

## ORIGINAL PAPER

# Formulating Telemedicine Strategies in Isfahan University of Medical Sciences

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## ABSTRACT

**Introduction:** The use of telemedicine technology can lead to an equitable distribution of specialized care. There are numerous influencing factors which should be identified for successful implementation and efficacy of telemedicine. The aim of this study was to evaluate current situation and internal and external environment of Isfahan University of Medical Sciences (IUMS) and prepare telemedicine development strategies for IUMS. **Methods:** This study was an applied cross-sectional mixed method study which was conducted between July 2014 to November 2016 and in five phases in IUMS. a) Evaluating Internal and external factors (IFE & EFE); b) Formulating goals; c) Identifying and prioritizing strategic problems; d) Setting objectives; and e) formulating the strategies to develop telemedicine in IUMS. The research sample included 147 of IUMS inner customers and stakeholders in the first phase (census) and 14 in the second phase (Purposive sampling based on more work experience). In the first phase, to analyze obtained data of two researcher-made questionnaires, measures of central tendency and dispersion (frequency, percent and mean) were calculated using SPSS. To evaluate internal and external factors and formulating strategies was used TOWS matrix. And finally, to select optimal strategies for telemedicine developing quantitative strategic planning matrix was used. **Results:** The final score of internal and external factors evaluation was 2.67 and 2.68, respectively. According to the strategic position and action evaluation (SPACE), telemedicine strategic planning in IUMS was in aggressive posture. Because the numbers were closer to 2.5 can be concluded that based on internal factors the organization was in moderate to strong and based on external factors was in a moderate level and neither have a serious positive feature for use the opportunities outside the organization and suffered a serious threat from the outside of organization. Finally, we formulated 14 strategies to develop telemedicine in IUMS as followings: 5 SO, 2 ST, 5 WO, and 2 WT strategies. **Conclusion:** Telemedicine development in IUMS is located in poor aggressive posture. Therefore, IUMS can develop telemedicine and subsequently, in this study, strategies were developed to preserve and retain healthcare workers, practical studies, data confidentiality and security programs, and other issues.

**Keywords:** Strategy, Strategy formulation, Telemedicine, strategic planning.

## 1. INTRODUCTION

The improvement of the ICT had revolutionized the acting and the strategic planning of healthcare organizations, especially on that effectiveness, efficiency and quality (1). Today, the continuous increase in information production in health care has led to the introduction of new technologies for the proper utilization of information in this sector (2). After emerging computers, advanced information systems, mobile technologies development, and the global expansion of the Internet, these technologies have affected many aspects of people's lives and health

sector has found that provide better services to the public through the Internet (3, 4). Health is one of the most basic human rights in societies that must be accessible to all individuals in the same way as without discrimination (5). Therefore, the use of efficient information systems is essential to realize service efficiency, effectiveness, and quality, and customer satisfaction, but prudence is required (6). Equity in access to health services is one of the main goals of any health system and is one the policy makers' challenges in healthcare (7). The rapid advances in information technologies have led to a

fundamental shift in the workplace around the world, especially in health care (8).

Telemedicine is known as a new and broader field of health and is one of the providing health services methods to public; especially, to distant places and to medically underserved areas residents or even in situations with low willingness to pay (6, 9). A major goal of telemedicine today is to develop next-generation telemedicine tools and technologies (10). Its benefits are undeniable: breaking physical, geographical and temporal barriers between health services and its users as well as improving the communication between professionals and patients (6).

Specific training of the staff involved in long-distance areas would be necessary for optimal implementation (6). In addition, telemedicine may offer an avenue to implement self-management education for people in underserved communities (11). Overall, the economic and clinical benefits of telemedicine will likely come from: a) diminished travel times and lost work time for patients; b) remote consultation of subspecialty experts, such as neurosurgeons; and c) remote consultation to assist with triage and care in time-sensitive scenarios.”(12). World Health Organization (WHO) recognized telemedicine as a tool to improve access and quality in healthcare (1). Awareness of the vision, goals, benefits and impacts of telemedicine on improving the quality of services, reducing costs and increasing access to a variety of specialized and sub-specialized services, pushes health care professionals to the familiarity and use of telemedicine unconsciously (13).

Telemedicine is more cost-effective due to savings related to transport and productivity losses. It represents a cost-effective strategy to support the patients' routine clinical follow-up. Moreover, when adequate face-to-face consultations are impractical, it could provide an excellent alternative approach (6).

Demand trends have increased for health care services and severe shortages of providers and tertiary hospitals in deprived and rural areas (14). According to the 2011 census, Isfahan is the third largest metropolis in Iran with 4,879,312 populations (4,168,219 in urban and 711,093 in rural areas). In Isfahan, the number of general practitioners and specialists is more appropriate than the average of the whole country; 1 physician per 1097 people in Isfahan against 1 per 1275 in the country (11). The concentration of physicians in some parts of the city has led to heavy traffic, large environmental pollution and other problems such as excessive transportation, additional costs and the dangers of delay in the patient transferring to health facilities (15, 16).

The goal of telemedicine is to reduce inequalities as well as promoting life expectancy and meeting people's reasonable expectations, which means that all classes and levels of the community enjoy a high level of health as a fundamental right (17-19). The use of telemedicine improves access to health services and increases the distribution of specialized care in areas where population distribution and health care are not the same (20). Given the geographical location of Iran, the existence of mountainous and desert areas, deprived areas with limited medical facilities, the concentration of facilities in metropolitan areas, and the high cost of transferring patients, the use of telemedicine can meet health needs (21). Therefore, all involved actors should be prepared to enter this

technology (22). The World Health Organization has designated the Ministry of Health and Medical Education on behalf of the government as a health care practitioner and has been entrusted to the medical universities at the provincial level.

However, key barriers continue to challenge widespread telemedicine adoption by health facilities. These barriers include technology, financial, legal, standards, business strategy, and human resources issues (10). Despite technological development, growing interest, and increasing reimbursement opportunities, telemedicine utilization has not yet materialized in Isfahan, because of concerns regarding an apparent lack of need for telemedicine services, lack of widespread reimbursement, lack of interstate licensure reciprocity, lack of universal access to necessary technology, concerns about maintaining patient confidentiality, and concerns and limited precedent regarding liability issues (23).

There are several factors in the success of each technology, such as: social, organizational and environmental factors which these determinant factors can be effective in its productivity. Today, no organization operates in a vacuum, and changing the various economic, social, technological, demographic and legal factors will change the world, and affects the functioning of organizations consequently (24). Facilities need to be aware of what is happening in their environment and may affect their fate and traditional planning assumptions do not meet health care delivery systems managing needs, (25). Regarding the above mentioned statements and the state's move toward the formation of e-government and the consequent electronic health, in this article, we analyzed the current situation and formulated strategies for developing telemedicine in IUMS.

## 2. METHODS

This is an applied cross-sectional mixed study in which was conducted using the process of strategic studies in five phases, through both quantitative (survey) and qualitative (interviews and focal groups) methods. To formulate telemedicine development strategies in IUMS, we used strategic planning model of ministry of health and medical education in Iran (26).

Based on the model, we performed the following phases:

In the first phases, we analyzed the current situation of telemedicine in IUMS. The current situation of telemedicine in IUMS was analyzed by evaluating internal and external factors. The study population consisted of all telemedicine key stakeholders, including: physicians, nurses, medical records and IT personnel, managers and heads of 10 IUMS' academic hospitals; headmaster such as vice-chancellery for clinical affairs, university IT Department, vice-chancellery for logistics and personnel affairs; third-party payers (social security and health insurance), and legal organizations (Isfahan medical council, and General office of legal medicine in Isfahan). The sample was 147 in the first phase (Census) and 14 in the second phase (Purposive sampling based on more work experience).

In the first phase, to evaluate the internal and external factors of telemedicine development, we performed the following steps:

Telemedicine target groups including inner customers and

stakeholders were identified. Their identification criteria are: recipient or consumer of telemedicine services, telemedicine beneficiary Groups, IUMS external customers for telemedicine and its Inner customers, and stake holders.

A researcher-made questionnaire was prepared based on the literature review, IUMS performance in the past and present, other countries experiences and the research panel opinions, consists of three parts: demographic data, internal environments factors, and external environments factors. Internal and external factors were determined through contributors' (customers and stakeholders) interviews and prioritized using the IFE & EFE matrices.

The degree of impact of the prioritized factors identified using a researcher-made questionnaire based on IFE & EFE. The questionnaire consists of: Respondent Demographics; Prioritizing strengths, weaknesses, opportunities and threats of the telemedicine development in IUMS. The validity of both questionnaires was confirmed by the health information technology department academic members and their reliability was also confirmed (Cronbach's alpha at the first questionnaire = 0.971 and at the second questionnaire = 0.971). Also, TOWS strategy selection model was used to evaluate internal and external factors, as follows:

- To evaluate the strengths and weaknesses, IFE matrix was formed. Then, 10 priority internal factors were identified based on factor rankings and amount of strengths and weaknesses impact.
- To evaluate the opportunities and threats, EFE matrix was formed with the same structure of IFE matrix. The difference is that instead of internal factors, external factors (opportunities and threats) were introduced into the table.
- Using SPACE model we evaluated the strategic position of telemedicine at the aggressive posture.
- In the second phase, we formulated goals.
- In the third phase, we identified strategic problems of telemedicine development using fish bone diagram. Then, we prioritized strategic problems using weighting strategic issues matrix.
- In the fourth phase, we set objectives of telemedicine developing by determining the components of each of the objectives such as action, object, amount, and deadline.
- Finally in the fifth phase, we formulated the strategies to develop telemedicine in IUMS.
- To analyze obtained data of questionnaires, measures of central tendency and dispersion (frequency, percent and mean) was calculated using SPSS. We used TOWS matrix to evaluate internal and external factors and formulating strategies. And finally, we used quantitative strategic planning matrix to select optimal strategies for telemedicine developing.

### 3. RESULTS

To formulate telemedicine development strategies, at the first, we identified the customers and stake holders (Table 1).

The findings of IFE revealed that "disproportionate allocation of the specialists across the country" was the highest relative importance of the strengths in telemedicine development (3.06) and the lowest one was "the office automation

system" (2.07). The highest relative importance of the weaknesses, also, was "the lack of an international standard for data exchange" (2.94) and its lowest one was "lack of attention to the satisfaction of native and foreign customers, and customer dignity" (2.01).

According to Table 2, Most of the strengths were related to education and research factors (25%) and the least strengths related to legal considerations, equipment and standards (0%). Also, most number of the weaknesses (17%) was related to human resources and the least number of weaknesses was related to health factors (0%).

According to EFE findings, the highest relative importance of opportunities was related to "the existence of international experiences and case studies in telemedicine (2.76)" in the field of training and research factors, and the least relative importance of opportunities related to the "existence of the university financial and trading regulations of the (1.92)" in the economic factors. The highest relative importance of threats was related to the "novelty of telemedicine in Iran and lack of sufficient experience in IUMS in this regard (3.13)" in the health factors and the least relative importance of threats was related to "Justice and Emphasis on Religious Values (2.01)" in the Health factors.

In this study, to evaluate external factors, these factors were

Inner customer /Stakeholder	Number	percent
Director and Head	9	6
Physician	3	2
IUMS hospitals	107	73
Nurse (Merton, supervisor and head nurse)		
IT man	8	5
Health Information Manager	10	7
IUMS administration	3	2
ICT Office		
Vice-Chancellery for Clinical Affairs	1	0.7
Health insurance	3	2
Legal medicine of Isfahan Province	1	0.7
Medical council of Isfahan province	1	0.7

Table 1. Telemedicine stakeholders and inner customers

Main factors	Strengths N(%)	Weaknesses N(%)	Total sub-factors N(%)
Training & research	19(25%)	6(7.9%)	25(32.9%)
Health	7(9.2%)	0	7(9.2%)
Human resources	6(7.9%)	13(17.1%)	19(25%)
ICT	5(6.6%)	7(9.2%)	12(15.8%)
Legal considerations	0	3(3.9%)	3(3.9%)
Equipment	0	7(9.2%)	7(9.2%)
Standards	0	3(3.9%)	3(3.9%)
Total	37(48.7%)	39(51.3%)	76(100%)

Table 2. Internal factors (strengths and weaknesses)

Main factors	Opportunities N(%)	Threats N(%)	Total sub-factors N(%)
social and cultural	10(11.8%)	5(5.9%)	15(17.6%)
training and research	5(5.9%)	4(4.7%)	9(10.6%)
health	3(3.5%)	8(9.4%)	11(12.9%)
economics	2(2.4%)	13(15.3%)	15(17.6%)
ICT	2(2.4%)	15(17.6%)	17(20%)
legislation	0	8(9.4%)	8(9.4%)
governmental policies	0	10(11.8%)	10(11.8%)
Total	22(26%)	63(74%)	85(100%)

Table 3. External factors (opportunities and threats)

SO Strategies	WO Strategies	ST Strategies	WT Strategies
<p>SO1: Designing and deploying optimal training programs for health care staff in accordance with the telemedicine technology developing requirements as well as organizing and conducting staff intentions and motivations on the path to telemedicine implementation.</p> <p>SO2: Grow, develop and enhance the quality and quantity of telemedicine applied studies, through the existing international up-to-date &amp; reliable studies and experiences utilization</p> <p>SO3: Expanding the range of telemedicine services and technologies in various health facilities, by enhancing the computer literacy of the staff and motivating the new generation of physicians and patients to use it</p> <p>SO4: Using cyberspace capability, social networks, mobile technologies, training and encouraging the public to use telemedicine services at different levels</p> <p>SO5: Using IUMS and other related institutions capacities in the field of hardware, software, network infrastructure, Internet, computer equipment and etc. to expand the use of telemedicine in different regions</p>	<p>WO1: Enriching of telemedicine course syllabuses with the topics of a variety of telemedicine standards</p> <p>WO2: Designing and deploying of optimal telemedicine training programs for health care staff to develop telemedicine technology as well as organizing and motivating them to establish clinical academic centers through telemedicine</p> <p>WO3: Growing, developing, and improving of the quality and quantity of telemedicine applied studies and utilizing it in accordance with current regulations, to determine the opportunities of changes in policies consistent with telemedicine strategies</p> <p>WO4: Establishing an interdisciplinary post-graduate course in line with the health staff motivation &amp; intention, to train and improve the telemedicine standards establishment as well as strengthen the technical expertise of telemedicine</p> <p>WO5: Exploiting mobile technology to introduce and train various types of telemedicine standards and launch the telemedicine elementary levels</p>	<p>ST1: Benchmarking telemedicine growth &amp; development in compliance with advanced countries</p> <p>ST2: Identifying required legal infrastructures and reviewing existing regulations as well as identifying opportunities for changes to policies and actions consistent with this strategy</p>	<p>WT1: Encouraging the private sector to invest in telemedicine, with conditions such as the establishment of an international data exchange standard, the privacy &amp; confidentiality and data security infrastructure, appropriate equipment, and good bandwidth</p> <p>WT2: Establishing Telemedicine association with activities, such as: 1) benchmarking; 2) telemedicine licensing; 3) Publishing standards for telemedicine programs evaluation, data exchange standards, privacy standards, security laws and regulations; with a focus on: a) licensing service, b) support for deliverable services by telemedicine, 3) following up to define the tariffs for telemedicine services</p>

Table 4. Telemedicine Development Strategies in IUMS

classified into the following main factors: economics, health, training and research, legislation, information and communication technology, social and cultural, and governmental policies (22 opportunities and 63 threats) which the highest number of identified sub-factors was related to the information and communication technology with 17 sub-factors (2 opportunities and 15 threats). According to Table 3, the greatest number of opportunities was related to cultural and social factors (12%), and the least number related to the legislation, and governmental policies (0%). The highest number of threats (15%) was related to information and communication technology and the lowest (5%) related to training and research. The final score of internal and external factors evaluation was calculated 2.67 and 2.68 out of 4, respectively. Then, Internal-External (IE) Matrix was formed. Telemedicine development is in aggressive posture and it can be deduced that regarding both internal and external factors, telemedicine is relatively moderate; and in fact, there are not serious opportunities, threats, strengths or weaknesses for telemedicine development. According to SPACE model, SO strategy is the proper strategy for telemedicine development in IUMS. From the confluence of strengths, weaknesses, opportunities and threats in TOWS matrix, strategies were obtained (Table 4). Telemedicine development is in aggressive posture, therefore, the most strategies are SO strategies or to achieve them.

#### 4. DISCUSSION

Today, the health system faces severe resource constraints in many countries. Hence, healthcare managers and planners, as community health care providers, should be able to use existing resources in the most efficient and effective way possible so that they can maintain their share in the current competitive market. They identify and evaluate the most important strengths, weaknesses, opportunities and threats by analyzing organizations. Considering the importance of this issue, we have developed strategies for the development of telemedicine in this study.

Designing and deploying optimal training programs for health care staff in accordance with the telemedicine tech-

nology developing requirements as well as organizing and conducting staff intentions and motivations on the path to telemedicine implementation.

According to SO1 and WO2 strategies, Optimum training programs should be designed and implemented for health care staff based on the requirements of telemedicine development. Also, the goals and motives of the staff on the path to telemedicine should be organized and guided. These strategies are explained with Gifford and Higgins findings. According to Higgins et al, to deliver telehealth services, competent providers training is vital for implementing successful telehealth programs, thereby bridging the gap between qualified providers and consumers in isolated locations. Their findings also revealed robust and immediate improvements and participants' high satisfaction by telehealth training package (27). In addition, Gifford et al found that providers' behavioral telehealth competencies and their positive perceptions increased following training and they achieved progress on the majority of behavioral telehealth goals set during the training (28). Over time, the quality of telemedicine studies has generally improved, but its conclusions cannot be drawn on the cost-effectiveness of telemedicine applications (29). Known theories are inadequate in clarifying any unique telemedicine feature (30). Telemedicine underlying theoretical components should be identify (30). According to SO2 and WO3 strategies, the quality and quantity of telemedicine applied studies should be developed through up-to-date and reliable international studies and the use of experiences. Also, Whitten findings revealed that it will be difficult to draw firm conclusions of telemedicine studies until agreed on the methodological details of telemedicine reporting (31).

The success of Telemedicine depends on the knowledge and understanding of the concept, skills acquired, attitude towards technology and working environment by the concerned professionals (32, 33). To succeed, the culture of using these technologies should be promoted (34). Therefore, we formulated SO3 strategy as it says a wide range of telemedicine services and technologies should be developed in various health centers, through increasing staff computer literacy and motivating a new generation of physicians and patients to

use it. According to our SO4 strategy, to use telemedicine services, it must be used with cyberspace, social networks, mobile technologies, training and general encouragement. Evans et al findings showed that the innovative use of mobile screening allows efficient utilization of resources to meet the medical screening needs of a large number of miners in geographically remote locations in the United States (35).

According to our SO5 strategy, It should be used from IUMS and the other related institutions capacities such as hardware, software, network infrastructure, Internet, computer equipment, etc., to expand telemedicine utilization. It may be explained with the findings of Barry and Capozzi. They believe that using existing organizational infrastructure improves education, compliance with institutional handoff policies, and tele-monitoring services (36, 37). Also, according to Saghaeiannjad-Isfahani et al, the implementation of telemedicine involves improving the technical infrastructure (34). One way to overcome the obstacles and to maximize the benefits from telemedicine is to strengthen education in telemedicine and tele-health, at postgraduate level (38, 39). Telemedicine developing involves organizing of training courses (34). To this end, we formulate WO1 strategy which says the telemedicine courses must be enriched with the topics of the various telemedicine standards.

According to our WO4 strategy, it should be established an interdisciplinary postgraduate telemedicine course in line with the health staff motivation & intention, to train and improve the standards establishment as well as strengthen the technical expertise of telemedicine. This strategy can be explained with Meyer and Brebner's findings. Meyer believes that more interdisciplinary technology-driven courses are needed to better prepare students for clinical practice (40). Also, Brebner et al believes that the following steps appear to be important, before establishing a telemedicine service: Identify the required training competencies; Train the "hands on" curriculum based on the required training competencies; ; back up the curriculum with an instruction booklet; Ensure that trainees have at least weekly practice; measure the user competence level (41).

According to CAO, combination of telemedicine and mobile technologies gives a practitioner more objective and reliable information to manage decisions as well as increasing the quality of information gathered, resulting in more accurate and rapid assessments, and increase patient satisfaction (42). To this end, we formulate WO5 strategy which states it should be Exploited mobile technologies to introduce and train various types of telemedicine standards and launch the telemedicine elementary levels.

With limited government investment, the telemedicine systems development will increasingly rely on the private sector. Many of the unique barriers inhibit the growth of private sector investment in telemedicine development which is necessary to identify to increase private sector participation (43). For this purpose, we formulated WT1 strategy to encourage private sector to invest in telemedicine, with conditions such as the establishment of an international data exchange standards, the privacy & confidentiality and data security infrastructure, appropriate equipment, and good bandwidth.

The healthcare industry has a strong need for guidance,

well-documented strategies, and a variety of avenues for learning and training. Telemedicine association can amplify enthusiasts' voice and advocate for legislative reforms through public affairs and collaborations with key stakeholders. It also to empower change and innovation, can re-tool educational learning programs to lead to solutions, technological advancement, and higher standards. In addition, telemedicine association can mobilize its resources to effect transformation (44-50). That means boosting member engagement across various platforms, and refining internal operations to create a nimble, creative, and highly productive work culture. According to Saghaeiannjad-Isfahani et al, the implementation of telemedicine requires the state of the art development of its standards (34). To that end, we developed WT2 strategy to establish telemedicine association with activities such as benchmarking, telemedicine licensing, Publishing standards for telemedicine programs evaluation, data exchange, privacy, and security; with a focus on licensing service, support for deliverable services, and following up to define the tariffs for telemedicine services.

## 5. CONCLUSION

The findings of this study revealed that considering the significant achievements of health sector with the aim of improving the quality and efficiency of health care in Isfahan, providing telemedicine services and using other technologies, such as mobile technology, is a cost-effective option for the equitable distribution of quality health care, due to Isfahan features such as high population density and city growth. But the launch of Telemedicine requires preparation and planning on a continuum of telemedicine. To find the true potential of this technology, it is essential to conduct further applied researches. With regard to the findings of internal and external factors analysis, it can be deduced that telemedicine can be achieved in IUMS with aggressive strategies or its aligned strategies. To enhance the ability and overcome the obstacles to the advancement of this technology, we suggest the followings:

Establishing a government agency to implement this technology such as National Coordinating Committee:

- Identifying professional business models;
- Improving the legal environment to practice and data security in telemedicine;
- Improving IT infrastructure;
- Identifying the Telemedicine Custodian;
- Conducting interdisciplinary telemedicine researches;
- Providing strong documents on the economic justification of telemedicine.

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