 2002). The fact that only a few healthcare organizations actually utilize mobile apps in 2016- with many others reluctant to it, supports these perceptions, despite the global shift towards smart solutions in many other industries such as banking and hotel booking (Bredican, et al., 2013).

Funding and budget policies are identified as non-medical factors for innovation in literature (Marceau & Basri, 2001). This is found true with our findings, as budget allocation was a main constraint for some participants to adequately develop their IT departments and better train their staff to keep them updated on state-of-the-art IT topics. Funding can also be a major issue due to the presumed high costs associated with integrating mobile apps, which (i.e. high costs) was identified by some respondents as one of the concerns in implementing this technology.

Violation of safe access and confidentiality of medical records was among top concerns for study's participants, which is also in alignment with literature's concern for breaching confidentiality (Charani, et al., 2014; Vasquez & Christopher, 2013). According to literature, some skeptic voices have emerged from the uncertainty of the sustainability of mobile apps (Charani, et al., 2014). This study found one manager who expressed his concerns about the future and lifecycle of this technology. One respondent added a concern of technical difficulties. We also found this present in literature being identified as the challenge of interoperability between the different devices (Logan, 2012), suggesting a common ground globally when it comes to integrating mobile apps. Further, none of our participants perceived medical mobile apps as a threat to clinical practice, which is similar to Krieger's notion that medical professionals are indispensable; yet, by medical technology (Krieger, 2013). However, one respondent did point to the fact that adjusting to the

clinical model is a concern for his organization upon integrating mobile apps into the internal business processes. We found this unique to our study, since none of the previous studies we reviewed had pointed to this concern.

With respect to challenges when integrating mobile apps into internal operations, Coughlan (2006) had identified an unexpected one that comes from end users, where clinical staff members put up resistance to change and refuse to fully exploit it (Coughlan, 2006). Interestingly, one of the participants (A-1) revealed that usability and acceptance of mobile apps to their end users was a main challenge for his institution upon the integration of mobile apps. This is logical because heavily investing in a product must have a valid return on investment that only comes from the adequate exploitation of that product. This is why (A-1) also reported that designing the mobile apps was one of the challenges in order to make it more appealing to end users.

Another challenge for (A-1) was integrating newly developed mobile apps back to the old HIS. This was also found in literature as "seamless" integration and deployment of mobile apps are required to prevent any interruption of the services provided (Logan, 2012). And finally, it was the finalization of the services required via mobile apps that (A-1) found challenging. On the other hand, challenges for (B-2) was completely different, as this healthcare setting had its own in-house developed mobile apps-- mainly being budgeting and the development processes of the smart solution.

Infrastructure

The questions related to "accessibility" and "IT department profile" all answer our third research question: "Do healthcare facilities in Dubai have the right infrastructure to integrate mobile apps as a new way of performing their businesses?." It is clear that the two facilities (A-1 and B-2), that have integrated mobile apps into their internal business processes, have the adequate basic IT

infrastructure for such innovation, as will be discussed hereafter, and almost share the same features. This is reflected by the experienced, more mature IT departments of this dyad. This is considered strength in our questionnaire and structured interview. It proves the contextual relevance of questions.

One of the requirements to integrate mobile apps into healthcare systems according to the literature is a thorough experience and knowledge in mobile apps and IT concepts (Logan, 2012). An up-to-date IT technical team was assessed by the frequency of training provided by each institution to its IT staff on most updated topics in IT. This study has found inconsistent data on this matter, with a couple of institutions having no trainings of this type, including (A-1) which has mobile apps integrated into its system.

From infrastructure point of view, we found accessibility and mode of connectivity as effective predictors of the capacity for mobile apps integration: both institutions with mobile apps have the same level of access (from outside via VPN, and allowing for a third party integration as well), same types of internet connections (LAN, 3G, and 4G), and similar data protective methods, which imply the implementation of a familiar IT plan to the IT industry. However, the three institutions looking forward to integrating mobile apps lack these accessibility features, rendering them not ready yet for the employment of mobile apps according to our assessment.

Therefore, we can conclude that (B-2) establishment has a superior competitive advantage over (A-1) regarding the adoption of mobile apps for several reasons. These reasons can be further utilized for policy implications. Firstly, (B-2) has invested in developing its own product, a unique in-house-built mobile app for the entire operational functions required. This reasoning is supported by Burrus (2013) who suggested that customized mobile apps that are unique to the business is a trick to increasing competitive edge in the market (Burrus, 2013). Secondly, due to different, though confidential, funding and budget allocation policies, (B-2) was able to keep its IT crew more

updated on technical innovation through monthly training, unlike IT department at (A-1) with no training for their IT employees.

This can further be explained by the larger size of (B-2)'s mother company with its large foreign group of multi-unit hospitals across the region, and a strong marketing machine, which all suggest a higher budget for business operations and a more mature healthcare business. This can imply a more mature IT department at (B-2) that contributes to a fully-integrated network of apps within their HIS.

The fragmentation of mobile app system at (A-1), on the other hand, is due to the frequent purchasing of different apps from different operators and developers, based on the best products offered in the market. This state of fragmentation is documented in literature (Krieger, 2013). Nonetheless, the current fragmentation of mobile apps could be the first step towards a more coherent and robust future of mobile apps that are more solid and integrated.

The trait of belonging to a larger foreign group was lacking among those which do not integrate mobile apps in their systems, except for one which, at the time of the study, was at an exploring phase and whose mother company is developing an open-source mobile app for its specialty to be integrated into its system in the near future.

Not only IT staff, but also medical and non-medical employees need frequent training on mobile apps or any innovative tool that is used by the institution. There is evidence on absent adequate training in (A-1), while (B-2) reported a monthly basis training for medical and non-medical staff on its mobile apps, which supports our conclusion of their superiority and maturity in this aspect, as adequate training is highly recommended in literature (Vasquez & Christopher, 2013).

In conclusion, there is evidence that infrastructure plays a major role in deploying mobile apps into internal operations of institutions.

Business Restructuring

There is an evident tendency towards exploiting mobile apps in restructuring business processes, as four interviews had revealed, which provides answer to our fourth research question on whether mobile apps are being utilized in business process restructuring of healthcare industry in Dubai. However, the efforts are limited within a small bundle of operational options such as booking, scheduling, financing, and HR solutions; unlike the wide range of business operations explored in literature that can benefit from technical innovations (Marceau & Basri, 2001). Nonetheless, these actual and potential utilizations of mobile apps are consistent with the international healthcare practice (Bredican, et al., 2013).

Both of the organizations that integrated mobile apps into their systems use this technology at three levels: patient-facing mobile apps in which clients can benefit from the services provided, medical-decision apps in which medical staff can utilize their smart gadgets in their day-to-day medical practice, and operational apps in which different departments can communicate and facilitate their workflow. One particular app was a real-time voice recognition system which physicians can use to facilitate medical dictation on the go. This was consistent with one article (Bredican, et al., 2013), which supports our conclusion that Dubai's healthcare market is swiftly picking up in line with the international trend.

It is the agility which is induced by these innovative apps that contributes to the reforming of healthcare. Although they are a heavy investment in funds and time, mobile apps are currently the only technology that provides immediate, real-time, push notification system that foster agility in internal operations. This would totally transform the way business is done in healthcare settings,

because, unlike traditional practices, physicians and nurses will be able to take immediate actions at any location.

Our interviews revealed other types of mobile apps not mentioned in the literature. For example, one participant revealed a clinical decision-support app (*UpToDate*) which provides summary and conclusion for the differential diagnosis and possible treatments of myriad of diseases by linking evidence-based medical data together and extracting the information needed. According to this participant, it had positive feedback from their physicians and helped to lower medical errors. Other identified smart apps were a pharmacy solution app, a patient-engaging solution (*OneView*), and medical code-finder software (*3M*^{TM}).

Sustainability of Mobile Apps

In literature, there have been many voices that doubt the sustainability of any technology in healthcare (Charani, et al., 2014; Kerleau & Pelletier-Fleury, 2002). For the sake of argument, it is possible that a healthcare innovation may remain functional even in the declining phase of this technology, as the pick-up pace of innovations can vary from region to region (Asheim, et al., 2011).

The innovation of Smartphones had accelerated progress towards a future (present) of previously unpredictable capabilities of the current mobile apps, which in turn can play a major role in accelerating progress towards an unforeseen future of medical innovations.

Moreover, no one actually knows how long mobile apps will dwell. Whatever the next era of innovation it will probably depend on the previous one, and until we adopt the current ones we won't be able to take the next step. It is an ethical demand to "engage fully in our present" (Krieger, 2013; p. 268), and as problems start to show by time, it is our duty to stay dynamic and change our

policies as required (Krieger, 2013). And despite criticism of mobile apps from skeptics, they continue to evolve and thrive in a way that makes them superior to other tools.

Policy Implications

Any enhancement of patient accessibility to the healthcare services contributes to better quality care and enhanced well-being (Djellal & Gallouj, 2007). While this study could not assess the public healthcare sector in Dubai, one can make out a strong case for mobile app integration for the improvement of the services provided. The literature has provided evidence on a fundamental redesign of healthcare services provided by one government agency (i.e. NHS) in the UK through the integration of mobile apps. These business restructuring efforts have resulted in many positive outcomes and an efficient system (Akenroye, 2012).

Other strategic steps have to be taken to mitigate persistent issues in healthcare in order to improve performance over time. Unexpected events require certain level of innovation to handle them effectively (Akenroye, 2012), such as enhancing hospitals' surge capacity in responding to disasters. To reduce bed occupancy, the NHS introduced "Telecare" delivery healthcare system, where healthcare is provided at homes for some medical cases (*ibid*).

There is a need for clear and coherent organizational policies that direct and focus staff efforts towards innovation and what is expected from its employees in a systematic approach (Logan, 2012; Marceau & Basri, 2001), as the integration of mobile apps in any healthcare setting should be designed within its strategy and goals (Bredican, et al., 2013; Kerleau & Pelletier-Fleury, 2002). All of these preconditions are believed to be established well with a centralized healthcare system that promotes a stable flow of unidirectional policies and regulations (Kerleau & Pelletier-Fleury, 2002), taking into considerations budget allocations and funding policies (Marceau & Basri, 2001).

There is a need for industry-defined standards in healthcare led by a superior body, similar to the aviation industry in which the IATA is forcing its regulations globally and effectively. These standards can globally regulate mobile apps in healthcare settings.

Nonetheless, as mobile apps integration becomes fully fledged in the healthcare industry, there would be unforeseen consequences that can emerge as this total transformation takes over. Some consequences can be positive while others can be negative, but until then healthcare managers won't be able to realize them and take appropriate decisions.

Implications for Literature

This study has used a qualitative research approach to provide rich, thick descriptions of the integration of mobile apps into the internal business processes. This kind of methodology certainly provided a safeguard against 'seeing what a researcher is already believing' risk that quite often exists in empirical research. This study has the potential to lead to a serious consideration for employing fuzzy set analysis—an extended version of qualitative comparative analysis (QCA) used in this study. This approach could be used to combine elements of quantitative and qualitative analyses for generalizing the findings.

Strengths of the Study

The study findings are unique because they can be viewed as a documentation of the early uptake of smart solutions in Dubai's healthcare operations, particularly within its private sector, which runs in conjunction with the "smart healthcare initiative" launched by DHA in 2013 (Dubai Healthcare Authority, 2013).

Despite the small sample size, it involved a wide range of specialties and organizational types which are of different sizes in terms of the number of employees. Thus, we can conclude that the study sample is generally representative of the small population of healthcare organizations in

Dubai. This is due to the sampling technique that mixes judgmental sampling with maximum variation sampling which was based on author's experience in healthcare field. And despite that participants were not randomly selected, non-random samples can produce results that are possibly generalizable (Banerjee & Chaudhury, 2010).

Limitations

Admittedly, in-depth interviews with key decision makers in healthcare establishments could have enriched our understanding of the current perception and practice towards the integration of mobile apps.

The population of this study is relatively small (around 150), which is due to several factors. First, it is the inclusive criteria that eliminate small healthcare firms of 30 employees or less, and also excluded certain types of healthcare businesses that are not targeted for this study. Another important factor is the absence of a comprehensive, up-to-date list of all healthcare firms in Dubai, whether governmental or private; under DHA or DHCC authorities, which results in a very fragmented data that is challenging to trace.

While this study asks respondents about their perception of the effects of mobile apps integration into their systems (if any) on the general performance of their internal processes, it does not assess key performance indicators (KPIs) for that institution for more accurate evaluation of mobile apps' effect.

Due to time constraints, it was not possible to assess public healthcare sector in Dubai. The formality in application process had exceeded the time frame of this study.

Recommendations

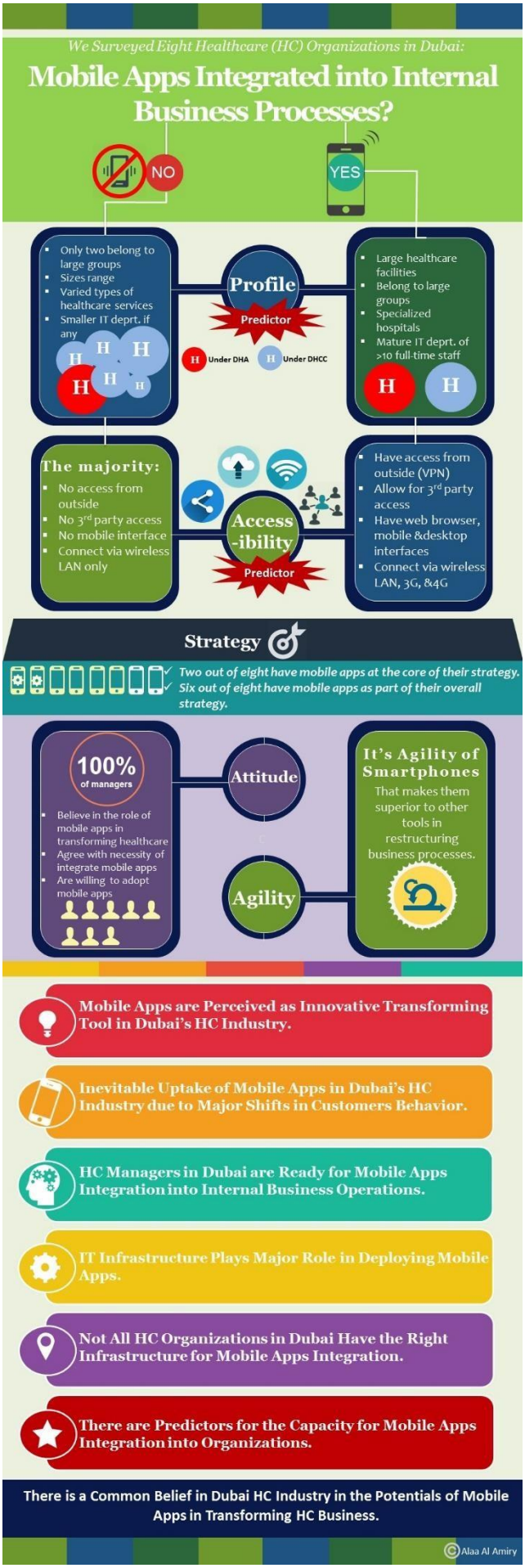
Should the trend of approving mobile apps integration into the internal business operations takes over in Dubai's healthcare industry, a following study can be conducted to assess the impact

of such mechanism on business performance, and whether mobile apps are being endorsed as a business restructuring scheme or not. Only then, a further step can be taken to measure more human aspects when it comes to the impact of mobile apps on healthcare performance, such as connecting this technology with improvements in morbidity and mortality rates; or as called "technical effectiveness" (Djellal & Gallouj, 2007).

It is also recommended for future studies to focus more on the KPIs as valuable variables to examine the candid effect of mobile apps on healthcare performance.

As the integration of mobile apps is associated with high costs, it is critical to assess the economic viability of such integration. Assessment techniques may include cost efficiency, cost effectiveness, return on investment, technical feasibility, operational feasibility, and cost-benefit analysis.

Finally, it is recommended to widen the spectrum of healthcare sectors to include the public sector as well as prehospital care, as this study has identified a gap in literature regarding mobile apps in the EMS.


We Surveyed Eight Healthcare (HC) Organizations in Dubai:
Mobile Apps Integrated into Internal Business Processes?
NO
YES
Only two belong to large groups
Sizes range
Varied types of healthcare services
Smaller IT deprt. if any
Profile
Predictor
Under DHA
Under DHCC
Large healthcare facilities
Belong to large groups
Specialized hospitals
Mature IT deprt. of >10 full-time staff
The majority:
No access from outside
No 3rd party access
No mobile interface
Connect via wireless LAN only
Access -ibility
Predictor
Have access from outside (VPN)
Allow for 3rd party access
Have web browser, mobile &desktop interfaces
Connect via wireless LAN, 3G, &4G
Strategy
Two out of eight have mobile apps at the core of their strategy.
Six out of eight have mobile apps as part of their overall strategy.
100% of managers
Believe in the role of mobile apps in transforming healthcare
Agree with necessity of integrate mobile apps
Are willing to adopt mobile apps
Attitude
Agility
It's Agility of Smartphones
That makes them superior to other tools in restructuring business processes.
Mobile Apps are Perceived as Innovative Transforming Tool in Dubai's HC Industry.
Inevitable Uptake of Mobile Apps in Dubai's HC Industry due to Major Shifts in Customers Behavior.
HC Managers in Dubai are Ready for Mobile Apps Integration into Internal Business Operations.
IT Infrastructure Plays Major Role in Deploying Mobile Apps.
Not All HC Organizations in Dubai Have the Right Infrastructure for Mobile Apps Integration.
There are Predictors for the Capacity for Mobile Apps Integration into Organizations.
There is a Common Belief in Dubai HC Industry in the Potentials of Mobile Apps in Transforming HC Business.
Alaa Al Amiry

VII. Conclusion

Smartphones are redefining industrial revolution due to their convenience. Therefore, the market has shifted towards new and smart business models, and many industries are picking up to fulfil, as well as create, the need. Mastering a competitive advantage is essential and a necessity for long-term and sustainable revenue generation. This is only possible by exploring new horizons and adopting innovative solutions to regular and common practices to improve them and enhance their efficiency. This study provides evidence that mobile apps are unescapable reality in Dubai's healthcare sector, and will dominate its operations soon.

However, one should not ignore the inherent hazard when choosing the right technology from an expeditious innovative supply (Sutton, 2004; Kerleau & Pelletier-Fleury, 2002), which can create a paradoxical condition and increase pressure on decision makers. Hence, one can argue that it is best to take advantage of the current innovative practices than stay outdated.

This study found that the local healthcare industry in Dubai is picking up with the innovative trend of mobile apps in many creative forms, which aids physicians in their day-to-day practices and enhances accessibility for clients. Moreover, it is swiftly entering into many non-medical operations.

At a management level, we found positive attitude and readiness towards mobile apps integration among all respondents to our questions. In case opportunity arose, they would exploit of this technology in their organizations. It would certainly help to have IT specialists on the Board of Directors as some of this study's strong visions came from managers with an IT background.

Regarding infrastructure of Dubai's healthcare industry, this study found inconsistent data, albeit we were able to identify certain predictors for the right capacity to integrate mobile apps that

could be considered for policy. In fact, there is evidence that infrastructure plays a major role in deploying mobile apps into internal operations of institutions.

The two organizations that integrate mobile apps within their systems are utilizing this technology in business process restructuring, and the three organizations which have clear strategies towards mobile apps integration have suggested certain types of smart apps that will impact their business processes and transform them. Thus, this study concludes that there is a common belief in Dubai's healthcare industry in the potential of mobile apps in transforming the way healthcare business is done.

VIII. Reflective Learning

Choosing the Topic

With a healthcare background, I wanted to build a bridge between my new knowledge of business administration and my field of expertise. I was interested in Operation Management (OM) course at SBS. After exploration I was interested in the process of outsourcing, as it becomes evident to me more. I wanted to assess the operations healthcare facilities usually outsource, and du to my interest in strategy management, I wanted to know whether this practice is reflected on general performance. As I read more I found it a dull topic that didn't ignite my brain cells! As I read on that topic, I have encountered business restructuring and the importance of it on performance and cost efficiency. I shifted my reading towards this subject, but it was not enough. At some point I could finally visualize what my topic would be. Perhaps it was the frequent massages I used to get from Dubai's RTA marketing for its smart mobile apps, perhaps it was my surfing on the internet. It was appealing to me that mobile apps are a hot topic that will sustain my excitement!

Alas, the quest to study business restructuring was on top of my mind, therefore I decided to tackle it as well. I started to search for three broad keywords: healthcare innovation, business restructuring, and mobile apps. Innovation was at the core of my study as I was fascinated as well by SBS course on Entrepreneurship and Innovation. To my surprise, the following year of choosing my topic (i.e. 2015) was marked as the Year of Innovation in UAE. That was the point when I was confident that I had chosen the most appealing topic on the perfect time!

Study Design

Being more familiar with quantitative studies, I found myself struggling to understand research. Sample size was a major obstacle that I faced. I couldn’t link qualitative data to ‘quality’ and small

sample sizes, and when faced with the small population I'm studying it added up to my doubts. I found myself studying research methodology all over again! Sooner, I started to understand more concepts in qualitative research. I learned that in qualitative research authors can be flexible and creative in their study design as dictated by the study.

Data Analysis

I learned that the use of hypothesis and null hypothesis is not necessary for qualitative research. I was considering using regression analysis, it was hard for me to understand that statistics are also not necessary in qualitative research. I recognized that qualitative research has different method of analysis, and I got to study the CCM. I also learned that in qualitative research the author is the maestro of her work and there is no rigid method, rather, a flexible one that adapts to the nature of the study; hence the 'creative' sampling method referred to in my discussion chapter.

On a Personal Level

It was an opportunity for me to learn more about the industry of healthcare in Dubai from personal interactions with the experts, as well as a great opportunity to connect and network. I was honored to meet key decision makers in the field, and humbled by some's dedication and great achievements. The anticipation before any interview was intense, and indeed the results were quite satisfying. Alas, as many potential candidates turned my interviews down, I learned to push myself forward and revived my persistent nature.

Most of my learning objectives were met, as I learned from the experts about new possibilities of mobile apps and how it can transfer the way healthcare is provided. Mobile apps provide guidance and make workflow much easier and more efficient. The examples of restructuring business were interesting, yet, it can open a new horizon of unseen possibilities of connectivity and staying "on".

Application of knowledge

It was a great chance to apply many of the knowledge I gained throughout my MBA study at SBS. The principles of Marketing Management were overtly applied as in creating a competitive advantage to survive the market by responding to and creating the needs. Performance improvement was a concept thoroughly used and adopted from the knowledge of Strategic Module courses. Operations management was at the focus of the research, as the study was looking for the integration of mobile apps into internal operations processes, and looking for chances of business processes restructuring. It was the ASDM course that allowed for the full understanding of the importance of effective data communication to decision makers, and from which I applied data presentation. Innovation and Entrepreneurship spirit was at the core of the study as mobile apps integration is an up-coming innovation for smart solutions and an opportunity for emerging businesses. Finally, it was the overall business knowledge gained at SBS's MBA program that induced a self-growth which allows for a conscious competence within me towards different business processes, and through more practice an unconscious competence stage can be achieved!

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