An Empirical Evaluation of Mobile Technology Acceptance in Health Service

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Abstract: The proliferation of mobile communication and computing technologies in supporting highly specialized tasks and services in health care has made it increasingly important to understand the factors essential to technology acceptance by health care sector. This paper presents an empirical evaluation of Mobile Acceptance in Health Service using a multi-objective decision model based upon user judgments. Providing that health-related activities stand to benefit from Information and Communications Technology (ICT) endorsement, the evaluation involving data from three category hospitals is carried out to identify the priority dimensions of a mobile technology system in a health center service.

Keywords: Medical decision support, communications system.

1. Introduction

M-Health is a new and evolving research discipline that is defined as emerging merging mobile communications and network technology for healthcare [6]. This new evolutionary research area will involve the provision of new paradigms in healthcare that will provide both the health care professionals and patients with an efficient, secure, ubiquitous and robust infrastructure coupled with tools for the assessment and management of patient health status and the support of preventive and patient empowerment programmes [7].

The healthcare industry is recognized as having been lagged behind other industries in the use and adoption of new information technologies (IT) and information systems (IS) [2][5]; however, this situation is gradually shifting at a fast pace. Applications of mobile IT/IS in health care can be recognized as both emerging and enabling technologies [1], which have been applied in several countries for either emergent care or general health care. For example, the variety of wireless technologies such as mobile computing, wireless networks and global positioning systems (GPS) have been applied to ambulance care in Swedish [4] and emergent trauma care in Netherlands [3].

Relative information about the patient and the ambulance location (can be transmitted to the hospital in real-time. Therefore, the hospital can be well prepared for the arriving of the ambulance at any time. The challenge is to provide the appropriate optimal treatment and right hospital to the patient at the right time [3]. In Finland, a system with secure mobile healthcare services has been tested in 2003 including health consulting, electronic prescription, etc. Authorized individuals can easily access to the system via mobile devices such as mobile phones [8].

However, in any health-care system with limited resources, priorities for investment must be set on the basis of clear evidence of benefit to patients and good value for the money spent. The implementation of new technology compete for funding available to health services and simply introducing all of them is impossible. This has encouraged the development of a decision model to identify the different ICT systems, its utilization level and its relevance in health related activities. In previous work we have presented an analysis of Chilean Mobile Communication System [9]. In this paper we present an empirical evaluation of Mobile Acceptance in Health
Service using a multi-criteria decision model [10] derived from users judgments. Section 2 introduces notions of the decision making method: the Analytical Hierarchy Process (AHP). Section 3 introduces the evaluation method and the results are presented in section 4. In section 5 the conclusions are provided.

2. The Analytic Hierarchy Process Approach

The AHP engages decision-makers in breaking down a decision into smaller parts, proceeding from the goal to criteria to sub-criteria down to the alternative courses of action. Decision-makers then make simple pair-wise comparison judgements throughout the hierarchy to arrive at overall priorities for the alternatives. This approach provides the structure and the mathematics for helping decision-makers make rational decisions. A rational decision is one that best achieves the multitude of objectives of the decision maker(s) [10]. The three basic principles of AHP are: Hierarchy Representation and Decomposition, Priority Discrimination and Synthesis and Logical Consistency.

3. The Empirical Evaluation

In any health service requirement we can distinguish different agents. Each agent has different expectations about the system and desire varied characteristics to endow an ICT system. While the patients demand a medical assistance without delay, with precise and confidential information on their state of health, updated information on therapeutic or preventive options, benefits and risks, etc. The professionals require having the information on their patients, at the moment and the place of the attendance. The research professionals demand a better access to specialized bibliography, guides of clinical practice, protocols and the opinion of other colleagues, and the opportunity to value and to discuss this information to optimise their individual and collective practice. Finally administrative personnel demand tools of management of information to reduce paper work.

The process was divided into two major steps. The first step is to build a hierarchical structure incorporating critical categories at each level and their relationships. Guidance was obtained through the judgments issued by an opinion poll formed by representatives of the system. For this study, the agents are initially arranged into four groups of representatives: patients, clinical care, administrative and medical researcher.

A team of experts comprising members from each group was form. In the second step, the critical tendency of undertaking certain activities is identified. Experts expressed their judgment according to their own expertise and knowledge.

Data from three categories of hospitals according to their resources was incorporated into the hierarchical structure where level 0, stand for the global objective designated as, "ICT in Healthcare". Level 1, takes into consideration the agents’ perspective. Level 2, comprises the activities performed by the agents and would have an effect on each of them. Level 3, consists of that alternative system of ICT that each activity depends on. The alternative ICT systems were classify into four main groups, labeled as : fixed system (Phone, fax, and office), wireless system (Wireless communications devices, mobile phones), radio (Radio communication devices) and computer assisted systems( Computer assisted network communications). The next stage is to prioritise the different criteria implementing an evaluation method. A comparison process is carried out based on decisive factors and user judgement to rank the ICT support to health related activities.

4. Results

The overall results are shown in Figure1. The highest priority was given to computer assisted system to back their activities. The priority results for each agent are shown in Table 1. From clinical care perspective the priority is for the support from computer related system. However, gradient sensitivity indicated shows an increasing priority for wireless system while fixed system priority declines. From administration perspective, the activities such as, delivering test and exams results, within the institution or externally has the highest priority. A strong usage of fix network system (phone, fax, extensions, etc) is detected. From medical research perspective, a strong interaction with database applications implying an increasing demand
for computer-assisted support is visualized (55.4%). From the patient perspective the results indicated that patient priority is mainly involved with urgency service requirement (63.4%). In this concern, at the present time, the importance of having access to wireless technology was ranked on second place while fix network system obtained the highest priority (52.4%). Nevertheless, gradient sensitivity for patients in urgency requirement wireless technology tends to increment from (20.9%). Figure 2 shows a comparison between fixed and wireless systems for each of the activities.

5. Conclusions

This paper has presented an empirical evaluation of Mobile Technology acceptance in Health Service using a decision model based on user judgments.

This empirical evaluation concludes that the combination of fixed and wireless network can give the relevant and timely information needed for better decisions. The factors for measuring quality in healthcare system: availability of the services and the need for ubiquitous access to integrated information are considered the most important. The methodology helps decision-makers to elaborate course of actions for resource distribution proportional to user requirement.

6. Acknowledgements

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7. References


Table 1: Priority results

<table>
<thead>
<tr>
<th>Agents</th>
<th>Activities</th>
<th>%</th>
<th>ICT system</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic Care</td>
<td>Urgency serv.</td>
<td>34.8</td>
<td>Fixed</td>
<td>19.7</td>
</tr>
<tr>
<td></td>
<td>Hospital</td>
<td>13.0</td>
<td>Wireless</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Consultant</td>
<td>9.3</td>
<td>Radio</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>Patient data base</td>
<td>42.9</td>
<td>Comp. Assist.</td>
<td>56.1</td>
</tr>
<tr>
<td>Medical Research</td>
<td>Statistics</td>
<td>16.8</td>
<td>Fixed</td>
<td>26.1</td>
</tr>
<tr>
<td>26.8%</td>
<td>Drug research</td>
<td>48.4</td>
<td>Wireless</td>
<td>9.8</td>
</tr>
<tr>
<td></td>
<td>Clinic research</td>
<td>34.9</td>
<td>Radio</td>
<td>8.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Comp. Assist.</td>
<td>55.4</td>
</tr>
<tr>
<td>Administrative</td>
<td>Financial</td>
<td>26.0</td>
<td>Fixed</td>
<td>49.7</td>
</tr>
<tr>
<td>12.9%</td>
<td>Test results</td>
<td>41.3</td>
<td>Wireless</td>
<td>11.2</td>
</tr>
<tr>
<td></td>
<td>Inventory</td>
<td>32.7</td>
<td>Radio</td>
<td>10.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Comp. Assist.</td>
<td>28.9</td>
</tr>
<tr>
<td>Patient</td>
<td>Urgency req.</td>
<td>63.4</td>
<td>Fixed</td>
<td>52.4</td>
</tr>
<tr>
<td>6.2%</td>
<td>Hospitalization</td>
<td>9.0</td>
<td>Wireless</td>
<td>20.9</td>
</tr>
<tr>
<td></td>
<td>Consult, treatm.</td>
<td>9.7</td>
<td>Radio</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>Health Inf.</td>
<td>17.9</td>
<td>Comp. Assist.</td>
<td>15.8</td>
</tr>
</tbody>
</table>

Figure 1: Priority results

Figure 2: Mobile Technology vs Fixed Technology for clinical care service