Chapter I
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1.1 INTRODUCTION

Education and training are a prerequisite for a fully functioning "knowledge triangle" (education – research – innovation). Improving the use and impact of knowledge for developing policy and practice at the national levels would improve the quality and governance of education systems. This in turn would contribute to realizing the main aim of the Education and Training. There is still a need for further development of educational research strategies and capacities, to address and make best use of the inherent complexity of research – based knowledge, on the basis of which it would be possible to justify increased investment in relevant and high-quality research. Relevant evidence can take many forms, such as experience and evaluation of practice, the results of independent or commissioned scientific analyses, quantitative and qualitative research, basic and applied research, and the development of statistics and indicators. Evidence is only one of the factors contributing to decision-making and will, in any case, always be mediated through complex social and political processes. In particular, education and training are parts of the diverse cultural traditions and identities of countries and regions and they interact with a web of other policies.

The relationship between research, policy and practice in education and training was conceptualized in terms of three main dimensions:

- Knowledge creation – the production of research-based knowledge relating to education and training.
- Knowledge application – the utilization of research and evidence by educational decision makers, practitioners and other end-users.
- Knowledge mediation – the brokerage of such knowledge in terms of making it accessible and facilitating its spread.

It is important to stress that these three sets of knowledge processes were not viewed as separate or distinct in any actual sense. In other words, while the three-fold breakdown was helpful analytically in structuring the
preparation of the working paper, the complex nature of the knowledge cycle as a whole system was central to all aspects of this work. This was in recognition of the increasingly blurred boundaries between the communities of educational researchers, policy-makers and practitioners, the increasingly important role of knowledge brokers and mediators within the knowledge system, and the critical significance of wider social influences such as public opinion, the media, and political imperatives and so on. The aim of research/evidence based or research/evidence informed practice is promoting economic competitiveness and social cohesion by improving educational resources, structures, and practices. For promoting these two objectives, we need an educational infrastructure that provides all learners with opportunities to obtain an education at the highest level commensurate with their own growth and growth potential (Niemi & Vendlinski, 2006). This means that decision-making in education should strategically aim at improvements in education and training, and for this purpose we need research and evidence. A set of activities which involves the systematic collection and analysis of data with a view to producing valid knowledge about teaching, learning and the institutional frameworks within which they occur (Hillage, Pearson, Anderson & Tamkin, 1998, p. 7).

All types of research are classified as qualitative and quantitative research:

- **Qualitative research** allows flexibility in all aspects of the research process. It is more appropriate to explore the nature of a problem, issue or phenomenon without quantifying it. Main objective is to describe the variation in a phenomenon, situation or attitude e. g., description of an observed situation, the historical enumeration of events, an account of different opinions different people have about an issue, description of working condition in a particular industry (Dawson, 2002).

- **Quantitative research**. Here everything that forms the research process - objectives, design, sample, and the questions that you plan to ask of respondents - is predetermined. It is more appropriate to determine the extent of a problem, issue or phenomenon by quantifying the variation as
Descriptive Survey Research, Experimental Research, Single-Subject Research, Causal-Comparative Research, Correlation Research, and Meta-analysis.

1.2 META-ANALYSIS

Meta-analysis is a method for systematic literature reviews on a certain substantive question of interest. It refers to quantitative synthesis, a general set of procedures for combining the results of many individual research studies addressing a single question (Glass, 1976, 1978). The technique has grown out of a need in the social sciences to capture the essence of ever-expanding research literatures and to provide definitive answers, in terms of the magnitude of effectiveness, to the bigger questions posed by theoreticians and practitioners. In addition, meta-analysis attempts to circumvent the subjectivism commonly associated with narrative forms of literature review and the limitations ascribed to the box score or vote count technique (Kavale, 1984).

It has long been recognized that the result of a single research study by itself is far from conclusive, even when the finding supports the hypotheses under consideration. Therefore, it has been common practice for researchers to review the literature of all such studies, whenever enough are available. It is not uncommon, in fact, to see the same question asked and answered in reviews every couple of years, as new studies add to the weight of evidence that can be brought to bear on a particular question. Since few studies of educational phenomena and even fewer studies of instructional methods actually draw subjects at random from a population, integrative reviews of many similar studies serve to provide greater coverage of the population. Integrative reviews provide a means of overcoming the effects of chance fluctuation within samples, leading to a more generalizable conclusion concerning an effect.

Conscientious practitioners are always searching for support for the design of quality instructional programs. This might come from previous successes, from the analysis of cost/benefits, or from the literature of research studies. Meta-analysis seems a reasonable tool for achieving the
latter goal. It remains the single most powerful tool for summarizing studies in an era of rapidly expanding scientific literature. For the researcher, meta-analysis represents a means for focusing thought on the large questions and a heuristic for designing future studies taking into account the smaller questions, for the practitioner in the media and technology field, meta-analysis are a means for making broad decisions about the implementation of new programs and the design of instructional products.

Conventional reviews of research on the efficacy of psychological, educational, and behavioral treatments often find considerable variation in outcome among studies and, as a consequence, fail to reach firm conclusions about the overall effectiveness of the interventions in question. In contrast, meta-analysis reviews show a strong, dramatic pattern of positive overall effects that cannot readily be explained as artifacts of meta-analytic technique or generalized placebo effects. Moreover, the effects are not so small that they can be dismissed as lacking practical or clinical significance. Although meta-analysis has limitations, there are good reasons to believe that its results are more credible than those of conventional reviews and to conclude that well-developed psychological, educational, and behavioral treatment is generally efficacious (Lipsey et al., 2001).

Meta-analysis may be broadly defined as the quantitative review and synthesis of the results of related but independent studies. The objectives of a meta-analysis can be several-fold. By combining information over different studies, an integrated analysis will have more statistical power to detect a treatment effect than an analysis based on only one study. Meta-analysis involves combining summary information from related but independent studies. The objectives of a meta-analysis include increasing power to detect an overall treatment effect, estimation of the degree of benefit associated with a particular study treatment, assessment of the amount of variability between studies, or identification of study characteristics associated with particularly effective treatments. Meta-Analysis is both applied and basic research. Meta analysis is also widely used in basic research to evaluate the evidence in areas as diverse as sociology, social psychology, sex differences, finance and economics, political science, marketing, ecology and genetics, among others.
An often-recommended technique is the use of effect sizes to describe the practical significance of a statistical test result. When the treatment effect (or effect size) is consistent from one study to the next, meta-analysis can be used to identify this common effect. When the effect varies from one study to the next, meta-analysis may be used to identify the reason for the variation (Vaske, Gliner & Morgan, 2002).

1.2.1 Categories of Meta-analysis Approaches

Meta-analysis methods fall into three categories:

1. The purely descriptive methods: These are the Glass methods and study effects Meta-analysis methods which paint a descriptive picture of what is in the research literature but do not attempt to analyze, correct for, or otherwise address any of the artifacts that distort study findings. Gene Glass and Mary Lee Smith were to develop and conduct the first meta-analytical study. Glass and Smith's findings revealed that "the combined effect of psychotherapy in their 375 studies, comprising about 40,000 treated and untreated subjects, had an effect size of .68—over two-thirds of a standard deviation" (p. 34). This finding meant that "while the median treated client (at the middle of the curve) was as mentally ill before therapy as the median control individual ... after therapy, the treated client was healthier than three-quarters of the untreated group. In the social sciences, so large an effect of any intervention ... is almost unheard of “(p. 34). Prior to this meta-analysis, there was a 25-year argument between the supporters and critics of psychotherapy as to whether it worked or not. Although some diehard critics remained, the Smith and Glass study as well as subsequent studies have resolved this question to the satisfaction of most experts. It was in connection with the integration of the psychotherapy outcome literature that Glass devised many of the techniques that remain a part of the meta-analysis armamentarium. Indeed, the term "meta-analysis" was first used in 1976 in Glass's presidential address to the American Educational Research Association (Glass, 1976).

2. The Tests of homogeneity: Rosenthal and Rubin had used the result of Glass’s approach 15 years ago (Glass, 1976). These are meta-analysis methods that address only the artifact of sampling error. These include the
homogeneity test - based methods of Hedges and Olkin (1985) and Rosenthal, Rubin and Rosnow (1982). Homogeneity tests are very likely to indicate heterogeneity among effect sizes even when the variation is of no practical or theoretical importance.

The logic of this approach is converting the results of studies to the metrics of standard deviation. These metrics are z scores related to the probability of significance levels and converting r to z fisher for effect sizes. Then these indicators combine to get weighted averages and their variances (Rosenthal, 1971; Rosenthal and Rubin, 1978, 1988 cited in Farahani & Oreizy, 2005).

3. **Psychometric Meta-analysis:** These are Meta-analysis methods that address and correct for the effects of not only sampling error but also a variety of other artifacts that distort study results. Hunter & Schmidt (1990) method - Callender & Osburn (1980) method, Raju & Drasgow (2003) methods – These have made important contribution in psychometric methods. This approach is different from others approaches scientifically and philosophy. This approach tries to correct bias in r and g indicators.

Hunt (1997 cited in Wilson n.d.) believes that as the twenty-first century unfolds, and scientific research in nearly every field is growing almost explosively, new findings daily “overthrow” old ones, and a “relentless cross fire”. Findings are often confusing and conflicting about central issues of theory and practice, not only in psychology more narrowly defined, but in the related domains of education, medicine, and other bio-psychological and socio-psychological disciplines These, and many other topics, have been addressed by myriad studies that have varying outcomes - some show effects in one direction and some in the opposite, and some show effects that are close to zero. A resolution of conflicting evidence regarding these outcomes is often necessary for further advance of a field and for any practical application. The quantitative procedures of meta-analysis help to address some of the challenges introduced by the existence of multiple answers to a given research question. Meta-analysis allows the combining of numerical results from a few or many studies, the accurate estimate of descriptive statistics
(Hedges, 1987; Rosenthal, 1978) and the explanation of inconsistencies as well as the discovery of moderators and mediators in bodies of research findings. Meta-analysis allows researchers to arrive at conclusions that are more accurate and more credible than can be presented in any one primary study or in a non quantitative, narrative review qualitative or narrative methods approach controversy by listing and describing conflicting findings, and sometimes by trying to group or otherwise configure those that have various types of results or outcomes.

Unfortunately, this technique requires substantial information from individual studies for accurate correction of effect sizes. This information is not always available in research reports (Cited by Bangert-Drowns, Rudner & Lawrence, 1991).

As Hall and Rosenthal (1995) have noted, there is no single correct way to perform a Meta-analysis. There are certain goals that should be addressed; however, some methods better serve these goals than others. They offer three interrelated basic principles to guide Meta-analysis: **accuracy, simplicity, and clarity.** The simpler a Meta-analysis, the more likely it is to be accurate; it is not possible to present one that is too simple. The best quality scientific exploration is often one that poses unadorned, straightforward questions and uses simple statistical techniques for analysis. Alternatively, it is possible to do a Meta-analysis, or any statistical analysis for that matter, that suffers from “high-tech statistication”. Such analyses lend an impressive air of sophistication but may be massively inappropriate. Staying simple and staying close to the data helps to avoid serious misconceptions about it (Hall & Rosenthal, 1995).

According to Rosenthal (1991), the Hunter and Schmidt work is valuable for reminding us that there are many source of noise that may serve to lower obtained effect sizes. Their work is also valuable for providing us with procedures for adjusting for these sources of noise. The application of these procedures gives us some estimate of what effect size we might expect to find in the best of all possible worlds. According to him, the goal of Meta-analysis is to teach us better what is, not what might someday be in the best of all
possible worlds when all our independent and dependent variables are perfectly measured, perfectly valid, perfectly continuous, and perfectly unrestricted in range.

Smith, Ferguson and Caris (2001) and Glass, McGaw and Smith (1981) have treated multiple results as though they were independent, a practice for which they have been unjustifiably criticized. They have confused the effect of non independence on significance testing with its effect on effect size estimation. Treating on independent results as independent one does tend to create errors in significance testing, but Smith et al. and Glass et al. did not do significance testing. Treating non independent results as independent for proposes of effect size estimation simply weights each study in proportion to the number of different effect sizes it generates although not all Meta – analysts may wish to employ such weighting, there is certainly nothing wrong with doing so” (Rosenthal, 1991, p. 25).

Rosenthal’s own recommendation is to have each study contribute only a single Effect size estimate and a single significance level to the overall analysis. That recommendation does not preclude computing additional overall effect size estimates in which each study is weighted by the number of research results yields, by its sample size, by its quality, or by any other reasonable weighting factor (Rosenthal, 1991).

Rosenthal’s purpose, very briefly, is to describe meta- analytic procedures in sufficient detail so that they can be carried out by readers and researchers so that they can be wisely evaluated when they have been carried out by others. It was designed to be used by advanced undergraduate students, graduate students, and researchers in social and behavioral sciences.

It is needed a record of the important characteristics of each study as variables, it can examine whether the strength of the effect is influenced by these characteristics. This is called a moderator analysis.
1.3 HISTORICAL OVERVIEW OF META-ANALYSIS

Early usage of Meta-analysis dates back to the twelfth century in the ancient China, a famous philosopher, Chu Hsi (朱熹, 1130~1200), built up his philosophical theory by summarizing a series of related literatures. He called this research methodology 'Theory of Systematic Rule' (http://ir.lib.ntnu.edu.tw). While in the Western World, the historical roots of meta-analysis may be traced back to 17th century studies of astronomy, a paper published in 1904 by the statistician Karl Pearson in the British Medical Journal which collated data from several studies of typhoid inoculation is seen as the first time a meta-analytic approach was used to aggregate the outcomes of multiple clinical studies. The first meta-analysis of all conceptually identical experiments concerning a particular research issue, and conducted by independent researchers, has been identified as the 1940 book-length publication *Extra-sensory perception after sixty years*, authored by Duke University psychologists J. G. Pratt, J. B. Rhine, and associates. This encompassed a review of 145 reports on ESP experiments published from 1882 to 1939, and included an estimate of the influence of unpublished papers on the overall effect (the file-drawer problem).

The first meta-analysis was performed by Karl Pearson in 1904, in an attempt to overcome the problem of reduced statistical power in studies with small sample sizes; analyzing the results from a group of studies can allow more accurate data analysis. However, the first meta-analysis of all conceptually identical experiments concerning a particular research issue, and conducted by independent researchers.

Gene V. Glass is an American statistician and researcher working in educational psychology and the social sciences. He was the first modern statistician to formalize the use of meta-analysis, and is widely recognized as the modern founder of the method. The online Oxford English Dictionary lists the first usage of the term in the statistical sense as 1976 by Glass. He coined the term "meta-analysis". The most extensive illustration of the technique was to the literature on psychotherapy outcome studies, published in 1980. The statistical theory surrounding meta-analysis was greatly advanced by the work.

Although meta-analysis is widely used in epidemiology and evidence-based medicine, today, a meta-analysis of a medical treatment was not published until 1955. In the 1970s, more sophisticated analytical techniques were introduced in educational research, starting with the work of Gene V. Glass, Frank L. Schmidt and John E. Hunter.

1.4 EDUCATIONAL TECHNOLOGY

“Educational Technology (also called learning technology) is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources” (Richery, 2008). The term Educational Technology is often associated with, and encompasses, instructional theory and learning theory. While Instructional Technology covers the processes and systems of learning and instruction, Educational Technology includes other systems used in the process of developing human capability. Educational Technology includes, but is not limited to, software, hardware, as well as Internet applications and activities. But there is still debate on what these terms mean (Lowenthal & Wilson, 2010).

Educational Technology is most simply and comfortably defined as an array of tools that might prove helpful in advancing student learning. Educational Technology relies on a broad definition of the word "Technology". Technology can refer to material objects of use to humanity such as machines or hardware, but it can also encompass broader themes including systems, methods of organization, and techniques. Some modern tools include but are not limited to overhead projectors, laptop computers, and calculators. Newer tools such as "smart phones" and games (both online and offline) are beginning to draw serious attention for their learning potential. Technology can change or alter how people access, gather, analyze, present, transmit, and simulate information (See, 1994). The impact of technology is one of the most critical issues in education (Webber, 2003).
The use of Information and Communication Technology (ICT) creates a powerful learning environment and it transforms the learning and teaching process in which students deal with knowledge in an active, self-directed and constructive way (Volman & Van Eck, 2001). Technology allows us to better serve the diverse learning styles of our students and educate them for a wider range of intelligence. Everybody has different learning styles for meaningful learning but teachers cannot represent all the styles in a traditional classroom environment. If we see traditional teaching, it is characterized and dominated by a teacher who shares knowledge with his/her students. The neo-modern trend was characterized by knowledge plus ever-pouring information. For a single teacher it is difficult to internalize and have expertise in every facet of the available knowledge, but if the teacher can make use of techno-pedagogic skills perhaps he/she can better justify his/her role as a facilitator for the fund of knowledge available. Techno-pedagogical skills are defined as the skills to handle the appropriate technology for making the teaching-learning process effective and efficient. It is the use of audio-visual, multimedia technological devices in the classroom without disturbing the classroom management. Teachers can provide individual as well as collaborative/interactive learning contexts through technology.

Educational Technology is intended to improve education in different ways:

1. **Easy-to-access course materials.** Instructors can post the course material or important information on a course website, which means students, can study at a time and location they prefer and can obtain the study material very quickly.

2. **Student motivation.** Computer-based instruction can give instant feedback to students and explain correct answers. Moreover, a computer is patient and non-judgmental, which can give the student motivation to continue learning. According to James Kulik (1990), who studies the effectiveness of computers used for instruction, students usually learn more in less time when receiving computer-based instruction and they like classes more and develop more positive attitudes toward computers in computer-based classes.
The American educator, Cassandra B. Whyte (1989), researched and reported about the importance of locus of control and successful academic performance and by the late 1980s, she wrote how important computer usage and information technology would become in the higher education experience of the future.

3. **Wide participation.** Learning material can be used for long distance learning and are accessible to a wider audience.

4. **Improved student writing.** It is convenient for students to edit their written work on word processors, which can, in turn, improve the quality of their writing. According to some studies, the students are better at critiquing and editing written work that is exchanged over a computer network with students they know.

5. **Subjects made easier to learn.** Many different types of educational software are designed and developed to help children or teenagers to learn specific subjects. Examples include pre-school software, computer simulators, and graphics software. In general, students like online classes because they allow for flexibility, the comfort of sitting at home, and the potential to save money. Many universities and colleges are receiving pressure from students to offer more and more classes online. Research argues for both the advantages and disadvantages of online classes and stresses the importance of colleges and universities weighing both sides before deciding to adopt an online class. Certain classes may not be suitable for online instruction and not all instructors are suitable to teach online classes.

The Association for Educational Communications and Technology (AECT) has adopted the following definition of Instructional Technology: “Instructional Technology is the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning” (Seels & Richey, 1994, p. 1).
1.5 INSTRUCTORS AS FACILITATORS

According to the social constructivist approach, instructors have to adapt to the role of facilitators and not teachers (Bauersfeld, 1995). Whereas a teacher gives a didactic lecture that covers the subject matter, a facilitator helps the learner to get to his or her own understanding of the content. In the former scenario the learner plays a passive role and in the latter scenario the learner plays an active role in the learning process. The emphasis thus turns away from the instructor and the content, and towards the learner (Gamoran, Secada, & Marrett, 1998). A teacher tells, a facilitator asks; a teacher lectures from the front, a facilitator supports from the back; a teacher gives answers according to a set curriculum, a facilitator provides guidelines and creates the environment for the learner to arrive at his or her own conclusions; a teacher mostly gives a monologue, a facilitator is in continuous dialogue with the learners (Rhodes & Bellamy, 1999). A facilitator should also be able to adapt the learning experience ‘in mid-air’ by taking the initiative to steer the learning experience to where the learners want to create value. The learning environment should also be designed to support and challenge the learner’s thinking (Di Vesta, 1987). While it is advocated to give the learner ownership of the problem and solution process, it is not the case that any activity or any solution is adequate. The critical goal is to support the learner in becoming an effective thinker. This can be achieved by assuming multiple roles, such as consultant and coach.

A further characteristic of the role of the facilitator in the social constructivist viewpoint is that the instructor and the learners are equally involved in learning from each other as well (Holt et al., 2000). This means that the learning experience is both subjective and objective and requires that the instructor’s culture, values and background become an essential part of the interplay between learners and tasks in the shaping of meaning. Learners compare their version of the truth with that of the instructor and fellow learners to get to a new, socially tested version of truth (Kukla, 2000). The task or problem is thus the interface between the instructor and the learner (McMahon, 1997). This creates a dynamic interaction between task, instructor and learner. This entails that learners and instructors should develop an
awareness of each other’s viewpoints and then look to their own beliefs, standards and values, thus being both subjective and objective at the same time.

Some studies argue for the importance of mentoring in the process of learning (Hill Duin & Archee, 1996; Brown, Collins & Duguid, 1989). The social constructivist model thus emphasizes the importance of the relationship between the student and the instructor in the learning process.

### 1.6 BARRIERS ON USING EDUCATIONAL TECHNOLOGY

Teachers play an important role in the teaching-learning paradigm shift. They must understand the potential role of technology in education. Also, they should become effective agents to be able to make use of technology in the classroom. But, it is commonly observed and inferred by many research studies that majority of teachers are not using Educational Technology adequately in the classrooms. There are many barriers to use Educational Technology in teaching-learning process. In fact, understanding the pedagogical, psychological and cognitive barriers to the successful use of information technology is a vital precondition for improving the utilization of computers and other technological aids in the educational process (Benzie, 1995). It is a fact that teachers are at the center of curriculum change and they control the teaching and learning process. Therefore, they must be able to prepare young people for the knowledge society in which the competency to use ICT to acquire and process information is very important (Plomp, Ten Brummelhis & Rapmund, 1996).

#### 1.6.1 Teachers’ Characteristics

Teachers’ characteristics (e.g. individual’s educational level, age, gender, educational experience, experience with the computer for educational purposes and financial position) can influence the adoption of an innovation (Rogers, 1995; Schiller, 2003; Abdolmaleki, 2007), so also using educational technology for improvement of teaching-learning process.

- **Years of experience**: The report by the National Center for Education Statistics (2000) indicated that teachers with fewer years of experience were
more likely to use computers in their classes than teachers with more years of experience. More specifically, teachers with three years or less teaching experience reported using computers 48% of the time; teachers with 4-9 years, 45% of the time; those with 10-19 years, 47% of the time, while teachers with 20 years or more reportedly used computers only 33% of the time.

- **Age and Gender**: Venkatesh and Morris (2000) investigated about age and gender differences in the overlooked context of individual adoption and sustained usage of technology in the workplace using the Theory of Planned Behavior (TPB). They studied on user reactions and technology usage behavior over a 5-month period among 355 workers being introduced to a new software technology application. The results showed that the decisions of men and younger worker were more strongly influenced by their attitude toward using the new technology. In contrast, women and older worker were more strongly influenced by subjective norm and perceived behavioral control. On the other hand, Albirini (2006) found that age was not a significant factor in relation to teachers’ attitudes towards ICT. However, it was revealed in the current study that age correlated negatively with the Jordanian EFL teachers’ attitudes towards ICT in Jordan ($r = - .13$, $p < .01$). This result demonstrated that as the age of the teachers increased, their attitudes towards ICT decreased. This finding confirms the results of Roberts, Hutchinson and Little’s study (2003) that the probability that teachers would use ICT in the classroom was limited by the reality that teachers who were educated 20 years ago were trained by people who themselves were trained before the arrival of computers in schools.

- **Learning style**: There are other personal characteristics that may influence how teachers use computer applications in their classrooms. The teacher’s own learning style is certainly one such factor. For example, if a teacher is a creative thinker who likes the idea of constructing knowledge, is a life-long learner, a social learner, and a decision maker, he/she may be more likely to use computers in more integrative and transformational ways that are useful and valuable to students instead of ways that promote and support traditional classroom practices (Bielaczyc & Collins, 1999; Carvin, 1999).
Teachers’ attitudes: Previous research on the use of computers has found empirical support for attitude as driver of actual usage of computer (AUC) (Yildirim, 2000). It was identified that teachers’ positive attitudes towards computers are pertinent for effective usage of computers in schools. SheikhSadeghi (2007) observed teachers’ negative attitude towards educational technology as one of obstacles in using it.

Computer compatibility: Computer compatibility is defined as teacher’s acceptance of computer being well-suited with their working life styles and consistent with their existing values and able to satisfy their personal needs. The study showed that teachers enhance their usage of computers since they found they are compatible with it. Hu, Clark and Ma (2003) model also identified that hardware and software compatibility positively influences teachers AUC.

The lack of knowledge and understanding: The lack of knowledge and understanding by some teachers may have contributed to a conceptual confusion as to what integration of ICT into the teaching and learning process demands (Abdolmaleki, 2007). More specifically, teachers’ perceptions of the role and the educational use of the computer drive their lesson planning, management and implementation of ICT in the classroom. Evidently, when teachers lack these high order ICT skills and knowledge, their vision and perception of computer use is fairly blurred and doesn’t meet the educationalists’ dominant theories and perception of ICT as a teaching and learning tool. Bauer and Kenton (2005) carried out a study about technology integration in the schools. They found that the teachers were highly educated and skilled with technology, were innovative and adept at overcoming obstacles, but that they did not integrate technology on a consistent basis as both a teaching and learning tool. They stated two reasons regarding these findings: Students did not have enough time at computers, and teachers needed extra planning time for technology lessons. Other concerns were outdated hardware, lack of appropriate software, technical difficulties, and student skill levels.
Drenoiyanni and Selwood (1998) stressed the necessity for teachers’ acquisition of skills, knowledge and understanding in the use of ICT: The educational value of using computers and many other tools in education can only be justified through educational psychology principles and ideas. Teachers’ lack of Educational Technology skills among teachers and knowledge regarding the psychology of learning may have the effect of them not understanding the value of computer use, which for other tools is obvious because they are established. This lack of awareness encourages teachers to justify computer use through the adoption of a computer awareness approach (pp. 97–98).

1.6.2 Availability of Computers and Facilities

The study on barriers of development of e-learning in Agriculture High Education in perspective of students noted that the lack of necessary and appropriate training facilities as an obstacle in using Educational Technology (Rezaie, 2009). Albirini’s study (2006) showed that a relatively high percentage of the teachers (57%) had computers at home while only 33.4% of the respondents had access to computers at school. This percentage gives a clear indication of the insufficiency of computers at Syrian schools, particularly for teacher use. Thus, Albirini’s findings substantiated this globally felt barrier that computer access has often been one of the most important obstacles to technology adoption and integration worldwide (Pelgrum, 2001).

A report on teachers’ use of technology by the National Center for Education Statistics (September, 2000) indicates a correlation between availability of computers and computer use. In general, teachers who had computers in their classes were more likely to use them in instruction than teachers who did not; more than 50% of teachers who had computers in their schools used them for research and activities related to lesson preparation.

Goktas, S. Yildirim and Z. Yildirim (2009) carried out Main barriers and possible enablers of ICTs integration into pre-service teacher education programs. The findings indicate that the majority of the stakeholders believe that lack of in-service training, lack of appropriate software and materials, and lack of hardware are the main barriers for integrating ICTs in pre-service teacher education programs.
1.6.3 Lack of Time

According to Mumtaz (2000), lack of time is a factor that hinders technology integration in schools. This barrier becomes manifest in two ways: (a) release time and (b) scheduled time. Results of a study conducted by the National Center for Education Statistics (2000) with in-service teachers revealed that 82% of the participants thought that lack of release time was the most significant factor that prevented them for using computers in their classes as well as prepare materials for use with their classes. Teachers felt that, with their regularly scheduled classes, they did not have enough opportunities to practice using computers in their classes.

1.6.4 Lack of Technical Support

The National Council for the Accreditation of Teacher Education (NCATE) (1997) reported the lack of technical support as one of the major barriers that resulted in computers being underutilized in the classes. Teachers did not want to use computers because they were not sure where to turn for help when something went wrong while using computers. Butler and Sellbom (2002) carried out a study on barriers to adopting technology for teaching and learning. Regarding to the role of technical support staff, they recommended that schools should work to convince technology staff that reliability is very important, especially concerning technology in classrooms; encourage the purchase of highly reliable technologies; improve systems for checking and maintaining classroom technologies; create new approaches (including staff training) to assure that extremely rapid responses are made to breakdowns.

1.6.5 Lack of Leadership

The role of school leadership is clearly central in meeting several of these preconditions. In fact, teachers need both technical and administrative support when they decide to use technology in their classes. Although infrastructure is important, leadership is an important element in establishing technology as a part of school culture (Anderson & Dexter, 2000). Fullan (1992) believes that the role of the leader is crucial to the successful
implementation of educational innovations. Similarly, Baylor and Ritchie (2002, p. 412) describe leadership as a critical predictor of ICT integration, since it focuses on promoting the use of ICT at a strategic and action level: ‘school principals who wish to nurture a technology culture need to join in rather than sitting by the side’. Then, if leaders are cognizant of the benefits to be gained from using technology in the teaching-learning process, technology use in school is more likely. To promote ICT integration in schools, school leaders should adopt strategies that make ICT a part of the daily routine or tasks of the teachers. These strategies may include using e-mail as the mode of communication among staff, accessing the intranet to download forms and using a word-processor to complete lesson plans for submission (Bangkok, 2004). Therefore, school leaders should be a role model and should make ICT a tool in his everyday life.

Anbaj Chamani (2008) scrutinized the obstacles of using Educational Technology in the teaching-learning process in the perspective of teachers in Tehran 8th district. Except social factors, management, structural, educational factors were articulated as barriers in using Educational Technology.

1.6.6 Need Assessment

The teacher has an important role to play in the teaching-learning process, with ICT facilitating the development of a higher level of cognitive skills in evaluating arguments, analyzing problems and applying what is learnt. Although teachers play an important role in the learning environment, they are often not consulted regarding changes to teaching and learning procedures (Bangkok, 2004). In fact, the teachers’ needs under changing conditions have to be continuously assessed and activities to satisfy these have to be developed. So, professional development is necessary for teachers to enable them to effectively use technology to improve student learning. Staff development should be collaboratively created, based on faculty input and school needs. It must prepare teachers to use technology effectively in their teaching.
1.6.7 Professional Development

The review of literature in teacher training program shows that lack of professional development for technology use is one of the most serious obstacles to fully integrating technology into the curriculum. According to Spillane (1999), teachers who have a strong engagement towards their own professional development are more motivated to undertake activities, which lead to a better understanding of the goals of an innovation.

Similarly, Fullan (1992) pointed out that teachers who are actively involved in their own professional development are more able to implement changes in their teaching. Hence, having a recognition system for innovative and effective use of ICT integration in schools will motivate teachers to use ICT in teaching. For example, formal certification of in-service professional development that leads to diplomas or degrees could provide an incentive for teachers to upgrade and update their skills in and knowledge of ICT integration.

In line with this idea, Fullan (1992) suggested that training should not be one shot workshops, but rather ongoing experiences so that learners can be kept up to date with ever-changing technologies. Teachers need follow-up training sessions to ensure that they keep abreast with current technologies. Hence, teacher training is crucial and these programs must adequately prepare teachers with skills necessary to integrate technology in their classes. Moreover, they must learn to work smarter and have a vision to implement ICT in their classes. Having vision requires strategic planning, risk-taking and decision making, imagination and commitment. In addition, teachers need to have a clear understanding of what to change as well as how to change (Bennis, 1990). Therefore, they need to become lifelong learners and develop their skills and abilities to overcome their fear of being the captain and focus on leading the ship. In other words, the teachers must work to become transformational leaders. Efficient and effective use of technology depends on the availability of hardware.
and software and the equity of access to resources by teachers, students, and an administrative staff.

1.6.8 Lack of Funds

Many scholars proposed that the lack of funds and Financial Limitations to obtain the necessary hardware and software as barriers in using Educational Technology at schools (Mumtaz, 2000; SheikhSadeghi, 2007). Also, a report on teachers’ use of technology by the National Center for Education Statistics (September, 2000) indicates a correlation between availability of computers and computer use. In general, teachers who had computers in their classes were more likely to use them in instruction than teachers who did not; more than 50% of teachers who had computers in their schools used them for research and activities related to lesson preparation. A total of 78% of teachers surveyed cited limited access to computers as a barrier to effectively using computers in their classes. Of this total, 38% thought “not enough computers” was a “great barrier” to using technology in their classes. Therefore, the effect use of technology depends on the availability of facilities especially computers at schools and universities.

1.6.9 School Culture

School culture can be defined as the basic assumptions, norms, values, and cultural artifacts that are shared by school members (Maslowski, 2001, pp. 8–9). These meanings and perceptions indirectly affect attitudes and behavior in the organization of schools (Devos, Bouckenooghe, Engels, Hotton & Aelter-man, 2007). Hence, if the technology is not received well by teachers, there must be a mismatch of values between the culture of schools and the technology (Albirini, 2006). Thus, teachers who have positive perceptions about the cultural relevance of computer technology will apply ICT in education. Samiee (2006) believes that social - educational factors have affected on using Educational Technology.

Demetriadis et al. (2003) studied cultures in negotiation: teachers’ acceptance/resistance attitudes considering the infusion of technology into schools. Data resulting indicated that although teachers expressed
considerable interest in learning how to use technology they needed consistent support and extensive training in order to consider themselves able for integrating it into their instructional practice. Teachers were interested in using ICT (1) to attain a better professional profile, and (2) to take advantage of any possible learning benefits offered by ICT but always in the context of the school culture. They were willing to explore open and communicative modes of ICT-based teaching whenever school objectives permit; otherwise they appeared to cautiously adapt the use of ICT to the traditional teacher-centered mode of teaching (strongly connected to the established student examination system). Teachers’ attitude to adapt ICT mode of use was supported by research evidence that emphasized the situational character of knowledge and expertise.

1.6.10 Subjects Taught

Subjects taught in schools are as one of the factors that serve to influence the usage of computers in schools (Heinssen et al. 2001). Whereby science and technology teachers tend to use the computers more in classrooms compared with other subjects.

1.6.11 Perceived Usefulness

Hu et al. (2003) described perceived usefulness as the extent to which computer considered by an individual to be useful, whereas perceived ease of use is the degree to which an individual views his or her use of computer to be free of effort. Venkatesh and Morris (2000) and Hu et al. (2003) had avowed the importance of perceived usefulness and perceived ease of use and its significant positive influence on AUC. Numerous studies have shown that teachers’ readiness to use technology will increase as a result of strong support systems that include colleagues, administrators, parents and other members in the community (Davis et al. 1999). Kazemzadeh (2003) found the lack of belief towards educational technology as one of barriers in using it.

1.6.12 Other Factors

In addition, Bosley and Moon (2003) review the literature on the use of Information and Communication Technology within an educational context.
They mentioned a case study research in the UK that identified a number of factors that enable teachers to successfully engage in innovative practice. These were support at senior management level for implementing new practices and addressing financial implications where appropriate; involvement of several members of staff; fostering culture within schools of collaboration and mutual support; and lastly willingness to take risks. Abdolmaleki (2007) mentioned teachers' resistant, education system problems, teachers' characteristics as some obstacles in using Educational Technology in the classroom. Taghvaee (2005) identified barriers like human factors (attitude - skill), mastery of English language, knowledge about computer, internet, creativity, innovation, searching morale.

The key to effective ICT teaching and learning does not lie in the mere availability of technology, but rather on the way it is used and manipulated. Faster or more powerful and advanced computers cannot alone bring the desired results or substitute for human thinking. ICT alone does not constitute the panacea to the problems of education, but can prove a valuable tool for teachers and learners if used effectively. Human intervention is the most essential and indispensable constituent to all this. As Chalkley and Nicholas (1997) stress it is now well understood that the challenge of integrating technology into schools and classrooms is much more human than it is technological. What's more, it is not fundamentally about helping people to operate machines. Rather, it is about helping teachers integrate these technologies into their teaching as tools of a profession that is being redefined through the incorporation process (p. 99). Teachers require the skills, knowledge and understanding as well as time in order to achieve the integration.

1.7 NEED AND IMPORTANCE OF THE STUDY

The teaching–learning process essentially involves the process of transfer of learning. This process which calls complex in behavior as Yadav (2008) said "the behavior of a person is broadly divided into 3 kinds a) thinking b) feeling c) doing, which are technically known as cognitive, affective and psychomotor objective. Cognitive objectives involve the learner in thinking
processes like remembering, recognizing, analyzing, evaluating and problem-solving. Affective objectives involve the learner's feelings, interests and attitudes. Psychomotor objectives involve the learner in various kinds of muscular activities and skills" (p.71).

Experiences provided by the teacher bring about a change in disposition. Learning occurs as a result of newly acquired skills, knowledge, perception, facts, principles, new information, etc. Learning can be reinforced with teaching-learning aids of different variety because they are capable of stimulating motivating as well as arresting learners' attentions during the instructional process. Hence a teacher needs to employ as many teaching-learning aids for effective teaching. These aids help the teacher in realizing the objectives formulated. The learning aids include visual aids, audio aids, audio-visual aids, real objects, specimens, models, etc.

Educational Technology is a systematic integration of materials, communication system and psychology of learning. Educational Technology comprises the process and product dimensions of the interaction of teacher – learner. Educational Technology is a branch in the discipline of education which is revolutionizing it and correlating different disciplines of social and physical sciences with it. Educational Technology is a dynamic discipline, which is ever changing with the changing times.

Mean (cited by Vanaja & Rajasekar, 2007) lists the ways in which technology facilitates education: Educational Technology provides real world contexts for learning connections to outside experts; visualization and analysis tools, scaffolds for problem-solving, and opportunities for feedback, reflection and revision. In this way Educational Technology enables us to make use of technology to improve education by incorporating new ways of teaching – learning in the classrooms. Teachers need to use a variety of teaching activities in their classrooms, and that variety should include technology whenever appropriate. Technology can be used not only as an information management tool, but also as a means of reaching students of diverse backgrounds (Sianjina, 2000). Use of technology can help teachers relate to today's students who are very media aware, prompt new approaches
to curriculum, and encourage developments in teaching skills (Schwarz, 2000). It can also assist teachers in helping students make connections with a worldwide community (Davidson, 2000). Technology exists in classrooms not just for the sake of its presence, but also to enhance the learning process. Scheffler and Logan (1999) emphasize that integrating technology not only involves the attainment of computer skills but also consists of a process in which learners try, fail, access, evaluate, analyze and apply meaningful tasks including but not limited to researching, analyzing data, applying and representing knowledge, communication and collaborating.

There are a lot of advantages of Educational Technology that facilitates teaching-learning process which every educational system can use to improve student learning. These advantages are for both students and educators when successfully integrated into a learning environment. Some of these advantages include:

- **Increased Access to Resources:** Unlike the traditional classroom that is locked at the end of the school day, Educational Technology allows students to access educational resources from anywhere at any time for example using computer increased access to resources is especially valuable for students with special needs and those students who live in rural areas or developing countries.

- **Interactive Learning Experiences:** Many educators deliver information to their students in the form of lectures. Educational Technology allows students to access information through videos, podcasts, and a variety of other interactive media, which creates a more engaging learning experience for students.

- **Student-Centered Learning:** In a traditional classroom, students cannot control how lessons are planned. Through the use of Educational Technology, students can take control of their learning experiences. Students can decide when class is in session, as well as how the lesson material will be presented.
Jungck (1999) stated that, “What we know is linked to the way we come to know it” (p. 283). Hence, as students’ interaction with computers shape what they know about them, researchers through conducting observations of technology access and use in schools will shape the understanding of teachers and students’ experiences, their values and their needs in this teaching-learning process. Thereby, voices from the ground level are endemic to shaping the effectiveness in policy and practice in technology in education.

In examining large-scale state and national studies, as well as some innovative smaller studies on newer Educational Technologies, Schacter (1999) found that students with access to any of a number of technologies (such as computer assisted instruction, integrated learning systems, simulations and software that teaches higher order thinking, collaborative networked technologies, or design and programming technologies) show positive gains in achievement on researcher constructed tests, standardized tests, and national tests.

Results from other studies (Thirunarayanan & Perez-Prado, 2002; Smith, Ferguson & Caris, 2001) also suggest that students can benefit from technology-enhanced collaborative learning methods and the interactive learning process. Research indicates that computer technology can help support learning and is especially useful in developing the higher-order skills of critical thinking, analysis, and scientific inquiry “by engaging students in authentic, complex tasks within collaborative learning contexts” (Roschelle, Pea, Hoadley, Gordin & Means, 2000). In cases where technology-based instruction has been successful, the research suggests that it is most often the result of using the computer to deliver well-designed and well-managed instruction (Hasselbring & Glaser, 1999). Thus, the focus is placed on the teacher’s actions in the classroom rather than on the technologies that were utilized in educational setting.

Research on teacher behavior revealed that the attitude and pro-activeness of the teacher is important for them to utilize technology in classrooms. Therefore, teachers must have a proactive attitude towards technological innovation, be committed to use ICT and be able to integrate it
in the learning process. The teachers should learn about the potential role change towards advanced students and how to cope with a situation where the teacher is not the most advanced person in the class anymore. They must have a critical view of the use of technology in education instead of remaining a mere passive consumer of technology. Moreover, teachers must promote this critical view in their teaching. Teachers should be able to consider the learner/pupil as the centre of the learning process, to change from a teaching to a learning perspective, a model and guide to the pupils, an agent of change and not the unique source of knowledge. He/she must be able to have multiple approaches to a question (i.e., the perspective of a second observer) showing flexibility in the modeling of knowledge.

Teachers should keep in mind their role as mediators of the learning process. In the context of ICT usage in schools, the teacher becomes often moderator for student activities by promoting teamwork, promoting project work and independent learning and also acting as a resource facilitator mediating collaborative learning. The teacher has the responsibility to provide resources for the students like Internet access, WWW addresses and technical counseling. Teachers should be able to decide which methodology is best suited to the objectives of learning, how to use ICT and to identify the adequate methodologies to integrate ICT in teaching. The choice for a particular methodology should be based on co-participation of students. This includes the participation of students in producing a specific methodology promoting a conversational approach (Pushpanadham & Khirwadkar, 2006).

Regarding the use of Educational Technology and problems in using it, much research has been made in almost all the countries (both developed and developing), so also in Iran. Although, the use of Educational Technology is emphasized at all levels of education (both students and colleges), it is commonly observed that Educational Technology is not being used effectively by School and University teachers in Iran. The review of literature on studies in Iran revealed that there are a lot of studies on obstacles in using Educational Technology in different cities in Iran. Some findings are different, some are similar. It is very difficult to draw any conclusion on obstacles to use Educational Technology, implication from these studies for improvement of
states of using Educational Technology in schools and universities. These demands need for identifying, describing and analyzing the factors that obstruct the implementation of Educational Technology.

Studying examples of last practices in education, as it said by Cottans and Stoks (2000) can inform the efforts of schools to "put in place educational practices based on their understandings of best practice" (p.1.) (Cited by Ashleigh, 2005). Contributing to this understanding within the study will be the stories of the staff involved with the implementation and management of Educational Technology within schools and universities. Learning from experiences of the studies done provides opportunities for the reader to inform his/her understanding of the factors that contribute to the successful implementation and management of Educational Technology at schools and universities.

It is found that the most of teachers in all level of education systems of Iran neither use equipments of Educational Technology nor use the principles of it. Why it is so. A few studies were done on obstacles that cause some teachers at schools and universities not to use Educational Technology in their classes. Thus, it is attempted here to get a total result of all these studies done represented through meta-analysis and it is entitled *Meta-analysis of Studies on the Obstacles in Using Educational Technology in the Education Systems of Iran.*

This research attempts to develop an understanding of the Obstacles in Using Educational Technology in the Education Systems of Iran and this intend leads to think about how these obstacles can be overcome and Educational Technology can be used effectively. This study is based on the assumption that the valuable data can be gathered by studying the last studies about schools and universities on some factors which prevent the schools’ and universities’ teachers use Educational Technology in their classes and this attempt intended to think about the following questions:

- What are the obstacles prevailed in Iran to use Educational Technology in schools and universities?
Is there any significant relationship between financial limitations and the non-use of Educational Technology by Teachers of Schools and Universities?

Is there any significant relationship between the lack of Educational Technology experts/technologists and the non-use of Educational Technology by Teachers of Schools and Universities?

Is there any significant relationship between the lack of necessary and appropriate training facilities and the non-use of Educational Technology by Teachers of Schools and Universities?

Is there any significant relationship between the curriculum and content of books and the non-use of Educational Technology by Teachers of Schools and Universities?

Is there any significant relationship between the lack of teachers’ knowledge about learning theories in connection with educational technology and the non-use of Educational Technology by Teachers of Schools and Universities?

How can these obstacles be overcome and Educational Technology can be used effectively?

The meta-analysis approach was chosen for this research because of the following points:

- It is the analysis of analyses (in other words, it enables the synthesizing of literature by combining the findings of a number of studies);
- Each data point used for analysis is obtained from an individual study rather than an individual participant. Rarely do single experiments provide sufficiently definitive answers on which to base policy decisions;
- A meta-analysis can also include studies over a large time and scope, potentially validating the factors over time;
- Because technology changes over time, the impact of factors at various stages of technological development can be combined effect size, a value which reflects the magnitude of the treatment effect or (more generally) the strength of a relationship between two variables, is the unit of currency in a meta-analysis.
1.8 DELIMITATION OF THE STUDY

The present study is delimitated:

i. The studies done in only one country;

ii. The studies done in a particular period 1993 to 2009.

1.9 CHAPTERIZATION

The present thesis consists of five chapters:

The first chapter deals with the theoretical background of the study, the context, need and importance of the study, the problem undertaken and chapterization.

The second chapter focuses on the review of related literature, i.e. the details of the studies related to Educational Technology and meta-analysis on them in Iran and other countries.

The third chapter deals with the statement of the problem and methodology of the study. This chapter presents the details on the objectives, hypotheses of the study, variables, operational definition of key terms, delimitations of the study, design and procedure, tools used, sample selected, and statistical techniques used for analysis of data.

The fourth chapter presents the details of the analysis of the data, and its interpretation under the following heads:

- Descriptive Analysis
- Hypothesis Testing

The fifth chapter presents the summary and conclusions of the study. In this chapter, the details of the chapters of I and IV are summarized, implications of the findings are discussed and topics for further studies are suggested.