A Study on Application of Telemedicine in Health and Medical Centers and Its Effect on Customer Satisfaction with a Focus on Resistance Economy (Case Study: health and medical centers across Roodsar Township)

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ABSTRACT: Telemedicine uses information and communication technology (ICT) to enable the provider to provide health and medical services to patients in remote areas. The present research is performed to study the application of telemedicine in health and medical centers across Roodsar Township and its effect on the customer satisfaction with a focus on resistance economy. The study investigates two samples using one-sample t test and chi-squared test and then compares the results of these two samples. In the first sample, from the service providers’ viewpoint, telemedicine contributes positively into customer satisfaction by reducing access cost and time, facilitating and improving service availability, and creating an administered care space. And in the second sample, from the customers’ viewpoint, there is a significant correlation between customer satisfaction, in one hand, and shorter access time, facilitated and improved service availability, and creation of an administered care space, on the other hand. The results indicated that on-time and appropriate use of tele-medical consulting and telemedicine can accelerate the treatment course, thereby enhancing customer satisfaction. Therefore, by developing telemedicine technology and communication infrastructures and localizing the technology, managers shall lower the cost of medical trips and the country’s reliance on foreign specialists, so as to provide a basis for realization of resistance economy and its components within this scope while satisfying the customers.

KEYWORDS: Telemedicine, Satisfaction, Customer, Resistance Economy

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1. INTRODUCTION

Telemedicine has been defined as the use of electronic information and communication technologies by health care experts to provide clinical services to patients in different places (Edoha, Korab, Pawarc, Coulilibyb, Alahassad, 2016). These cares include all the things related to remotely follow up of patient’s health conditions by the respective doctor, drug prescription, and specification of the activities which shall be taken by the patient (such as exercises) as well as the patient’s questions to be asked from the doctor and so on.

Telemedicine is one of the newer applications of TRICARE Line for Care (TCL) for health care, and effective, costly, and efficient application is expected for both cases (Kluge, 2010). Rapid development of receivers and information and communication technology (ICT) has resulted in the growth of innovative new services in health care, such as telemedicine. One of the necessary elements of telemedicine development is the acceptance of this technology by end customers. An in-depth analysis of the performance of this technology and customers’ insight into that requires a deal of knowledge and information about available technologies, which in turn depends on available resources (Klaassen, Van Beijnum, Hermens, 2016). Health and medical information technology can help country’s health and medical state. The medical ICT is defined as providing care, treatment, consulting services and creating electronic health files via electrical signals and electronic medical equipment. The result of such a process will be patient’s fast access to better services at lower costs and easy access to the best specialized services and comprehensive improvement of the quality of providing the patients with health care services (Bangert and Doctor, 2002).

Internet greatly affects the access to health information. It helps patients and health care personnel to access the required information to make informed decisions based on evidences and provide/receive health care services in a simple manner. As a result, it is of paramount importance to improve information quality and promote its use (Chande-Mallya, Enock-Monde, Pius-Mtega, Tandi-Lwoga, 2017).

One of the most important barriers against implementing telemedicine is the high cost of installing communication infrastructures and other technical equipment. Socioeconomic, administrative and political barriers, differences in language and literacy, cultural differences in terms of doctors’ acceptance, and differences in available resources for medical cares are some of other barriers in this regard (Sadeghi and Barooti, 2010). Cultural differences may not prove problematic in culturally similar countries such as Canada and Australia. The differences, however, can incur numerous problems elsewhere. The degree to which these services are accepted contributes to the development and advancement of this technology. Cultural differences tend to keep a doctor from providing identical services all around the world, because the target country and even the specific area within the target country shall be taken into consideration when providing these services (Klug, 2010). Therefore, procurement of a telemedicine system requires effective change management (Yelloleees, 2005).

Acceptance of a new technology in organizations is recognized as an integrated part of the organization process, and satisfaction with a service plays an important role in acceptance or non-acceptance of a technology. As such, the present research has been performed to study the effect of telemedicine in centers providing health and medical services and its effect on customer satisfaction.

2. RESEARCH BACKGROUND

In a research entitled as “Usability in telemedicine systems”, Klaassen et al. concluded that monitoring patients in their homes can help improving the delivery of health and medical services at lower costs, which may end up with increased demand for novel health and medical

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*http://www.mums.ac.ir, 2016*
strategies such as telemedicine. They believe that, with increasing the research and development of telemedicine, wider spectrum of its capabilities will be identified (Klaassen, et al., 2016).

Different research works have referred to numerous barriers against the use and adoption of telemedicine. A research entitled as “Capabilities of barriers against telemedicine” defines the major and common barriers against using telemedicine as follows: strong resistance of local health providers and fear of losing their jobs, insufficient insurance coverage, low quality of diagnosis or cares and associated costs. In this research, inability of current mechanisms in accepting changes is recognized as a major barrier, even greater than the fear of reduced quality of health care. In a research entitled as “The evolution and impact of telemedicine in Arkansas” Lowery et al. suggested that telemedicine can enhance health care accessibility and quality while reducing costs, thereby promoting patient’s and provider’s satisfaction (Lowery, Bronstein, Benton, Fletcher, 2014).

In a research entitled as “Impact of a University-Based Outpatient Telemedicine Program on Time Savings, Travel Costs, and Environmental Pollutants” Dullet et al. concluded that telemedicine can shorten the time to access health and medical services. Furthermore, the results obtained from this research confirmed that telemedicine can reduce environmental impacts of air pollutant and greenhouse gases emission by reducing the rate of vehicle travels. The results of these researchers’ investigations indicated that patients tend to be further satisfied with remote services rather than face-to-face services (Dullet, Geraghty, Kaufman, Kissee, King, Dharmar, Smith, Marcin et al., 2017).

In a research, 82 doctors’ and specialists’ viewpoints about the characteristics affecting successful implementation of telemedicine technology in the studied hospitals administered by University of Tehran as well as other centers providing health care services across the country. Of the 82 individuals, 70 were men, with the remaining 30 been women, and all of them were specialists and faculty members. According to the results, 95.1% of the participants believed that, in order to successfully implement telemedicine technology, a basic requirement is top management commitment to support new technologies such as telemedicine in respective organizations, while 4.9% of the participants made no comments in this regard. Moreover, 94% of these participants believed in the necessity of implementation of continuous/in-service training programs to enhance doctors’ and staff awareness and empower them, with 4.9% of the participants making no comments in this regard while 1.1% of them declared their opposition to such a characteristic in organizations (Dargahi and Razavi, 2004).

In a research on customer satisfaction with telemedicine technology by Frances and Pamela, the authors have pointed out such general advantages such as easier accessibility, faster and less expensiveness, shortened waiting time, fewer trips and lower traffic load to access medical facilities at other areas (Mair and Whittle, 2000).

3. THEORETICAL FRAMEWORK

Telemedicine was first introduced into medical treasuries in 1920. NASA was the first organization which used satellite connection to establish a connection between astronauts and doctors on Earth to provide the astronauts with medical consultation and treatment via telemedicine using which patients’ health states were evaluated (http://it.behdasht.gov.ir, 2009). The new health care arena is where doctors, hospitals, and medical centers collaborate with financial and insurance experts within a virtual framework wherein information serves as objective, profit, and instrument in policy-setting and administration of health care (Mihova, 2016).
In 1990s, two types of advancement were achieved in the scope of technology; these two enhanced interests in telemedicine. The first advancement was the ever increasing promotion of broadband and high-speed telecommunication systems all around the world, and the second advancement was the invention of the instruments which were capable of data and image acquisition and transmission in digital format (Strode, Gustke, Allen, 1999). Nowadays, following the great advancements in the development of telecommunication systems and information technology and increased bandwidth, telemedicine has succeeded to shorten the temporal and physical distance between patient and medics and health care personnel, particularly in natural disasters, forests, chronic diseases control, pregnancy cares (especially for high-risk pregnancies), treatment of burns, infectious and disease epidemics, air flights, fatal accidents, medical emergencies and rescue the victims, remote surgery, etc.

4. ROLE OF TELEMEDICINE IN REALIZATION OF RESISTANCE ECONOMY

Associated costs with health in health and medical sector are increasing on a daily basis. Management of information systems via mechanized methodologies and health information integration and creation of electronic health files greatly help reducing costs via fast access to personal medical information and reducing the need for repeated visits and medical tests. Development of technology and specialist human force in hospitals and localization of technology and efficient application of up-to-date medical technologies by specialist human forces within the country will reduce the costs incurred by medical trips and the country’s dependence on foreign specialists, realizing the so-called resistance economy and its components in this scope while satisfying the customers.

5. MODEL TELEMEDICINE EFFECT ON CUSTOMER SATISFACTION

![Figure1. Research model](image-url)
6. RESEARCH HYPOTHESES

H1: Telemedicine technology brings about customer satisfaction by reducing the cost of medical cares.

H2: Telemedicine technology brings about customer satisfaction by reducing the waiting time to access medical facilities (across wide geographical and population scopes).

H3: Telemedicine technology brings about customer satisfaction by facilitating and improving the availability of medical services at medical centers.

H4: Telemedicine technology brings about customer satisfaction by creating administered care space in hospitals and medical centers.

7. RESEARCH METHODOLOGY

The present research is a descriptive and applied study performed in hospitals and medical centers across Roodsar Township, where library studies and field surveys are used for data collection. In the first sample, the volume of statistical population is supposed to be equal to that of the sample. The sample is composed of a total of 82 individuals including doctors, specialists, nurses, and midwives. For the second sample, however, considering the fact that no accurate information was available on the size of the statistical population, it was considered as being unlimited. Therefore, using the unlimited population formula, sample size was determined as 267 individuals and sampling was taken randomly among the customers. The sampled customers were researched via a questionnaire. Data collection instrument was a questionnaire containing 20 questions (five-level scale). Assigning numeral values of 1 to 5 to the responses (strongly agree = 5, agree = 4, no idea = 3, disagree = 2, strongly disagree = 1), the required data for statistical analysis was obtained. Validity of the questionnaire was of content validity type and reliabilities (as measured by Cronbach Alpha calculation) of the first and second samples were measured at 0.70 and 0.718, respectively, by modifying the questionnaire. Four factors were taken as independent variables (including cost reduction, access time reduction, access facilitation and improvement, and creation of administered care space), with only one factor been considered as the dependent variable (customer satisfaction). In this research, in the first sample, mean, standard deviation, and frequency were used for data description and on-sample t test was used for statistical analysis and inference. It was while in the second sample, frequency was used to describe the data and chi-squared test was used for data analysis and inference. The analyses were undertaken utilizing SPSS v.19 Software. Subsequently, the results of the two samples were compared. The p-values less than 0.05 are considered to indicate significant results.

8. FINDINGS

An investigation on demographic information of the respondents indicates that, in the first sample, 88% of the respondents were women (72 individuals), with the remaining 12% been men (10 individuals). The corresponding figures to the second sample were 74% (198 individuals) and 26% (69 individuals), respectively. In terms of age group division, in the first sample, 3 individuals were younger than 25 (3.0%), 17 individuals were between 25 and 35 (21.0%), 44 individuals were between 35 and 45 (54.0%), and 18 individuals were between 45 and 55 (22.0%), while the corresponding figures to the second sample were 47 (17.66%), 103 (38.58%), 74 (27.71%), 41 (15.35%), and 2 (0.7%), respectively. Moreover, 68 individuals in the first sample of the research had B. S. degrees while 14 individuals were doctors/specialists (17.07%). It was while, in the second sample of the research, 29 individuals (10.86%) had under diploma degrees, 101 individuals (37.83%) had diploma, 78 individuals (29.22%) had associate
degrees, 56 individuals (20.97%) had B. S. degrees, and 3 individuals (1.12%) had M.S. or higher degrees. According to analytic results of descriptive statistics, average effect of the drop in the cost of health care, medical treatment, consulting services, surgeries, etc. as a result of telemedicine on customer satisfaction is measured at 4.242, average effect of reduced time to access health and medical services on customer satisfaction is 4.411, average effect of faster access to medical and health information via web-based databases and information centers, availability of experienced specialists for remote surgeries, medical consulting, home cares and alike on customer satisfaction is 4.079, and average effect of the quality and administered care space which tends to establish effective communications between patient and service providers on customer satisfaction is 4.5, which are above the average for all questions, i.e. μ = 3. That is, from service providers’ point of view, all of the considered factors are perceived as effective on customer satisfaction.

When undertaking the one-sample t test, the test value was set to 3 and confidence interval was assumed to be 95% (tolerable error = 5%). In this test, null hypothesis implies ineffectiveness of the considered factors on customer satisfaction (μ ≤ 3). As such, considering Table 1, since the significance level obtained for each of the hypothesis is sig = 0.000 < 0.05, then all of the considered hypothesis are confirmed and the null hypothesis can be rejected at 95% level of confidence.

Table 1. The Results of one sample T test.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Test value = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
</tr>
<tr>
<td>Cost reduction satisfaction</td>
<td>4.242</td>
</tr>
<tr>
<td>Reduced access time satisfaction</td>
<td>4.411</td>
</tr>
<tr>
<td>Facilitated and improved availability</td>
<td>4.079</td>
</tr>
<tr>
<td>Quality and creation of administered care space satisfaction</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Chi-squared (χ²) test was used to investigate the hypotheses on the second sample. Table 2 presents the results of Chi-squared (χ²) test.

Table 2. The Results of Chi-squared (χ²) test Hypotheses.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Chi-squared (χ²)</th>
<th>Significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost reduction satisfaction</td>
<td>8.909</td>
<td>0.063</td>
</tr>
<tr>
<td>Reduced access time satisfaction</td>
<td>14.264</td>
<td>0.006</td>
</tr>
<tr>
<td>Facilitated and improved availability</td>
<td>17.818</td>
<td>0.003</td>
</tr>
<tr>
<td>Quality and creation of administered care space satisfaction</td>
<td>12.636</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Therefore, considering Table 2, since the obtained significance levels for the H2, H3, and H4 hypotheses are smaller than 0.05, then the hypotheses are confirmed, while one can reject the H1 hypothesis at 95% level of confidence. As a result, no significant relationship exists between the independent and dependent variables, i.e. the hypothesis is not confirmed.

9. DISCUSSION AND CONCLUSION

In the first sample, doctors, specialists, nurses, and midwiferies were studied as the medical service providers and executive agents of telemedicine technology; however, in the second sample, service receivers were investigated. The considered hypotheses were analyzed using
one-sample t test (in the first sample) and chi-squared test (in the second sample). Accordingly, all of the hypotheses were confirmed in the first sample, indicating that, from service providers’ point of view, all of the considered factors tend to positively contribute into service receivers’ level of satisfaction. In the second model, all of the hypotheses but H1 were confirmed, i.e. from customers’ point of view, telemedicine technology can contribute to their satisfaction via shortened time to access medical centers, shortened treatment period, faster access to patients’ medical information for doctors, and faster and better treatment approaches. However, procurement of exclusive medical equipment or remote surgeries which have proven expensive, geographical scattering and high cost of developing suitable communication channels to access telemedicine facilities have made the patients dissatisfied with telemedicine.

In many countries, telemedicine is being increasingly used. In Iran, however, due to underdeveloped transportation network, population distribution at some points of the country including mountainous and difficult to access areas, no access to required infrastructures in many areas of the country and increasing population of elderlies who need special medical cares, telemedicine tends to help fast diagnosis, appropriate treatment, reduced treatment time, and lower associated costs (direct and indirect).

Telemedicine can enhance health level greatly by delivering basic trainings to rural people, so as to convince them to take primary tests on regular basis. Development and promotion of telecommunication systems across geographically remote and difficult to access areas will provide residents of and patients at these areas with faster and on-time access to medical centers and even specialized medical centers. Reduced service cost, enhanced quality, extended scope of applicability, and availability for to general public results in increased demand and further satisfaction while reducing the reliance on foreign medical equipment and patient transfer to foreign countries. Providing medical and health services via telemedicine technology contributes to disease prevention and faster diagnosis at the appearance of initial symptoms; this will contribute to enhanced health level across the society. Deployment of expensive and advanced medical equipment in one place and undertaking remote surgeries and tele-treatments will decrease the cost of purchasing and equipping physical spaces, bringing about foreign exchange and income savings. Therefore, it is hoped that further studies on telemedicine contribute largely to extended incorporation of this technology into health system, enhancing general public’s satisfaction.

10. Practical Recommendations

1. Tele-consulting and family doctor system can be used to consistently monitor and take care of patients, while medical centers can undertake preliminaries for hospitalizing the patient as they are aware of the patient health state, so as to accelerate the treatment.

2. Considering unavailability of particular specializations or expensiveness of medical services in many of neighbouring countries, one can provide a basis for medical collaborations, information exchange, and, if required, transferring foreign patients to specialized Iranian hospitals by developing a communication channel for telemedicine, which seems to be a useful solution for income generation.

3. Establishment and extension of virtual hospitals will contribute to enhanced health level across the society by constantly monitoring the patients and having access to the patients’ information to set and prevent many of chronic and sever diseases.
REFERENCES:


http://www.mums.ac.ir/hit/fa/Telemedecine,(2016)