3.1 INTRODUCTION

In this chapter an attempt has been made to explain the methodology of the study, which includes the details like locale of the study, sample procedure, variables considered for the study, tools used for data collection and statistical techniques employed for analysis of the obtained data.

3.2 LOCALE OF THE STUDY

The locale of the present study is Shiraz University of Medical Sciences in Iran. The city of Shiraz is the sixth most populous city in Iran, and the capital of Fars Province. Shiraz is located in the southwest of Iran. Shiraz has a moderate climate and has been a regional trade center for more than a thousand years. The earliest reference to the city, as Tiraziš, is on Elamite clay tablets dated to 2000 BC. In the 13th century, Shiraz became a leading center of the arts and letters, thanks to the encouragement of its ruler and the presence of many Persian scholars and artists. Shiraz was the capital of Persia during the Zand dynasty from 1750 until 1781. Shiraz University of Medical Sciences (SUMS) is a public medical school located in Shiraz, Iran. It is ranked as one of Iran’s top medical schools, with more than 5000 students studying for 83 different degrees, and a
staff of nearly 13,000 faculty and personnel. With 13 hospitals, SUMS is a regional Continuing Medical Education provider and the main medical center in Fars Province. Located in central Shiraz, SUMS was founded in 1950 as a college within Pahlavi University. In 1954, a Faculty of Nursing was added, followed by a Faculty of Dentistry in 1969. After the 1979 Islamic Revolution overthrew the Pahlavi dynasty drastic changes were implemented at all universities. The name of Pahlavi University was immediately changed to Shiraz University. In 1986, the Iranian Ministry of Health, Treatment and Medical Education took over the departments and faculties in the medical sciences and SUMS became an independent institution.

3.3 SAMPLE OF THE STUDY

The entire study has been conducted in Shiraz city of Iran. The population for this survey is defined as Iranian physicians of all types of specialties in active including community practice. As per the most current list of physicians in Iran, there are 500 physicians. A sample of 400 has been taken from this total population of 500 physicians for the study. The researcher has used Cochran’s sampling technique, with a margin of error of 5% and 95% confidence of the 500 physicians in the total population; fax numbers were available for 90% of the population. Random samples were drawn from the pool of available fax numbers and responses solicited until 200 were obtained. 140 male and 60 females that categorized in 7 group medical basic science, ENT, cardiologist, psychiatrists, dermatologist, surgeon and pediatrics.
3.4 TOOLS USED FOR DATA COLLECTION

The researcher used a 4-E model questionnaire to collect data on the extent to which information and communication technologies (ICTs) have been adopted by Continuing Medical Education (CME) providers in Iran. Survey respondents were also asked to provide information about existing programming initiatives to enhance the knowledge, skills, belief, experience, motivation and attitudes of health professionals towards the adoption and use of ICTs in their professional work. The survey was validated by an advisory committee consisting of national experts in the field of continuing professional education and information and communication technology usage. These experts were consulted on the composition of the respondent population for the study, and they were given several drafts of the questionnaire-survey for review.

A draft of the questionnaire-survey was piloted with several health professional educators who were asked to critically review the survey and provide feedback on the readability and clarity of the questionnaire items. Lastly, two epidemiologists reviewed the formatting aspects of the survey and survey items. A final version of the survey and accompanying cover letters were submitted to the Human Investigation Committee, Faculty of Medicine, Shiraz Medical Science University. Full ethical approval was received in August 2007. The population of interest for this survey was defined as Iranian physicians of all specialties in active, community practice according to the most current physician listing; 400 physicians were identified.
A sample size of 400 medical professionals from Shiraz University of Medical Sciences (200 medical professionals who use ICT for CME and 200 medical professionals who are not using ICT for CME) was selected randomly to study their perception on use of ICT in CME. The 200 samples of medical professionals who are using ICT for their CME was used to generalize findings related to the effectiveness of ICT in CME. Random sample of 400 medical professionals from Shiraz University of Medical Sciences were drawn from the population. The tools were administered between September and December 2007.

Two hundred \((N = 200)\) responses were received from the medical professionals who use ICT for CME and 400 responses on the perception scale were obtained. The composition of the sample of the 200 medical professionals who use ICT for CME is as follows:

- Twenty eight \((N = 28)\) Group of ENT respondents were forwarded the questionnaire-survey for completion. This group respondent category encompassed all accredited Group of ENT in Shiraz medical Science University in Iran. The list was compiled and validated from the Association of CME Office in Shiraz medical Science University in Iran.

- Twenty eight \((N = 28)\) Group of cardiologist respondents were forwarded the survey. This group included all accredited of cardiologist in Shiraz medical Science University in Iran. The list was compiled and validated from the Association of CME Office in Shiraz medical Science University in Iran.
• Eighteen (N = 18) Group of pediatrics respondents were forwarded the questionnaire-survey. This group respondent category encompassed all accredited Group of pediatrics in Shiraz medical Science University in Iran. The list was compiled and validated from the Association of CME Office in Shiraz medical Science University in Iran.

• Fourteen (N = 14) group of psychiatrist were forwarded the questionnaire-survey. This organizational respondent category included national and provincial professional associations representing medical specialties. This category also included non-profit health organizations such as the Iranian Mental Health Association; the list was compiled and validated from the Association of CME Office in Shiraz medical Science University in Iran.

• Forty-eight (N = 48) Group of surgeons’ respondents were forwarded the survey. This group was compiled from the listing of Iran’s research-based surgeons in Shiraz medical Science University in Iran. The list was compiled and validated from the Association of CME Office in Shiraz medical Science University in Iran.

• Twelve (N=12) Group of dermatologist surgeons respondents were forwarded the survey. This group was compiled from the listing of Iran’s research-based surgeons in Shiraz medical Science University in Iran. The list was compiled and validated from the Association of CME Office in Shiraz medical Science University in Iran.

• Medical basic science/health care management boards comprised the final organizational category included in the survey respondent population. This Group
category consisted of fifty (N = 52) potential respondents, and included hospitals, regional district health authorities and boards, retirement, and long-term care facilities, and various health centers (e.g., rehabilitation, public health, Pharmacologist, pathologist, etc.). Whenever possible, surveys were directed towards each Group’s or a specific department, such as Human Resources, Communications, Staff Development or Information Services/Technology. The address list was compiled and validated from the Association of CME Office in Shiraz medical Science University in Iran.

The 4-E model questionnaire items were developed from the available literature. A number of survey items were adapted and modified, with permission, from the American Association of Colleges of Nursing (AACN) Technology Survey (AACN, 1999). The questionnaire-survey included items that were designed to collect information in the following areas:

- the type of organization to which respondents belonged;
- the organization’s commitment to the provision of Continuing Medical Education by technology-based Continuing Medical Education programming;
- experience in technology-based Continuing Medical Education delivery to health professionals;
- factors influencing decision to offer technology-based Continuing Medical Education;
• source(s) of support for technology-based education program delivery, and access to internal resources to support Continuing Medical Education program development and delivery;

• type(s) and nature of partnerships formed for the purpose of sharing resources for technology-based Continuing Medical Education program development and delivery;

• type(s) of technologies used in delivering Continuing Medical Education programs to health professionals;

• type(s) of faculty development provided to support instructors and faculty in Continuing Medical Education program development and delivery;

• composition of target audience/participants in Continuing Medical Education programs;

• factors influencing likelihood of use of information and communication technologies for technology-based Continuing Medical Education;

• Types of Continuing Medical Education programs offered in the Iran of information and communication technologies.

• Factors changing in knowledge, attitudes, skills, practice, behavior, or clinical practice outcome in Continuing Medical Education program development and delivery.

• Factors influences in the perception of usage of programmes effectiveness usage of ICT, usage of internet, perception on physicians experience, beliefs,
motivation, barriers and practice outcome in Continuing Medical Education program development and delivery.

3.5 COMPONENTS AND STATEMENTS IN PERCEPTION SCALE

- The organization provides technology-based Continuing Medical Education.
- The management of the organization provides support for technology-based Continuing Medical Education.
- The organization provides readiness to change for technology-based Continuing Medical Education.
- The organization provides technical infrastructure for technology-based Continuing Medical Education.
- The organization provides day-to-day support of technology-based Continuing Medical Education.
- The sufficient funding is available for technology-based Continuing Medical Education.
- ICT in CME will help to improve knowledge of medical professionals.
- ICT in CME will help to change the attitude of medical professionals.
- ICT in CME will help to acquire professional skills to medical professionals.
- Use of ICT in CME will help to bring some change in medical professionals practice behavior.
- Use of ICT in CME will help to bring some change in clinical practice outcomes.
- ICT in CME will help to bring in the change in knowledge; attitudes, skills, practice, behavior, or clinical practice outcomes.
• The use of ICT for knowing various CME programmes.
• The use of ICT to know the advanced medical instruments.
• The ICT is used to write academic articles for publication.
• The ICT is used for exchanging ideas with other medical professionals.
• ICT will be used to develop and improve students’ skills in searching for information.
• ICT for CME is a tool for individual learning.
• ICT for CME will be used for accessing the reference materials.
• ICT for CME will be used for download ready made curricular materials from the websites.
• ICT for CME will be used for providing simulated activities in the classroom.
• ICT for CME will be used for providing effective feedback to medical professionals.
• ICT for CME will be used for disseminating the innovative ideas and critical medical situations.
• ICT for CME will be used for proving forum of the specialists of the area across the globe.
• ICT for CME will be used for sharing the problem solving situations.

3.6 COMPONENTS AND STATEMENTS IN 4-E MODEL QUESTIONNAIRE

Organizational Influences

• The vision within my organization for technology-based Continuing Medical Education is...
• The support from the leaders in my organization for technology-based Continuing Medical Education is...

• The readiness to change among the people in my organization when it comes to the use of technology-based distance education is...

• The adequacy of my organization’s technical infrastructure for technology-based distance education is...

• The day-to-day support of technology-based distance education in my organization is...

• The funding and incentives for technology-based distance education that are available in my organization are...

• The experiences in the past that my organization has had with technology-based distance education have been...

**Professional Influences**

• My peers and colleagues believe the Internet is an important tool.

• In the professional field in which I work, many people are Internet users.

• In the professional field in which I work, most people think that technology-based distance education is important.

• Soon everyone will be using the Internet.

• Distance learning is likely to contribute to the solution of learning-related problems relevant to the professional field in which I work.

• It is my personal opinion that technology-based distance education will improve teaching and learning.
**Strengths & Resources**

- A priority of my unit.
- A priority of my organization.
- Administration supportive of the idea.
- Sufficient administrative/clerical support staff.
- Specialized staff to design the courses.
- Experience in technology-based distance education.
- Adequate budget for technology-based distance education programs.
- Telecommunication costs are reasonable.
- Adequate telecommunication infrastructure (e.g., bandwidth availability).
- Adequate facilities / equipment for supporting distance education development and delivery.
- Adequate faculty / subject matter expert support.
- Convenient personal Internet access among target audience.
- Convenient personal computer access among target audience.
- Adequate level of computer experience among target audience.
- Enthusiasm among target audience.
- Organizational support from employers of target audience.
- Sufficient time commitment for participation among target audience.

**Effectiveness of using ICT in CME**

- importing knowledge To physicians
- changing physician attitudes
• acquiring skills
• changing physician practice behavior
• changing clinical practice outcomes
• Changing in knowledge, attitudes, skills, practice, behavior, or clinical practice outcomes predicted by CME persist over time
• The effectiveness of using ICT in medical education outside of CME
• Characteristics of the audience by themselves or in combination with other characteristics in fluency the Effectiveness of certain educational techniques

Physician Experience in Internet Use

• Electronic mail
• Personal use
• Literature searching
• Searching for medical information
• Professional association updates
• Accessing on-line journals
• Continuing Medical Education
• Searching for specific patient information
• Consultation with colleagues
• Filing insurance claims
• Participating in clinical trials
• Writing prescriptions/patient orders
Physician Internet Beliefs

- Belief in professional value of Internet to physicians
- Belief better care can be provided using the Internet
- Belief Internet will improve patient-physician communication
- Belief Internet will save money for the health care system
- Belief Internet will improve Evidence-based Practice
- Belief Internet will Progressive medical profession
- Belief Internet will invigoration in teaching and learning

Physician Motivation for Internet Searching for Medical Information

- Particular patient problem
- Scanning new information in a disease area
- Latest research on a specific topic
- New product information
- Specific drug dosage

Physician Perceptions of largest Barrier to Internet Use

- Too much information to scan
- Not able to find information
- Inadequate searching skills
- Slowness of loading information
- Need for additional software plug-ins
**Factors Important in Using On-Line CME**

- Ease of program use
- Validity of content
- Category 1 credit
- Evidence-based content
- Faculty credentials
- Length of course
- On-line CME certificate
- Provider credentials

**Recent Medical School Graduates Use of Internet Compared to Other Physicians**

- More likely to use the Internet to find medical information
- More literature searching
- More accessing on-line journals
- More searching for specific drug information
- More likely to consider search skills sufficient
- Greater professional value placed on the Internet
- Greater belief the Internet supports better patient care
- Greater belief Internet will save money for the health system

**Male Physicians Use of Internet Compared to Female Physicians Use**

- More likely to have used the Internet longer
- More likely to use the Internet more frequently
- More likely to use the Internet for filing insurance claims
• More likely to use the Internet for CME
• More likely to have accessed the Internet for CME in the past year
• Less likely to search for specific patient information
• More secure in search skills

Specialist Use of the Internet Compared to Primary Care

• More likely to use the Internet for literature searching
• More likely to use the Internet for professional association updates
• More likely to search for the latest research on a specific topic
• More likely to consider faculty credentials important to Internet CME
• Less likely to use the Internet to search for specific patient information
• Less likely to use the Internet for writing prescriptions or patient orders
• Less likely to use the Internet for CME
• Less likely to have accessed the Internet for CME during previous year
• Less likely to use the Internet in the future at the request of patients

3.7 VALIDATION OF TOOLS

3.7.1 Validity

High content validity because the time at the first stage for tryout of the scale were selected on unanimous agreements (80% to 100%) of experts in field regarding its content adequacy. The questionnaire also claimed to have the item validity.

The methods of item selected after consulting the expert in the field of medical education and teacher education. In addition, the differences in the mean scores of not clinical and clinical, male and female and Organizational Categories were computed.
The differences observed also support the adequacy of scale validity. The content validity of the scale was determined by obtaining expert opinion. The scale possesses the content validity. The small sample is used to tryout the tools.

3.7.2 Reliability

Reliability of the scale was estimated by using test-retest method. The coefficient of reliability for the Perception Scale is 0.67 and for the 4-E Model questionnaire is 0.87 respectively. The Investigator translated the original English to Persian to administering among the medical professionals of Iran. The scale has been used in this study Initially, the Persian versions was subjected to pilot study on small sample of 50 medical teachers in Iran to find out the suitability of the scale.

3.8 SCORING OF PERCEPTION SCALE SCORES

The perception of the medical faculty was obtained by administering Perception Scale developed by the investigator. The perception about the ICT influence in CME was obtained from the medical faculty of Shiraz Medical University. The tool contains 25 items. The ratings of 1, 2 and 3 are given against each item for their response. The rating one for disagrees against response, two for undecided and three for agree. The sum of the total indicates the total degree of perception of an individual respondent.

3.9 SCORING OF 4-E MODEL QUESTIONNAIRE

The questions concerning ‘factors’ influencing the likelihood of ICT usage in CME delivery were adopted and modified from the work of Collis, Peters, and Pals (2000). According to Collis et al. (2000), telematics applications are not being used regularly as instructional tools in educational settings. Collis and colleagues
developed a model for predicting an individual’s likelihood of using a telematics application in teaching practices. According to this model, or the ‘4-E Model’ hypothesis, the likelihood of using a telematics application in teaching practices can be expressed as the sum of four factors: ‘environmental aspects’ in the institution in which one works; ‘educational effectiveness’ or perceived educational payoff; ‘ease of use’ or level of difficulty in making use of the application; and ‘personal engagement’ or subjective personal interest in the application. According to the 4-E Model, only when the sum of these factors approaches a certain threshold is usage likely to occur.

Items comprising the three scales of ‘organizational influences’, ‘professional influences’, and ‘strengths and resources’ were adopted and modified from the Collis et al. (2000) 4-E Model questionnaire. Table 1 lists the items included within each of these scales. The organizational influences scale encompasses items that are intended to measure the influence of organizational factors on the likelihood of information and communication technology adoption in Continuing Medical Education delivery. Each item (N = 7) is responded to via a five-point scale; the most negative option is coded as having a value ‘1’, and the most positive option is coded as having a value ‘5’. The professional influences scale consists of items (N = 6) that are intended to measure the influence of professional factors. These include items such as: ‘My peers and colleagues believe that the Internet is an important tool’; ‘In the professional field in which I work, many people are Internet users’; ‘In the professional field in which I work, most people think that technology-based Continuing Medical Education is
important’; ‘Soon everyone will be using the Internet’; ‘Distance learning is likely to contribute to the solution of learning-related problems relevant to the professional field in which I work’; and ‘It is my personal opinion that technology-based distance education will improve teaching and learning’. Response possibilities range from ‘Strongly Disagree’ = 1; ‘Disagree’ = 2; ‘I can’t say’ = 3; ‘Agree’ = 4; to ‘Strongly Agree’ = 5.

The range of sum scores (minimum to maximum) that respondents could receive for each scale was as follows: organizational influences, range of 7-35; professional influences, range of 6-30; and strengths and resources, range of 17-85. According to Collis et al. (2000), each factor’s sum (i.e., vector sum) can be either positive or negative. When the positive vector is large enough to approach a threshold level described as a ‘likelihood-of-use’ line, an individual is likely to use a telematics application in his/her teaching and learning (Collis et al., 2000). Therefore, using the 4-E Model as a template, an analysis of the sums of respondents’ scores for the scales of organizational influences, professional influences, and strengths and resources was hypothesized as being indicative of the point at which information and communication technology adoption and usage is likely to occur.

Data was coded and analyzed using the Statistical Package for the Social Science (SPSS 16.0 for Windows). Methods of analysis included cross-tabulation analysis to determine and compare the responses of organizational category respondents to individual survey items, and Mann-Whitney and Kruskal-Wallis tests to analyze the differences in and the relationships between organizational,
professional, and strengths and resources factors and the actual reported usage, by the
organizational respondents, of information and communication technologies.

This study provides a large amount of survey data and information; large
portions of these are presented in table format. To facilitate the reading of the report,
discussion of the findings is found in the text accompanying the tables. A discussion
of the major findings and the conclusions follow the presentation of results. The
results of this survey provide a national overview of the use of ICTs for CME
delivery. The results also provide a national summary of the CME programs being
offered by CME providers to develop the ICT-related knowledge, skills, experience,
beliefs, motivation, perception on the barriers and attitudes of health professionals, as
well as important information for future policy and decision-making related to the
effective use of ICTs in CME delivery. The findings also contribute to a better
understanding of the type and nature of CME programs being offered to enhance ICT-
related skills among the health professions.

3.10 STATISTICAL TECHNIQUES USED FOR ANALYSIS

The descriptive statistics and inferential statistics are used for analysis and
interpretation of data collected from medical faculty. The t-test was used to study
the effect of ICT in CME. The non-parametric tests like Kruskal-Wallis Test;
Man Whitney U test and ANOVA are used for testing the formulated hypotheses.