Online Information Technologies Certificate Program

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ABSTRACT

In this study, Information Technologies Certificate Program which is based on synchronous and asynchronous communication methods over the Internet offered by cooperation of Middle East Technical University, Computer Engineering Department and Continuing Education Center were examined. This online certificate program started in May 1998 and it is still active. The program includes eight fundamental courses of Computer Engineering Department and comprised of four semesters lasting totally nine months. The main aim of this program is to train the participants in IT field to meet demand in the field of computer technologies in Turkey. As a conclusion, the properties of this program were discussed in a detailed way.

Key words: **Information Technology, Internet-based Education, Online Certificate Program, E-learning, Online, Online education**

INTRODUCTION

Technology has penetrated into our lives during the last half-century. Across the developing world with technology, profound changes have occurred in various areas such as communication, nature of work, structure of organizations and daily life. In other words, technology is changing how we work, how we learn, how we spend our free time and how we interact with one other. As a result, people need to learn to cope with changes in different aspects of their lives and success depends on keeping up with it through advanced training and lifelong learning. Hanna (1998, Introduction sec, para. 3) claims: "throughout the industrial era, the system has focused upon serving the educational needs of youth to prepare for a lifetime of work. Today it is clear that the future will involve a lifetime of learning in order to work."

THE SHORTAGE oF SKILLED PERSON iN INFORMATION TECHNOLOGY

With the rising technology improvement, Information and Communication Technologies (ICT) are transforming our society. New mediums of human communication are emerging, which are radios and televisions, computers, and mobile phones. The old barriers of distance and time are being broken down. That brings savings in terms of cost and time, opens the doors for globalization, competitive advantage, and provides growth, and new

services. These developments have improved people's vocational and employment prospects and opportunities.

In addition to these, the fast pace of technological change demands a skilled workforce to compete in the global marketplace. However, there are not enough skilled personnel especially in information technology field. For example, in 1999, International Data Corporation (IDC) found that the shortage of IT workers worldwide stood at over one million. Their study predicted that the United States alone would experience intense recruiting problems for about 850,000 IT jobs by 2002. In the same year, the shortage of skilled IT professionals would exceed one million in Europe alone. By 2002, the openings for IT worker positions could exceed one-fourth of 1998's total IT workforce. West Europe estimates a staggering shortfall of 1.7 million IT workers by 2003, of which 400,000 unfilled positions will be in Germany (Chandrasekhar, 2000).

Looking at Turkey's condition, the survey done by Turkish Informatics Foundation stated that 70 thousand of qualified IT workforces are required for the formation of information society (Vural, 1999). In addition, Cisco and International Data Corporation in Turkey forecast in their reports that the number of network specialists' gap will be 12 thousand people in 2002 and 20 thousand people in 2003 (IDC Reports, 2001).

Many developed and developing countries are trying to accelerate the supply of IT workforce to eliminate the current critical shortage and to meet the expected huge demand growth in future. Moreover, we are facing another problem because of rapidly changing profile of human resource in IT field. According to Smerdon (1996), a decade ago a group of experts estimated the half-life of an engineer's technical skills. They defined a half-life, as the length of time it would take for half of everything an engineer knew about his or her field to become obsolete. It takes 7.5 years for mechanical engineers, 5 years for electrical engineers and 2.5 years for software engineers. At such a rapid progress the world is now experiencing, these figures are surely smaller than reality. It is clear that job and career changes come more frequently for today's adults than ever before.

ONE SOLUTION: DISTANCE EDUCATION

In the 21st century, human capital needs include the requirement for employees to develop their skills, adapt to rapid change in the workplace, and bring innovation into solving problems. Organizations, private sectors and universities are trying to supply the demand for qualified employees in many countries. Technical training, graduate programs and certificate programs are provided in many ways for the students and employees.

One of the effective ways to educate people, especially adults, is through distance education. McIsaac and Gunawardena (1996, Introduction sec, para. 1) mentioned distance education as "Distance education, structured learning in which the student and instructor are separated by time and place, is currently the fastest growing form of domestic and international

education". Actually, distance education has been used as an instructional mode in numerous countries around the world for many years (e.g., Australia, China, India, Norway, United States, and West Africa). A variety of subject is taught, such as, engineering, business, health, natural sciences, education, arts etc. Internationally, there are numerous distance-teaching institutions. Some of the most well-known include Athabasca University (Canada), Everyman's University (Israel), Open Universities (Netherlands), Open University (United Kingdom), University of the Air (Japan), Universidad Nacional de Educacion a Distancia (Spain) and Pennsylvania State, University Dept. of Distance Education (USA). In addition, in the last years, especially with internet technologies, it is suitable for especially working adults who work full-time and seek for continuous education as part-time students and allow them to achieve their goal. According to the Department of Education in U.S.A, distance education programs increased by 72 percent between 1995 and 1998. In 1998, institutions offered a total of 54,000 online education courses, which 1.6 million students enrolled in. In 1995, there were only 53,000 students and 26,000 courses offered. Many sources predict the involvement of over 2,000,000 learners by 2002 (Tulloch, 2000).

Furthermore, according to Knowles's andragogy theory, "adult learners take control of their education, and want the opportunity to learn at their own pace, at times and places compatible with the commitments of family, work and leisure. Also, they demand relevant and applicable coursework and a learning environment that is supportive and collaborative." (Knowles, 1984, p. 125). Distance learning encompasses all technologies and supports the pursuit of life-long learning for all. The structure of distance learning gives adults the greatest possible control over the time, place and pace of education.

In addition, instructional delivery methods are changing and improving effectiveness of distance education. Delivery methods can be roughly divided into synchronous or asynchronous types. Synchronous instruction requires the simultaneous participation of all students and instructors. The advantage of synchronous instruction is that interaction is done in real time. Forms of synchronous delivery include two-way video conferences, telephone conversations and chat sessions. On the other hand, asynchronous instruction does not require the simultaneous participation of all students and instructors. Students do not need to be gathered together in the same location at the same time. In addition, students may arrange their own study time and take or study learning materials according to their schedules. Asynchronous instruction is more flexible than synchronous instruction. Forms of asynchronous delivery include correspondence courses, audiocassette courses, videotaped courses, email, listservs and WWW-based courses.

With the beginning of personal computer technology in the 1980s and developments in communications technology in the 1990s with the Internet, the potential for improving the quality and effectiveness of distance learning has grown. The Internet is becoming a part of society and the most effective method of distributing many types of information.

With the Internet, the World Wide Web is a new medium that has expanded rapidly over the past years. It is easily accessible, it supports flexible storage and display options, it provides a simple yet powerful publishing format and a means to incorporate multiple media elements. Therefore, the Internet has become a popular medium of communication and information dissemination. Furthermore, it has been taken as an effective instructional tool of learning by the distance education institutions and with the Internet, distance education is becoming more prominent on the university campus, more and more instructors and students are becoming involved in both the technical and educational aspects of distance education.

ONLINE INFORMATION TECHNOLOGIES CERTIFICATE PROGRAM (ITCP)

The online Information Technologies Certificate Program (ITCP) is one of the first Internet Based Education Project of Middle East Technical University, which started in May 1998. It is based on synchronous and asynchronous education over the Internet offered by Computer Engineering Department with Turkish course materials prepared by the instructors who give the courses from the same department. The main aim of the online ITCP is to train participants in the IT field to meet the demand in the field of computer technologies in Turkey. Furthermore, the online ITCP provides opportunities for the people who cannot access education in information technologies or computer engineering, but who are interested in this area, who would like to improve themselves in this area and desire to make progress in their existing career.

The Internet Based Education Project is a project of a series of Internet-based programs. One of these programs is the online Information Technologies Certificate Program, which is still active now. In the beginning, it was started with the organization of IBM which sponsored the program, Middle East Technical University Continuing Education Center, and Department of Computer Engineering. However, during the following years, it was conducted under the management of the Continuing Education Center, as the academic responsibility of the Department of Computer Engineering, and technical support of METU Computer Center.

Online Information Technologies Certificate Program includes eight fundamental courses of Computer Engineering Department and comprises of four semesters lasting nine months totally now. The courses in the program are given by the instructors from Computer Engineering Department. The names of the courses and the semesters they are given are as follows:

First Semester (lasting two months)

- **Computer Systems and Structures**
- **Introduction to Computer Programming with C**

Second Semester (lasting two months)

- **Data Structure and Algorithms with C**
- **Operating Systems with Unix**

Third Semester (lasting two months)

- **Software Engineering**
- **Database Management Systems**

Fourth Semester (lasting two months)

- **Computer Networks**
- **Software Development Project**

In addition, there have been changes in online ITCPs since the first program. This program started with fifteen months for the first group, decreased to twelve months for the second group and nine months for the third, fourth and fifth groups. It is composed of eight courses and a Software Development Project given in the first and second groups. At the beginning, the titles of the courses and the terms they were given are as follows: Computers Systems and Structures, Computer Programming with Java I, Computer Programming with Java II, Operating Systems with UNIX, Data Structures and Algorithms with C++, Software Engineering, Database Management Systems, Computer Networks, and Software Development Project.

After the third program, number of courses given in online ITCPs decreased to eight courses and some of the courses were replaced by different courses. For example, Computer Programming with Java I course was replaced by Introduction to Computer Programming with C course and Data Structures and Algorithms with C++ course was replaced by Data Structures and Algorithms with C course in the fourth and fifth programs. Furthermore, Computer Programming with Java I and II courses were combined and given as an elective course in the fourth and fifth programs.

Boettcher (1996) stated that the major characteristic of Internet-based distance learning is its ability to provide asynchronous learning activities to students at their convenience. Students can choose the time of day that they would like to participate in the course. Hofmann (2002) states that work schedules and finding time for the family are no longer a problem because students can access their courses at times most convenient for them, be it morning, evening, weekday, or weekend. This program enables participants to take the lectures whenever they want, wherever they want; with the chance of arranging their study time, reviewing as much as they like and discussing the necessary points with help of Internet technologies.

In addition, a study by Moiduser, Nachmias, Nahar and Oren (2000), for example, reviewed 436 educational Web sites and found that most were "still predominantly text-based and do not yet exhibit evidence of innovative pedagogical approaches (e.g., use of inquiry-based activities, and application of constructivist learning principles)" (p. 55). Before discussing the advantage of the use of the web over other platforms, main properties of web technologies and pedagogical approaches are used as an integrated way in developing web-based environments.

This program does not only aim to supply lecture notes on the Internet like their primitive examples but also provides participants a pleasant way of learning with activities other than reading from computer with related visual and auditory elements and interactive communication channels. Since, social construction theory by Vygotsky stated that learning is a social process and it is not only active but also interactive. It happens within a social atmosphere. People learn when interacting and relating to each other. In addition to the interactive course material in this program, each course has an e-mail address, discussion list and chat sessions to provide interaction between instructors and participants, and participants and participants.

Furthermore, each course, except Software Development Project course, has one text book that provides more detailed information. Reading assignments are given from these text books. Also, for each lesson, at least four homework tasks were assigned to the participants during the semesters. In addition to this, it is known that one of the main concerns in Internet-based education is evaluation.

For example, students are given tests remotely; there is no way to determine if the tests are being taken by students registered for the course without assistance from either other students or resource materials such as text books. For this program, at the end of each semester there are face-to-face lectures for each course and traditional final examinations of the courses within the campus of Middle East Technical University.

The participants' final grades were based on mainly final examinations, homework, and attendance in the chat sessions and participation in the discussion lists. In brief, the courses, evaluations and interactions in this program are prepared and given as a blended way. Masie (2002) stated that in the early days of e-learning, learner is given a single method of mastering the material. For instance, key topics are provided to the learners with online reading. This is only one method. Single method learning may be cheaper and easy to deliver. However, this one method is not work properly when the learner is not engaged and motivated to participate.

On the other hand, blended learning brings many opportunities for the learner to master their performance. Also, participants who attended face to face sessions stated that they learn many things in a short time and cover their lack of information about courses (Yükseltürk and Zahide, 2003). In addition, in the last semester, the groups of the participants or individuals in the Software Development Project course have prepared software projects which are mainly used in real life with guidance of the instructors. They are presented to all participants at the end of the programs.

This official certificate is approved by the president of the METU, the chairman of the Computer Engineering Department and the president of the Continuing Education Center.

Participants Properties

Learners throughout the world are demanding educational opportunities in an anytime and anywhere format, and institutions are responding by devoting resources to develop online distance learning. Therefore, online learning has rapidly become a popular method of education for traditional and non-traditional students. However, the students who participate in distance education tend to be different from conventional students.

The distance education literature confirms this view of distance education students as adult learners. Moore (1985 cited in Wallace 1996) comments: "Most distance education is concerned with the education of adults and it seems fairly obvious that our research plans should be informed by the theories and research about learning in adulthood, adult development, program planning, instruction and evaluation in adult education" (p.36).

Also, demographic data available from several large national studies of adults studying for college credit showed that the majority of students are female, married, employed full time, and older than typical college-age students. The implications of these demographic characteristics were that many of these students have other responsibilities outside of school (e.g., family, job) that place demands or constraints on their time and their level of commitment to school (Hugh & Forest, 1997).

In these online ITCPs, 620 participants registered from the first program to the seventh program. Any participants who graduated at least from high school could apply to this program, but after the third program, participants who are students or who graduated from 2 or 4 year university programs have been accepted into the programs. Other expected characteristics of participants to be enrolled in the program are as follows;

- **being computer literate**
- **accessing a computer which has an Internet connection and multimedia properties**
- **intermediate level of English (being able to understand what he/she reads)**
- **attending face to face courses and examinations, which will be held at METU campus for two days in each eight-week semester**
- **sparing at least 6 hours of study for each course in a week**

Participants had to fill out the application form that consists of their demographic information before they started the program and signed the contract of the program for the acceptance of the rules and requirements of program mentioned above.

Table 1 presents the demographic characteristics of the participants who registered o the online ITCPs except first and second program. The number of male participants was greater than the number of female participants, and the majority of the participants' age range was 20-29 in all programs. In addition, majority of the participants attended the online ITCPs from Ankara and Istanbul.

Table 1:
The demographic characteristics of the participants.

	3rd program		4th program		5th program		6th program		7th program	
	N	%	N	%	N	%	N	%	N	%
Gender										
Female	19	22,8	34	32,1	25	28,4	14	18,2	19	27,1
Male	68	78,2	72	67,9	63	71,6	63	81,8	51	72,9
Age										
19 and below	2	2,3	1	0,9	0	0,0	4	5,2	2	2,9
20-24	38	43,7	35	33,0	24	27,2	24	31,2	25	35,7
25-29	27	31,0	40	37,7	43	48,8	20	26,0	23	32,9
30-34	11	12,6	21	19,8	13	14,8	15	19,5	15	32,9
35-39	7	8,0	6	5,7	4	4,5	6	7,8	2	2,9
40 and above	2	2,3	3	2,8	4	4,5	8	10,4	3	4,3
Cities the participants from										
Ankara	41	42,3	65	62,5	56	63,6	42	54,5	48	68,6
İstanbul	32	33,0	21	20,2	17	19,3	16	20,8	10	14,3
İzmir	6	6,2	5	4,8	2	2,3	2	2,6	2	2,9
Others	18	18,6	15	14,4	13	14,8	17	22,1	10	14,3

In the online ITCPs, there were participants who were university graduates, undergraduate students, graduate students, military school students and high school graduates presented in Table 2. Participants who graduated from high school were accepted to register only in the 3rd program and participants who graduated from military school applied to register only for the 4th program. Majority of the participants were university graduates and undergraduate students.

Table 2:
Education levels of participants

Education Levels	3rd program		4th program		5th program		6th program		7th program	
	N	%	N	%	N	%	N	%	N	%
University graduates	45	46,4	63	59,4	45	51,1	43	55,8	36	51,4
Undergraduate students	35	36,1	34	32,1	22	25,0	23	29,9	28	40,0
Graduate students	8	8,2	6	5,7	21	23,9	11	14,3	6	8,6
Other schools (e.g. military schools)	9	9,3	3	2,8	0	0	0	0	0	0

As shown in Table 3, majority of the participants were graduated or currently studying at Faculties of Engineering (Electrical and Electronics, Mechanical, Civil, etc.), Economics and Administrative Sciences (Business Administration, Economics, etc.), and Sciences (Mathematics, Physics, etc.).

Table 3:
The faculties which the participants graduated from or currently student at

Faculties	3rd program		4th program		5th program		6th program		7th program	
	N	%	N	%	N	%	N	%	N	%
Faculties of Engineering	32	33,0	42	39,6	43	48,9	39	50,6	30	42,9
Faculties of Economic and Administrative Sciences	17	17,5	27	25,5	16	18,2	19	24,7	13	18,6
Faculties of Science	13	13,4	16	15,1	14	15,9	8	10,4	13	18,6
Technical Vocational School of Higher Education	8	8,2	4	3,8	0	0,0	2	2,6	2	2,9
Faculties of Literature	7	7,2	2	1,9	3	3,4	2	2,6	2	2,9
Faculties of Education	4	4,1	3	2,8	6	6,8	1	1,3	2	2,9
Other Faculties	16	16,5	12	11,3	6	6,8	6	7,8	8	11,4

From Table 4, it is seen that about 50 % of participants work at different companies or institutions and they have different jobs. This statistic is parallel with participants' expectations. "To be more productive in my present job" and "To make progress in my existing career" were rated as the highest expectation about online ITCPs participants (Yükseltürk and Yıldırım, 2004).

Table 4:
Participants who have job or not

Occupation	3rd program		4th program		5th program		6th program		7th program	
	N	%	N	%	N	%	N	%	N	%
Have a job	52	59,8	56	52,8	46	52,3	45	58,4	37	52,9
Have no job	35	40,2	50	47,2	42	47,7	32	41,6	33	47,1

CONCLUSION

In summary, this online certificate program is one of the first Internet Based Education Project of Middle East Technical University, which started in May 1998. Seven different groups have completed education in this program so far and it is still active with eighth program. 70-100 participants registered to this certificate program in each year and they have different properties from traditional face to face students, like distance education students in the literature. In addition, a study about

this program by Yükseltürk and Yıldırım (2003) revealed that the participants' perceptions about the effectiveness of the courses in online ITCPs were positive in general. For example, participants stated that the proper courses were selected, the contents of courses were well prepared, and the way of giving courses were satisfying. In addition to these, participants made important suggestions to improve the program. Furthermore, the certificate of this program has been used as a reference by participants who are graduated from this program in academic and job applications and also some participants who have a job use it to change work status in their companies.

Khan (2004) states that a typical e-learning process has planning, design, development, evaluation, delivery, and maintenance stages. The e-learning process is iterative in nature. In this program, the components of the program have been updated and redesigned from the beginning years, such as, adding new course or extracting course from program etc. Also, web pages and the course contents are updated with interactive material. These iterative processes are still going on with help of participants' feedbacks.

Furthermore, we need more research about these types programs. Since one of the main concerns of Internet-based education is high drop out rates. Lowe (1997) stated that students drop out rates in web-based education courses far exceed those students who enrolled in traditional on-campus courses. A study by Yükseltürk and Inan (2004) found that about 35 % of this program participant didn't complete program in the last three year and it is also high for this online certificate program. The findings showed that student have big problem in arrangement of the time for the program. The personal problem takes second place. Generally student reported high for dropout reasons which were basis by them. The items – arrangement of time, personal problem, expenses, and motivation – had higher mean scores than problems regarding the program.

In conclusion, this program is an example of online certificate program given by university. It is difficult to say that all universites should prepare this kind of certificate programs. However, studenst, especially adults, can be educated by this kind of program to meet the demand in some field that we need qualified person.

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