

# ICT and Ageing in Lebanese Public Hospitals

## *A Resource based View Perspective on Capabilities*

Nabil Georges Badr<sup>1</sup>, Charbel Chedrawi<sup>2</sup> and Jamil Arida<sup>2</sup>

<sup>1</sup>Grenoble Graduate School of Business, Grenoble, France

<sup>2</sup>Universite Saint Joseph, Beirut, Lebanon

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**Abstract:** This paper looks into the Lebanese healthcare system and its readiness to care for a growing elderly population and how ICT is used and how it is perceived by the stakeholders. The paper presents concerns on ageing population in Lebanon. It first addresses the status of hospital infrastructure in the country, and then discusses some interviews regarding ICT plans with six general managers of large public hospitals in different regions of Lebanon.

## 1 INTRODUCTION

Population ageing, which entails an increasing share of older persons in the population, is a major global demographic trend; a trend that is expected to intensify during the twenty-first century, driven by remarkable increases in life expectancy and falling fertility rates. By 2050, old people will outnumber children on earth (ESA, 2012).

This paper's setting is the country of Lebanon, a small middle-income developing country with a population estimated at around four million, characterized by unique socio-demographic features that render the ageing of its population a complex challenge (Saxena, 2008). A rapidly ageing society of adults of 65+ years faced by the lack of clear comprehensive government policy, the unavailability of accurate comprehensive database and statistics, limited capabilities of existing institutions complicated by an increased pressure on a resources deficient healthcare system (Sibai, 2014). Findings from the Lebanese National Health Expenditures and Utilization Survey (Ammar, 2009), indicate that, while older adults constitute less than 10 % of the population, they consume over 60 % of the health care resources.

Key questions arise: *Are Lebanese Public Hospitals ready to face the demands from an ageing population? What role could ICT have in this shift?*

In an attempt to answer these questions, the paper surveys a selection of 6 geographically distributed

Lebanese public hospitals serving a mixed demography of patients in order to learn how these hospitals face the demands of an ageing population and identify the role of ICT implementations in addressing this challenge. Grounded in the principles of Resource-Based View theory (RBV), the paper is organized as follows: First, an overview on the relevant literature with respect to ICT implementations for ageing societies. Followed by a look into obstacles faced in developing countries with a focus on the Lebanese healthcare system and related ICT implementations. After the literature review a section presents the methodology used in this research. Then the paper is concluded with the discussion and suggestions for further research.

## 2 BACKGROUND

Similar to the work of Bryson et al. (2007), Rosenberg and Ferlie (2014), and Burton and Malone (2014), this paper uses RBV theory as a springboard in assessing the performance of Lebanese hospitals towards caring for the aging population. A RBV theoretical lens could shed light on the preparedness and capability of Lebanese hospitals to deploy internal resources in order to improve their performance, under severe financing pressure. Therefore, the RBV setting in this context does not assume the existence of competitive market forces but can be a useful assessment of the strategic potential

of Lebanese public hospital organizations. Furthermore, rather than financial performance, healthcare capabilities towards the aging are considered.

Literature on RBV links firm capability and performance to its ability to use its tangible and intangible resources (Eisenhardt and Martin, 2000). Originally developed in private sector firms (Wernerfelt, 1984), RBV theory argues that firms with different resource profiles and capabilities exhibit different performance levels. Thus, the effective use of these resources yields 'core competences'. Core competences are key internal resources, which, when effectively developed and exploited into dynamic capabilities (Teece et al, 1997), allow organizations to perform. These resources in healthcare could be human, such as nursing staff for example, financial and infrastructure such as number of beds, etc. and information technology. Further, the "level of resource constraint" in a public hospital setting may mimic "market volatility" in the private sector.

## 2.1 ICT for Health in an Ageing Society

New advances in technology make it possible to integrate previously disparate facility systems to form an "intelligent" hospital infrastructure (Blumenthal and Glaser, 2007). A plethora of applications generically referred to as 'telemedicine' (e.g. video chat, mobile devices, and internet connected medical monitors) is expected to extend the provider - patient relationship boundary to remote areas positively impacting healthcare for the ageing in developing countries (Lucas, 2008). Assistive technologies have been proposed to overcome elderly problems such as fall risk, chronic disease, dementia, social isolation, and poor medication management, etc. ICT is one of these technologies along with robotics and gamification (Khosravi and Ghapanchi, 2015).

In general, there is evidence of benefit to society healthcare and patient care from access to Information and Communication Technologies (ICT) infrastructure, such as communication and systems for data interchange (Anwar et al, 2011), or online health information tools (Bolle, et al, 2015) with a keen emphasis on integrated care for the ageing (Merino et al, 2015). Progress in the field of health information systems is rather directly correlated with more quality and efficiency of care, where "with more efficiency of care" may in future mean that care will remain affordable (Haux, 2006). Patient access to electronic medical records improved patient

communication (Cimino et al, 2002), however might have impacted aspects of physician - patient communication (Makoul et al, 2001). Poissant et al (2005) found that the use of bedside terminals and central station desktops saved nurses around 25% of their overall time spent documenting during a shift. That was encouraging. However, the authors found conflicting evidence supporting undesirable outcomes: bedside or point-of-care systems increased documentation time of physicians by 17.5%. Early empirical data on cost reductions was not very consistent (Hillestad, et al, 2005). This could have been due to the variability of the health IT systems in their features and implementations (Chaudhry, et al, 2006). Later on, as technology advances were introduced, the benefits of computerized physician order entry systems CPOE were reported (Khajouei et al, 2011). More recent studies show measurable benefits emerging from the adoption of health information technology; these benefits range from efficiency and effectiveness of care (McCarthy, 2009), provider and patient satisfaction, preventive care for chronic diseases (Wildevuur and Simonse, 2015) and patient safety (Buntin et al, 2011) especially in developing countries where health resources are scarce (Marful et al, 2015).

## 2.2 Obstacles to Public Healthcare ICT in Developing Countries

Since the turn of the century, public authorities have been encouraging healthcare organizations to adopt new techniques and systems in order to deliver services of high quality and low cost (Naranjo-Gil, 2009), especially where adoption of innovations tends to be slow and fragmented (Fagerberg et al., 2005). In the public healthcare context, legislation and donor support are fundamental to the rise of propensity and ability to adopt ICT into Healthcare even in its basic capacities (Oak, 2007). In developing countries, studies underscore the possibility of impact on the cost of care as hindering the adoption of ICT into healthcare practice (Panir, 2011), extending beyond initial implementation over the full life-cycle of operating and maintaining these systems (Cohen et al, 2015). Cost of acquisition and maintenance and the lack of ICT skills have been known to present a significant barrier to implementation of ICT into hospitals of developing countries. Lack of skilled resources (Bing-Jonsson, et al, 2015) and the deficiency in ICT infrastructure hinder the capabilities of developing countries to acquire and develop electronic medical records for instance (Anwar et al, 2011). Physicians may perceive a loss

of professional autonomy (Esmaeilzadeh et al., 2015) and English literacy and education levels could curb the intention to use (Hasanain et al., 2015). The increasing familiarity of a new generations of healthcare practitioners is likely to lessen adoption issues (Hennington and Janz, 2007). Thus, organizational barriers to ICT adoption in healthcare have been recognized in the form of structure, policies, incentives and decision processes (Lluch, 2011).

### 2.3 Ageing and the Lebanese Healthcare System

Research on ageing in Lebanon involves three themes: living arrangements, social relations, and health (Abdulrahim et al, 2015). Ageing was related to health in terms of practices and social statuses that encourage good health (Ajrouch et al. 2013), nutrition (Boulos et al, 2014), and discussing threats to good health such as chronic conditions (Waked et al, 2011), even the role of religion (Chaaya et al, 2007). Yet, the literature is scarce when it comes to discussing the contribution of hospitals to the well-being of the elderly in Lebanon. The Lebanese healthcare system is described by a wide network of public (28) and private (136) hospitals and counts 26 beds per 1000 population making this one of the highest ratios in the Middle East; however, only 17% of these hospitals and 16.6% of the beds are in the public sector. There are few geriatricians practicing in the country; few hospitals and health centers, both private and public, have geriatric units. In 2011 the Ministry of Public Health (MOPH) report (Table 1) shows that there were 377,470 of elderly individuals in Lebanon, 65% of them aged between 65 and 74. The number of hospitals and the number of beds don't reflect the effective need (6 hospitals and 470 beds in Mount Lebanon for 145,558 elder versus 5 Hospitals and 365 beds in Nabatieh for 26,033 elderly). Hospitalization rates (days per year spent at hospitals) among older people exceed 28 % which is almost two-fold the national average (Kronfol, 2006). Older persons in

Lebanon continue to rely on their relatives for healthcare. The transition from large extended families to small nuclear ones, accompanied with high rates of emigration among young Lebanese, an increased entry of women into the labor force have created a relative shortage in family members available for the provision of care (Sibai and Kronfol 2011). Concerns are growing about providing the elderly with a better quality of life (Silbermann et al., 2015).

### 2.4 Development of ICT in Lebanese Hospitals

In the Lebanon, the ICT sector witnessed significant growth over the period stretching from 2009 to 2014, growing by an average annual rate of 7.9% to reach a market size of USD 381 million in 2014 (MOPH). Though Lebanon has the required capacity, innovation, and skills required to improve its ICT sector, the country's lack of adequate infrastructure and regulations have so far slowed the development of ICT in hospitals. Furthermore, budgetary constraints and the lack of ICT competence in physicians present a challenge in rolling out ICT applications and services (Nicolian et al, 2015). Thus, ICT empirical research in Lebanese hospitals is limited and health data statistics present a daunting task in a fragmented health information system. Studies treating the use of technology tackled the effect of total quality management implementation on innovation skills of hospital staff (Aoun and Hasnan, 2015). Extant studies range from the discussion about Healthcare IS for data mining (Shahin et al, 2014) to a review job satisfaction of nurses is related to the level of information system use in their work (Maamari and Chaanine, 2013). Little research has focused directly on ICT in the care of the aging.

Table 1: Public hospitals capacity overview in relationship with the elderly in each region. Source: CAS, 2007 (The National Survey of Household Living Conditions), and MOPH 2011.

Region	Beirut	Bekaa	Mount Lebanon	Nabatieh	North Lebanon	South Lebanon	Total
Number of public hospitals	2	5	6	5	7	3	28
Number of beds in public Hospitals	595	430	470	365	455	235	2,550
Elderly population (% of population in region)	36,156 (10%)	50,311 (13%)	145,558 (39%)	26,033 (7%)	77,281 (21%)	42,131 (11%)	377,470 (70%)

### 3 METHODOLOGY

Our research employed a qualitative methodology in an exploratory approach (Eisenhardt, 1989). Data were collected by means of semi-structured interviews conducted between May 2015 and May 2016. In this study we interviewed general managers of six public hospitals, in six different regions in Lebanon covering a cross section of the Lebanese demography. Largest ranked by number of beds (by MOPH, 2011), these hospitals have stated that they have implemented or are in the process of implementing components of a Hospital Information System (HIS) as part of their ICT strategy. HIS provides the underpinnings for health-related decision-making that affect health outcomes of the ageing (mortality, morbidity, disease outbreaks, health status, disability, wellbeing). These hospitals were coded (H1...H6) to maintain the desired anonymity of the participants. Data consolidation was carried out by means of the software N\*VIVO. Secondary data from documentation provided by the hospitals showed (1) occupancy ratios and capacity; (2) nursing staff information; (3) financing and government support information; and (4) infrastructure details mapped to the stages of the electronic medical record adoption model suggested by the Healthcare Information and Management Systems Society (HIMMS).

## 4 DISCUSSION

### 4.1 Are Lebanese Public Hospitals Ready to Face the Needs of an Aging Population?

The study shows that the most likely answer is “No” (Table 2). Major challenges were reported by the informants in this study; mainly high occupancy ratios and low capacity in terms of number of beds, short-staffing on nurses, lack of adequate

infrastructure due to a reliance on self-financing, and little government support.

(1) Hospitals reported challenges of high occupancy ratios and low capacity in terms of number of beds; “*The hospital has 167 beds and still we face a daily problem. Sometimes occupancy is above 90% and the hospital cannot respond to the patients’ needs as they sit in the emergency waiting (H6)*”.

(2) The number of nurses is a major concern for all the hospitals in this study, as they agreed that they were adequately staffed by physicians and understaffed on nurses. This issue is well summarized by the informant of Hospital 4: “*The number of nurses is a major problem [...] but the number of doctors is adequate. The hospital performs 2000 surgeries yearly and 70% of these patients are aged more than 65 years*”

(3) The hospitals interviewed are still waiting for the Ministry of Health to define a strategy for quality health care. The General Manager of H6 explains: “*The government finances each hospital for its expenses in proportion to the number of beds with a plus related to the hospital needs. Public hospitals cannot reject patients even if the hospital cost exceeds the amount given by the government. The ministry of health gives our hospital 6 billion Lebanese pounds yearly (4 Million USD). This number is small if we compare it to the needs of care for 167 beds. This places a stress on our operating capability (H6)*”.

(4) All hospitals concurred on the lack of infrastructure to support the growth in demand and conveyed that most of their operational budgets is self-funded or financed through donations. “*The hospital upgrades its infrastructure from its own budget*”(H2) and the expansion plans are covered by auto financing” (H3, H4, H5, H6) “*Otherwise, most of the expansions financing sources in all the public hospitals in Lebanon come from donations and contributions from Kuwait, Islamic Banks, Emirates and Qatar (H1)*. This confirms the work of Saxena (2008) and Sibai (2014).

Table 2: Summary of empirical data (last column indicates hospital’s stated readiness to face the needs of an aging population).

<u>Hospital</u>	<u>Patients 65+</u>	<u>Occupancy ratios</u>	<u>Major ailments treated</u>	<u>Ready?</u>
H1	50 %	90 + %	Heart failure	Yes
H2	55 %	85 + %	Heart failure, chronic disease (Diabetes, etc.)	No
H3	70 %	90 + %	Heart failure and obesity	No
H4	65 %	80 + %	Heart failure	Yes
H5	70 %	80 + %	Heart failure	No
H6	50 %	90 + %	Prostate issues, broken hips, obesity, chronic diseases	No

## 4.2 ICT's Role in the Enablement of Care for the Ageing

The general manager of H6 gives a pertinent summary on the perceived role of ICT in Lebanese Public hospitals: *"Today there is a greater need than ever to leverage technology to improve health, quality of life, and social connectivity for older adults, and assist in clinical care and monitoring of more impaired older adults. A variety of technology solutions (such as Web-based applications, remote sensing technologies, electronic health records and other devices) support patient engagement. The impact of ICT is indirect and is contingent on the redesign of practices and structures also outside health care. Improvements will only be realized if all parties involved can coordinate their efforts to take advantage of new technology."*

Elderly care is demanding, hospitals must have the resources to act quickly and effectively with a solid decision support system in order to minimize errors and offer quality of care for the elderly (Smith et al, 2006). In addition to a trained and experienced staff in the needs of the ageing, *"a solid database to follow up each case is required in order to find the appropriate solution"* (H2). The GM of H4 indicated that they have installed *"24/7 monitoring systems of health and activities, intelligent devices and appliances, internet enabled services, predictive behaviour models, and so on"* in order to provide a better quality of care for their elderly patients". Such innovations in stationary and mobile solutions would allow practitioners to stay in continuous contact, whether at the patient's bedside, in examination rooms, or in emergency treatment centers, to effectively develop and deliver patient assessments, and make more informed care decisions based on collaborative treatment plans. This findings aligns with the works of Lucas (2008) and Anwar et al. (2011).

It is expected that such ICT technologies would (1) *Reduce the time of treatments* (H1); (2) *provide better access to data for enhanced decision making, preventive care and disease management* (H1, H2,

H3, H4, & H5); and (3) *improve interdepartmental collaboration / Emergency services* (H6).

For all 6 hospitals surveyed, the adoption of the information system is of top importance. *"The adoption of the information system is prominent practice for today's hospital, in the use of equipment, archive, and for more efficient medical results"* states the GM of H1 at the first stages of the interview. All hospitals have described their adoption of the Health IS system in advanced stage (Table 3). This is quite an achievement considering that all these public hospitals stated that they rely on self-funded initiatives. Nurses and doctors document patient's vital signs in the system, physician prescription history are tracked by the system, and PACS systems are connected to the online medical history. (PACS is the acronym for picture archive and communication system, a computer network for digitized radiologic images and reports).

Ultimately, addressing medical research advancement benefits, the GM of H1 stressed that *"better access to data that can be studied and help to get better solutions to face the ageing society"*. ICT has become necessary to manage routine function up close, and monitor vital signs measurements and control the administration and recording of medications (type, dose & time). Agreeing, three other hospitals (H3, H4, H5) pointed out that *"ICT in the form of an integrated information database aims at disease management to help improve the awareness and preventive care in the elderly patient population"*. Furthermore, the case summaries emphasized the role of the hospital senior management in encouraging adoption. *"It was my responsibility to oversee the implementation of the new system and to follow it up step by step with the different actors in order to achieve the results needed."* Adds the GM of H3.

The Lebanese government did not engage with any of the 6 hospitals in the decision to adopt their HIS, such decision was taken by the board of directors of each hospital independently.

Table 3: Level of HIS use in the hospital (Y= in use at the moment; Y\*=Incomplete, but in process).

<u>Level of Use (based on the HIMMS Model for EMR adoption maturity)</u>	<u>H1</u>	<u>H2</u>	<u>H3</u>	<u>H4</u>	<u>H5</u>	<u>H6</u>
Nurses / doctors enter patient's vital signs in the system	Y	Y	Y	Y	Y	Y
Physician prescription history tracked by the system	Y	Y	Y	Y*	Y	Y
PACS systems connected to online medical history	Y	Y*	Y	Y	Y	Y
Online medical history	Y	Y	Y*	Y	Y	Y
Automated pharmacy, laboratory, and radiology	Y*	Y	Y	Y*	Y	Y*

Three of the hospital surveyed (H6, H3 and H1) expressed a relatively low barrier to adoption: The general manager of H6 disclosed that for the relatively new hospital, HIS was part of the hospital build out plans. Likewise, H3 pride themselves with a continual development effort of the HIS: *“We had an integrated information system since the start [...] we develop it continuously based on the growing and changing needs of the hospital”*, affirms the GM. In the case of H1, their GM shared that *“there were no obstacles in the implementation because all the staff started using the system since the establishment of the hospital. No transition was required since the staff was recruited with an IT/IS experience. [...] When we developed the implementation plan, we defined the different roles of the major actors. I was following each step to make sure that the plan is well executed. This was time consuming but effective”*. In contrast the HIS in H5 is older and with limited with disparate data stores that are not integrated. Obstacles such as the qualification of the existing staff and the difficulty of recruiting new talent into the public sector were indicated. Additionally, budgets that need to be approved by governmental authorities have not yet been allocated to this hospital for the refresh of their system. Budgetary concerns were raised by most hospitals (H2, H3, H4, and H5), *“The process was time and energy consuming”* (H3). *“Significant efforts and investments in time and expertise were needed”* (H6). However, the *“novelty of technologies used posed a reluctance in the staff to embrace new technologies, with little evidence that this technology will indeed be useful”* (H6).

In H4, the GM reports an irregular focus on the Information System build out. The lack of IT/IS knowledge among the practicing staff presented significant challenges. To encourage adoption and assimilation, training and awareness sessions were necessary to highlight the importance of the implementation for the wellbeing of the patients.

Resistance to adoption was at different levels in each hospital; at some, the senior staff was non cooperative at the start (H2 & H5) and for others healthcare personnel's attitude towards new technology was not always positive (H1, H6, H4). Used to their traditional pen and ink methods, they were slow to assimilate the benefits of ICT usage for patient care (H6). The cooperation among project implementation teams and between IT teams and the hospital's staff at all levels was a key issue in order to reduce this resistance (H2).

## 5 CONCLUSIONS

Lebanese public hospitals are short of capable to face the needs of an ageing population. This work has achieved two objectives to help answer the research question:

First, the use of RBV theory as a backdrop for this study has underlined major challenges facing public hospitals in their ability to use their resources to care for an aging population. Informants have reported resource constraints and limitations of multiple dimensions, namely (1) high occupancy ratios and a low capacity in terms of number of beds, (2) short-staffed on nurses, (3) lack of adequate infrastructure due to a reliance on self-financing, and (4) little government support. Hospitals in the study communicated occupancy ratios between 80% and 90%. Most of their patients are above 65 years of age (reaching 65%). Major ailments treated are heart failures, chronic disease (obesity, diabetes, blood sugar, nervous system etc.) that require close supervision and long residency periods. With this burden, all hospitals express a lack of adequate infrastructure and a relatively low capacity to handle patients (number of beds); they are short-staffed on nurses and face higher cost with little financing support from the government. In spite of this self-funded effort, most of these hospitals recognize the value of an integrated information system in lowering their costs and increasing their capabilities to deliver quality elderly care.

Second, this paper extends the body of knowledge of healthcare ICT in the country of Lebanon to provide an account of ICT use in healthcare for the ageing in public hospitals in settings where uses of ICT could contribute to the effectiveness of Lebanese public hospitals to provide quality care for an aging population.

### 5.1 ICT as a Dynamic Capability in Lebanese Public Hospitals

The informants of this study reported use of ICT to care for the aging to have four significant benefits: (1) Provide better access to data for an enhanced decision making for treatment and medication; (2) potentially reduce the time of treatments; (3) improve the practice of preventive care, disease management and promote wellbeing; and (4) improve the resource allocation for better quality care. However, such benefits were recognized to impose a significant investment on hospitals. Investments that await governmental or donor funding support must be supplemented by commitment from senior

management, continual development plans, and a collaborative approach between all hospital staff to raise the awareness on the benefits of ICT usage for elderly patient care.

## 5.2 Research Limitation

This research presents a methodological limit that may open up new avenues of future research. One of the limitations of the study that worth mentioning is that it relies on information provided by general managers, thus potentially limiting the credibility of information. The opportunity to expand the interviews to IT managers of the hospitals would provide deeper insights. Further, we are aware that the results presented in this research depend strongly on the context of the country. Their generalization thus requires a certain reserve. Further research must be done to advance the results of this study possibly through action research potentially exploiting principals of organizational development. This approach could deepen the understanding on how hospitals are transforming their healthcare practices to improve their capacity for solving problems and managing the challenges of care for the aging.

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