

**DEVELOPING AN E-PORTAL FOR THE TRAINING
OF UNIVERSITY TEACHER EDUCATORS IN
PAKISTAN**



**AYSHA KHALIL
ROLL NO. AN-869214**

**DEPARTMENT OF SECONDARY TEACHER EDUCATION
FACULTY OF EDUCATION
ALLAMA IQBAL OPEN UNIVERSITY
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Chapter 1

INTRODUCTION

Diffusion of technological innovations has brought remarkable changes in all avenues of human conduct. This technological revolution has profoundly affected the established systems of health, business market, media and education etc. (Bosamia, 2013) indispensably bringing about myriad progress and improvements in global societies and systems. This phenomena has resulted in the accessibility of increasingly accelerated communication, ocean of information, and digital transition particularly in education. Education is transformed followed by shift towards e-learning that facilitates the ways to use information and communications technologies by integrating digital and online technologies in teaching and learning (Sutton, 2013). Many countries of the world have developed e-Learning policies for education and educational institutions/organizations globally have developed e-Learning strategies, vision and plans in order to pave their education in line with emerging technological trends (Bandalaria, 2018). e-Learning (digital learning & online learning) is deemed compulsory in many of the countries. e-Learning and e-Teaching has emerged as new models in technology-based education.

1.1 Background of the Study

Any digital transformation in education is possible to bring about by active role of teachers as according to Vandenberghe (1984) teachers are considered key players of change. So, It is vital to establish the technological patterns in the teacher education so that learning, teaching and training may be transformed. There are two key stakeholders in teacher education, those are i) students (prospective teachers) and ii) teachers (teacher educators). Prospective teachers, being digital natives are proficient and habitual of

utilizing digital and online technologies in their learning. In contrary to this, teacher educators, being the digital immigrants lack the digital competencies and e-Teaching skills to cater the digital learning needs of prospective teachers (Riegel & Mete, 2017). Here a gap exists between both groups but this lagging can be bridged, according to the view point of Johnston (2015), with appropriate system of training of teacher educators. Globally, It is emphasized that teacher educators must be proficient in technology utilization rather teachers educators must be e-Learning experts to use e-Learning in their professional teaching and to transform their curriculum in accordance with e-Learning patterns. In many countries, teacher trainings are conducted in online environments via training software/applications to enhance digital competencies, online pedagogical skills and digital literacy of teachers (Ranieri, Bruni & Xivry, 2017) and these trainings are conducted in online environments.

In the digital era, teacher trainings for enhancing digital competencies and e-Teaching skills get support from Connectivism (Koskinen, 2015) which is ascribed as the learning theory of digital age that highlights the networked, social and collaborative mode of training (Mattar, 2018). The training systems with e-Learning (digital & Online) integration are attributed as e-Training. e-Training focuses two major dimensions, one is 'why e-Training' which yields the objectivity of training, while other is 'how e-Training' emphasizing the via/means (resources and environments) through which training is conducted. As believed by Dop (2001), Online Training platforms are the dominant components in online training programs. A lot of e-Training applications are being used in the world for the training of teachers and teacher educators which include LMS, blogs, e-Portals, websites, Moodle, online communities etc. Some applications are open-source

while some are developed in-house (Ruchkin, 2012) on the fundamental basis of their characteristics rather than features according to the needs of training and trainees. Educational organizations develop their own online training applications by focusing the amiable characteristics of in-house built software in order to avoid the obstacles faced by using open-source online applications. Although many open-source online applications are available with latest and novel features but specific characteristics of ownership, data security, copyright, customization, interoperability and reliability invoke organizations to develop their own software applications in-house.

Connectivist training platforms possess specific characteristics and features, functionalities to maximize the experiences of teacher educators for seeking digital literacy, digital competencies and e-Teaching skills. For Connectivist e-Training, teachers educators need active, self-regulated, collaborative and interactive training platforms (Mattar, 2018) which may facilitate them for content and activities supported by Connectivism.

As in Pakistan, ICT is spotlighted in national education policy 2009 to be incorporated in teacher education (Chang, 2014). Furthermore Khan & Islam (2015) reported that seventh NPSTP also highlights the need of teachers' competencies and proficiency in ICT, but issue persists on the level of execution of these moves (Rahman & Haleem, 2018). ICT is still limited to computer/laptop use but no online technologies are experienced in teaching and training. Teacher education departments/institutes in formal public universities have not prioritized e-Learning resources availability and infrastructure development. There are no evidences of using digital tools and technologies in teacher education in teaching in these universities. Although some virtual

education organizations are evident to practice the e-Teaching and e-Training (Gul, Ramzan & Batool, 2017), yet formal education side is not practicing it (Rahim, 2013; Hassan & Sajid, 2012).

1.2 Statement of the Problem

e-Learning is not significantly incorporated in teacher education that is why e-Teaching is not evident in Pakistan. To promote e-Teaching in formal teacher education, it is needed to provided training to the teacher educators for enhancing their digital competencies and e-Teaching skills by providing them training experiences in online platforms. As there is no specific online training application for training of university teacher educators but acquired from open-source as per requirement. It is dire need to develop an e-Training application for UTEs by focusing characteristics of in-house built software applications to avoid the drawbacks of open-source applications. Keeping this need in view, this research study was conducted to develop an e-Portal for the training of University teacher educators of Pakistan.

1.3 Objectives of the Study

1. To conduct situation analysis for e-training of University Teacher Educators(UTEs)
2. To propose a Developmental Framework (DFW) of e-Portal for online training of UTEs
3. To identify the components, interface and features of e-portal for training of UTEs
4. To develop an e-Portal for the training of University Teacher Educators (UTEs).

5. To develop modules for the training of University Teacher Educators (UTEs) through e-Portal
6. To apply e-Portal for pilot testing and practical orientation course for University Teacher Educators (UTEs)
7. To explore the acceptance level of participants after taking practical orientation course through e-Portal

1.4 Significance of the Study

The findings of this study would identify the gaps and deficiencies in the prevailing situation and practices of teacher education regarding teacher educators' training programs. This study may propose remedies to fill those deficiencies and align the teacher educators training with the emerging needs and trends of time. Deficiency of e-Portals as preferred online training application is highlighted and e-Portal development is intimated as remedial approach to bridge this gap. Development of e-Portal may highlight the importance and precedence of characteristics over features of online applications. Also this study underlines the stratagem for overcoming digital divide between teacher educators and prospective teachers. This study may oblige to teacher educators for practicing e-Teaching and for the development of digital competencies and digital literacy as contemporary professional needs.

The developed e-Portal might be helpful for acknowledging the teacher educators' training in distance mode through e-Learning. Curriculum planners and developer may peruse new trends by following the identified need of distinctive technology-based curriculum for teacher educators.

This study might be helpful for the institutions of teacher education and teacher training, and for also distance education departments started in the universities of Pakistan after the approval of HEC. The training may be repeatedly available at all the time on the flexible own space of the teacher educators. This study may be helpful to the educational planners and policy makers to prepare the policies, professional code and ethics, and best practices standards for the neglected area of teacher educators.

1.5 Research Questions

- 1- What are the major difficulties faced by UTEs to incorporate e-Learning in their teaching?
- 2- What are the problems faced by prospective teachers for using e-Learning technologies and resources in universities?
- 3- What digital tools and technologies are utilized by UTEs for the development of online teaching learning resources?
- 4- Which applications are used by UTEs for e-Learning resources sharing?
- 5- What are the success factors of an e-Training program?
- 6- What is the importance of training environment for e-Training programs?
- 7- Do online applications for e-Training of UTEs already exist?
- 8- Which online training applications are preferred by UTEs for their online training?
- 9- Why development of e-Portal is preferred choice than outsourcing from open-source?
- 10- Are UTEs willing to participate in e-Training course?
- 11- How DFW is being validated?
- 12- Why e-Portal is preferred online training application to be developed?
- 13- What are preferred features of e-Portal?
- 14- What are preferences of UTEs for functionalities and characteristics of e-Portal?

- 15- What is preferred user interface of e-Portal?
- 16- How theoretical compendium of DFW is followed by ADDIE?
- 17- In what ways are Connectivism, ADDIE, and e-Portal are associated?
- 18- What is readiness level of participants to attend e-Training course?
- 19- What is engagement level of participants during e-Training course?

1.6 Research Hypotheses

- H₁: Perceived ease of use of e-Portal has a significant effect on the perceived usefulness of e-Portal.
- H₂: Perceived ease of use of e-Portal has a significant effect on attitude towards using e-Portal.
- H₃: Perceived usefulness of e-Portal has a significant effect on attitude towards using e-Portal.
- H₄: Perceived usefulness of e-Portal has a significant effect on intention to use e-Portal.
- H₅: Attitude towards using e-Portal has a significant effect on intention to use e-Portal.

1.7 DELIMITATIONS OF THE STUDY

The study was delimited to:

- i) All the public sector formal universities in Punjab providing teacher education.
- ii) All the teacher educators and HODs/Chairperson and students of public sector formal universities in Punjab providing teacher education.

1.8 Methodology of the Study

The study was undertaken to develop an e-Portal for online training of University Teacher Educators on the basis of need of online training and identified online training application. Mixed method Sequential transformative design aligned with pragmatic paradigm was employed to carry out this research study. Quantitative and qualitative both methods were used and inductive and deductive approaches were applied for solving research problems and hypothesis testing.

To find the need of e-Training, a situation analysis was conducted. Questionnaires, interviews, and literature reviews were used as tools to get data. On the basis of identified needs and gaps, an e-Portal was developed for online training of UTEs. In addition to this, e-Training modules compatible with the characteristics, features, interface and functionalities of e-Portal were developed. Then a practical orientation course was launched for the pilot testing of e-Portal. At start and mid of the course, e-Readiness and e-Engagement of participants was measured. At the end of practical orientation course, an online survey was conducted to find the acceptance level of participants for using e-Portal in their training programs.

1.8.1 Population

The population of the study comprised of:

- i) All HODs/Chairperson/Deans of faculty/department/institution of education in 32 formal public universities of Pakistan where teacher education is being imparted.
- ii) All University Teacher Educators (UTEs) of faculty/department/institution of education in 32 formal public universities of Pakistan where teacher education is being imparted.

- iii) All students enrolled in faculty/department/institution of education in 32 formal public universities of Pakistan where teacher education is being imparted.

1.8.2 Sampling

To select sample for this study, multi level sampling was implied. 10 formal public universities of Punjab were selected as sample because Punjab have maximum number of universities providing teacher education. Sampling of the study was explained as:

- i) Six provinces of Pakistan were taken as clusters. On the basis of maximum number of universities imparting teacher education, Punjab province was selected out of all clusters. Ten universities of Punjab were taken as sample followed by purposive sampling for imparting teacher education.
- ii) (Followed by census sampling technique), all 41 HODs/Chairperson/Deans of faculty/department/institution of education in 10 formal public universities of Punjab where teacher education is being imparted.
- iii) (Followed by census sampling technique), all 385 University Teacher Educators (UTEs) of faculty/department/institution of education in 10 formal public universities of Punjab where teacher education is being imparted.
- iv) (Followed by convenient sampling technique), 4575 students (prospective teachers)of faculty/department/institution of education in 10 formal public universities of Punjab where teacher education is being imparted.

1.8.3 Research Instruments

In different phases of study, many tools were employed according to the objectives. In Phase-I and III of study, to conduct situation analysis, three questionnaires and one interview was employed to collect data from sample of the study. In Phase-II, organizational documents, project reports, e-Learning policies and strategic plans of different TEIs/universities from different countries were reviewed and facts were gathered to fulfill the objective. In Phase-IV of study, PHP 5.2, Mysql 5.2 and Apache 2.2 were employed as tools for the development of e-Portal followed by Water Fall Model of SDLC and JAD technique. In Phase-V, questionnaire and ADDIE were used as tools to develop modules for the training of UTEs. In Phase-VI, e-Portal and training modules developed in previous phase were employed as tools in practical orientation course. Moreover two questionnaires were also used during this phase to measure the readiness of participants before practical orientation course and engagement level of participants during practical orientation course. In Phase-VII, a questionnaire to measure the acceptance level of UTEs to utilize e-Portal for their training was employed as research tool.

1.8.4 Research Procedure

The study comprised of seven distinct phases followed by objectives. Mixed method Sequential transformative design aligned with pragmatic paradigm was employed to carry out this research study. Quantitative and qualitative both methods were used and inductive and deductive approaches were applied for solving research problems and hypothesis testing. Phase-I was meant to conduct a situation analysis. In Phase-II, Developmental framework for e-Portal was proposed while in Phase-III, components,

features, functionalities and characteristics of e-Portal were decided. In Phase-IV, e-Portal was developed by following system development life cycle (SDLC) of software development. In Phase-V, training modules followed by ADDIE model and DFW were developed whereas in Phase-VI, e-Portal and training modules were employed to conduct practical orientation course for online training of UTEs. In Phase-VII, acceptance level for using e-Portal by UTEs was analyzed.

1.8.5 Validity and Reliability

Cronbach's alpha reliability analysis method was employed to ensure the internal consistency (reliability) of research instruments. Tools were validated through expert opinion, i.e. face validity and content validity of the tools was ensured by expert opinions. Construct validity of two questionnaires was measured by employing structural equation modeling (SEM) technique. For determining content validity of all six questionnaires, content validity index (CVI) was calculated. Interview was also validated by five experts of field. CVI was calculated to ensure the validity of training modules on the basis of opinions of content experts. Three versions of e-Portal were tested and piloted, so bugs were fixed. Features and functionalities were revised and enhanced until the validated final fourth version of e-Portal was released. Reliability of e-Portal was ensured during each developmental phase of water fall model.

1.8.6 Data Collection and Data Analysis

Data were collected by the researcher personally by utilizing developed instruments to carry out research. Furthermore Educational plan, educational policies, policy white papers, task force reports, annual reports, related research articles, websites, brochures were also reviewed for getting qualitative type of data.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Background

Change is one of the few certainties in life. Diffusion of technological innovations have brought prodigious changes in all avenue of human conduct. Ongoing transition and novelty in advancing and inventing new technologies and tools has pushed beyond the old/traditional patterns of living life by bringing exponential changes which could ever be dreamt. As new information and digital technologies are emerged and converged, they reshape life styles and activities in revolutionary ways which have made the life ubiquitous.

2.1.1 Digital World

"We are witnessing a world in transition with a massive dynamism that is strongly influenced by technological trends". (Trend Report, 2016)

Technology is enabling force behind globalization. For recent global landscape, the broad spectrum of technologies has radically transformed the interconnectivity of world to hyper-connective. Digital platforms plausibly facilitate the global communities to come closer, resultantly shifting the patterns of globalization. Technology has condensed time and space making it possible for people to engage in social, economic, and academic activities across the globe in real time. This technological revolution has profoundly affected the established systems of health, business market, media and education etc. indispensably bringing about myriad progress and improvements in global societies and systems. Information technology (IT) is considered as one of the most

fundamental forces for change in the all sectors of our lives (Alshurideh and Alkurdi, 2012; Shannak, Al-Zubi, Obeidat, Alshurideh, & Altamony, 2012; Hajir, Obeidat& Al-dalahmeh 2015; AL-Syaidh&Al-Zubi, 2015). So as so, all the sectors of society are considered outdated and archaic without hinging on technology integration. Computers have moved from climate-controlled realms to our pocket-devices. Traditional media has been trumped by social media. Currently, cloud has made available anywhere the applications and massive data in a broader connection. The information flow is impermeable to geographic limits which make the culture, information and knowledge, reachable to anyone by allowing the distant populations to be incorporated into global networks. This has become possible with the advent of internet. The fabulous growth of telecommunications has carried online services, specialized electronic networked systems, software, email, web pages, and comprehensive information resources to homes over and above to education. This phenomena has resulted in the accessibility of increasingly accelerated communication, ocean of information, and digital transition particularly in education.

2.1.2 Education in Digital Era

Education is generally renowned as an important knob to ensure competitiveness and affluence in the age of globalization. It is vital sector of potential success of nations and is one of the top priorities of governments of different countries. Education has been globalized by computing technology (Zondiros, 2008; Selinger, 2005; Ally, 2004). Nations around the globe are striving to modernize their education and training (E&T) systems in order to keep pace with the digital society. Therefore, being an effective tool for future success of nations, education must keep up with latest developments in

technology. It has become ever more important for learners to participate in an increasingly digital world. Technological dynamism of the education system is greatly caused by the convergence of innovative digital tools and technologies. Jung (2011) narrates that the growth in the use of technology no doubt adds to globalization as educational institutions are trying their utmost to break down geographical and social boundaries. The boundless cornucopia of digital technologies and e-Learning has produced the vast choices for education.

2.1.3 e-Education

For several decades, advances in digital and web technologies have led to an increased interest in considering potential applications in the education sector. In technology-driven paradigms, the contemporary concept of education is electronic and web-based, i.e. online education or web-based education or e-Education. According to Paulsen (2002), e-Education may be regarded as virtual education, web-based education, and online education. The term e-Education refers to delivery learning events/experiences with the application of digital tools, communication and digital technologies and online resources for the delivery of. Online education is easily accessible regardless of location and situation if only having an internet connection. e-Learning, web & digital technologies, wireless technology and ICT (Information and Communication Technologies) have been touted as potentially powerful tools for bringing change in educational setups. Appropriate use of these novel technologies expands accessibility to education while strengthening the quality and relevance to education to progressively digital worlds. In the recent years, there has been a groundswell of interest for improving efficiency and effectiveness of education through ICT, e-Learning, e-Teaching, digital

technologies and virtual learning environments etc. at all levels of formal and informal educational settings. Sirkemaa (2001) evidently reports that Information technology has significant potential in education.

As the ability of internet progresses and inflates, the potential for online learning, teaching, and training also expands and evolves. The growing number of digital tools and technologies, and escalating bandwidth have changed all the aspects of online educational activities embracing e-Learning, e-Teaching, and e-Training etc. As technologies continue to converge, educators find more opportunities for doing innovative practices in education. Collaborative platforms and interactive collaborations enable teachers and learners to connect with peers across the globe. Digital technologies and tools and online resources now permeate all areas of teaching, learning and training. Winthrop et. Al (2016) contend some collaborative projects of different countries to promote e-Education in table below:

Rumble (2001) states that e-Education embraces e-Learning, e-Teaching, development of e-Materials, infrastructure, support for e-Education, and planning and managing e-Education, and e-Training practices. In his study, Rumble (2001) further affirms that in fact it's not although necessary to establish distance teaching universities: but all needed is to broaden the horizon of existing universities so that to embrace e-Learning setups and e-Teaching.

2.2 Integration of emerging Technologies in Teaching and Learning

With the advent of ever-progressing affluent technologies, educational patterns are transformed and continue to change as Larson, Miller, and Ribble (2010) discussed the fact that technology has transformed how we learn and the transformation has begun

to increase. Incorporation of technology is not a new phenomena in educational settings. Transformation involves a different teaching approach and the creation of different learning strategies. Utilizing technology leads to enrichment of education and escalation to educational opportunities. Adcock (2008) and ChanLin (2007) defined technology integration as using technology to enhance education. Howley and Howley (2008) outlined how the early textbooks about technology integration offered a hopeful vision of education transformation based in part on technology use. Mirseli (2016) in his study presents a model that suggests effective technology integration to all components of education system like ministry, teachers, students, institutions, and policy makers and ministry to have consensus on a shared common vision of technology. (fig)

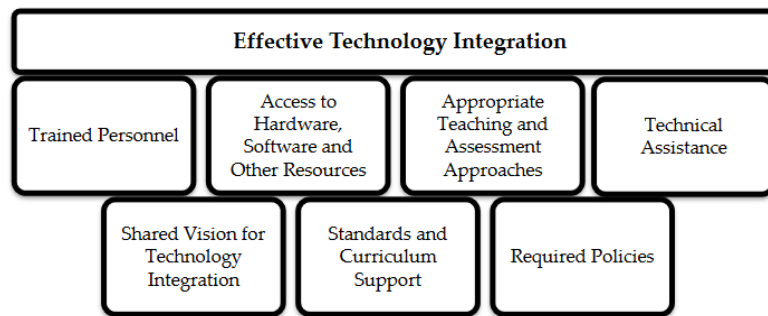


Figure 2.1 : Technology integration in Education

In a survey report stated by Kumar & Daniel (2016), a perpetual enhancement in technology integration into teaching from 2005-2009 was noticed represented by 20 % respondents. From 2010-2015, a significant increase was observed represented by 55 % of total respondents of survey study.

Having accessibility to computers, internet, digital tools and technologies and virtual environments, teachers look for adapting and integrating these novel technologies in their teaching to enhance students' learning. (Mehra &Mital, 2007) argue that

technology integrations into learning and teaching makes over the role of teachers from being a active to a facilitator of learning, whereas the role of students also changes being more active participants of learning rather than being passive. In this regard, Adcock (2008) posited that education has changed concerning teaching approaches, and the integration of technology has affected the roles of both teachers and students. Research conducted by Sánchez and Alemán (2011) has indicated that emerging technologies assist to transform teaching environments into learner-oriented ones. Oncu, Delialioglu, & Brown (2008) suggested technology integration would continue to increase, which may be an important factor in educational settings.

As maintained by Edutopia (2017), integration of technology corresponds to utilize technological resources like laptops, mobile devices, computers, Smartphone, tablets, digital/web cameras, social networking sites, social media platforms, software apps, Wifi, etc. in daily classroom practices.

Although, importance of utilizing and infusing ICT and other educational and instructional technologies in the teaching and learning have been demonstrated in previous researches, but issues associated with its use still exist. Whelan (2008) has identified obstructions which include insufficient technical skills that reduce opportunities for the accessibility of ICT in learning; lacking technology experts, and lack of timely responses from teachers; and also diminished interaction with teachers and peers. In some studies, lagging technological infrastructural development, the lack of access to devices and application , high training material costs, and poor technological competencies are acknowledged as prominent barriers adopt technology (Bonsu et al.

2013). Others researchers, in their studies, also pointed out relevant concerns and factors which barricade technology use in this regard.

Many authors confer about the obstacles of technology integration in teaching and learning. According to Fu (2013), efforts of teachers, organizational administrations and students makes it possible to successfully integrate the technology in teaching and learning. Alazam, Bakar, Hamzah & Asmiran (2013) argue that Level of technology integration in classroom and having competencies to use technologies are correlated to each other is one of the problems. Ward & Parr(2010) narrated that Teachers must be confident in their abilities for facilitating students' learning with technology. Technology integration is reliant to the degree of knowledge and technological competencies of the users (Saud, Buntat, Dahar, Arifin & Zaid, 2010; Buntat, 2010; Sukri, 2010; Paryono & Quito, 2010) while Problematic factors may be least or no accessibility to hardware or software, inadequate time for technology-based course planning, and lack of administrative and technical support (Ertmer & Otterbreit-Leftwich 2010; Al-Ruz & Khasawneh 2011; Groff and Mouza, 2009). Even though latest technologies hold the potential to transform learning and teaching more interesting, but it requires substantial contributions of teachers training to prepare them for ICT-based teaching and development of appropriate and relevant materials (Bonsu, Duodu, & Djang-Fordjour, 2013; Alazam, Bakar, Hamzah, & Asmiran, 2013; Peters, 2009; Buabeng-Andoh, 2012a).

2.3 Current and Potential Inventive Technological Orientations and Trends

A radical change is experienced in the traditional settings of learning as innovation information and communication technologies have evolved. Teaching and learning are no more limited to conventional classrooms (Wang et. al., 2007). The

expansion of worldwide web and its' influence on the education systems has emerged new models of learning, teaching and training which are deemed as revolution in education. Technological trends in educational scenarios discussed in this chapter are in tow domains. First one are technological practices which include e-Learning, e-Teaching, and e-Training, while secondly, technology resources which include digital tools, digital technologies, web 2.0 technologies, smart devices, and virtual learning environments (VLEs).

2.3.1 e-Learning

e-Learning potentially extends educational opportunities through its vibrant features. The ability to transcend time and space is one of the major benefits provided by e-Learning. Its unique characteristics dramatically improve communication and collaboration, exchange of knowledge and information by creating social learning networks. Having multi-functionality and flexibility, e-Learning exponentially increases the personalization and localization to meet diverse needs of learners. Manochehr (2007) portrays e-learning as saved programs on internet/intranet and can be accessed anytime, anywhere, regardless of the computer platform, as long as the user has subscribed to an internet or wifi connection. There is a broad spectrum of e-Learning definitions. These definitions explore and identify latest trends and characteristics of e-Learning as Chai, Koh & Tsa (2000) express that The range of definitions relate to the variety of techniques and the rapid changes taking place in IT and what is available is constantly changing.

It is evident from literature that e-Learning is a broader term which can be used in different contexts, setting and situations due to its vibrant and vast functionality (Oblinger & Hawkins, 2005; Dublin, 2003; Holmes & Gardner, 2006). Maltz & Deblois

(2005) discuss different perspectives of e-Learning i.e. virtual learning, distributed learning, as well as blended learning. It can be rightly said that e-Learning is combination of online learning and digital learning (use of digital tools and technologies in learning process).

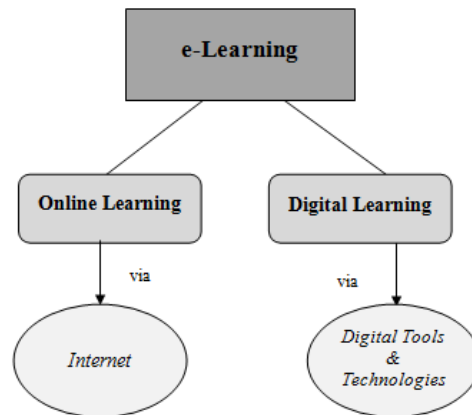


Figure 2.2 : Perspectives of e-Learning

E-learning can be presented through several resources, for example: computer software and internet websites. Moreover, other applications have been developed specifically for e-learning, such as Virtual Learning Environments (VLEs), which provide the user or the learner with numerous facilities like comfortable access to learning materials, communication with lecturers or trainers and the other peers. The VLE provides flexible access to learning, as it can be accessed anywhere and anytime (Adam & Healy, 2000).

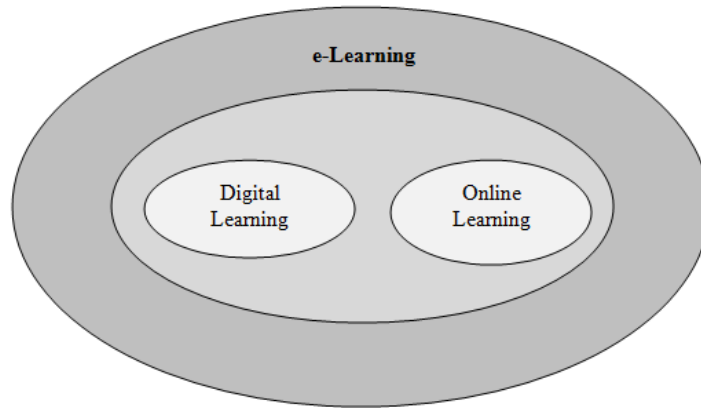


Figure 2.3 : Virtual Learning environments and e-Learning

2.3.2 Potential Dimensions of e-Learning

Literature discusses many of the dimensions of e-Learning with different factors focused in various studies. Enjoyable and user-friendly platform and attractive learning tools make the learning affable (IHRDC-IPIMS, 2017; Epignosis, 2014; Gutierrez, 2013; Kotzer & Elran, 2012; BUZZARD, 2002) while versatility and flexibility of e-Learning turns it being more adaptable. (Karholoo, 2015; Daradoumis, Arguedas & Xhafa, 2013; Goyal, 2012; Lynch & Smith, 2010; Hall, 2001). Personalization and individuality as a result of self efficacy is discussed by Alqurashi, 2016; Jan, 2015; Pellas, 2014; Lee & Hwang, 2007, whereas increase opportunities of communication and collaboration are reported by Buliga & Pentiu, 2016; Sathl, 2015; Hoan & Lim, 2015; Wirkala & Kuhn, 2011; Lai, 2011; Qiu, 2010; Luchoomun, McLuckie, & Wesel, 2010; Watson & Gemin, 2008; Lefta & Laferrire, 2007; Gaytan & McEwen, 2007; Murphy, 2004. Quality (Kear, Williams, & Rosewell, 2014; HKBU, 2010; Birzina, Kalnina, & Janevica, 2009; Žuvić-Butorac, 2007; Ehlers, 2005), effectiveness (Noesgaard, 2015; Zhang, 2015; Mohelská, H., & Sokolová, M. (2014); Bhatia, 2010; Coultas, Lukin, & Boulay, 2008), access (Taha, 2014; Noesgaard, 2014; Karaaslan, 2013; EDUCAUSE, 2013; Bichcel, 2013;

Olson, 2011; Crescente and Lee, 2011; Elias, 2011), enhanced understanding (Ravi, 2011; Lefever & Carrant, 2010; Rossi, 2009; JISC, (2009a and 2009b); McCracken, 2009; Sturgeon & Walker; 2009; McCarthy,2008; Brett, 2008; Swan, 2003) and online resources availability (Al-Asmari & Rabb-Khan, 2014; Bichsel, 2013; Wong, 2013; Anand, Sexena, & Sexana, 2012;Nfila, 2010; Perera & Richardson, 2010; Secker, 2004; Johnson, Trabelsi, &Tin, 2004; Poole, 2003) are widely talked dimensions referred in literature.

2.4 e-Learning in Teacher Education

All nations attribute the accomplishment of educational goals and objectives through teachers being the basic input. The teachers are accountable to establish the teaching/learning environment and prepare learning prospects which assist students' abilities to utilize technology in learning. Therefore it is vital for the teachers to get prepared for providing these opportunities to their students. To be proficient in technology use and knowing the potential of technologies to support students' learning have turned into essential skills professional repertoire of teachers. There are two direct stake holders of teacher education, i.e. prospective teachers and teacher educators. Teachers educators are meant to provide education to the prospective teachers.

Rhine & Bryant (2007) stated, "Teacher education programs usually endeavor in-service and pre-service teachers by employing the vision of teaching and developing abilities to think instinctively, reflectively and critically about intellectual and social rudiments of schools and classrooms."

It is consistently argued that teacher educators play an imperative role in teacher education. Teacher Educators are the professional who vigorously facilitate the formal

learning of student teacher. ETUCE, 2008 defines teacher educators as higher education academic staff who teach education". Swennen et al. (2010) in their research suggest that unlike other professionals, teacher educators have a professional identity as teachers of teacher, or teacher of education in higher education institutions. According to Tack & Vanassche(2014), University Teacher Educators (UTEs) are teachers of Teacher Education Departments/Institutes in Universities whose principle responsibility is the preparation of future teachers . Also European Commission (2013) attributes teacher educators as Higher Education academic staff with a responsibility of teaching, research, teaching practice supervision and training in teacher education institutions/departments and also those in charge of teachers' continuous professional development.

2.4.1 Prospective teachers as Digital natives

Students today are known as net-generation or digital natives who correspond to the first generation grown up with networked and connected digital technologies. They have and are spending their lives encircled by using laptops, digital tools, smart devices, smart apps, webcams, mobile phones and other gadgets of digital age.

The digital natives are observed as innovative consumers/users of available technologies, and fervent adopters of novel/modern technologies (Rideout et al., 2005). Digital natives are attributed for using variety of sophisticated innovative technologies more regularly. They also utilize internet frequently from gradually more younger age. Prensky (2006) expresses that digital experiences of digital natives have not only changed the means and techniques to socialize, communicate and entertain, however their approaches to learning are also fundamentally modified.

The students of teacher education, i.e. future/prospective teachers, are also included in digital natives and are more responsive to learning and teaching involving digital technologies as Generation-Z (who born 1995 or later), according to generation theory, are beginning or have been entered to the universities. They have diverse expectations regarding education so as to converge on their association with technology. In order to maintain relevance, teacher education must adapt a system to fulfill the evolving and unique digital needs of prospective teachers. There must be an established mechanism to teach them with emerging digital and online technologies to meet their diverse learning needs.

2.4.2 Teacher educators as digital immigrants

The individuals who were born before extensive and pervasive adoption of digital technology are regarded as digital immigrant. They are contrary to digital natives, who have been involved in interacting with digital technology from their childhood. Many countries define the digital immigrants groups on the basis of their birth years, as in North America, the people who were born before 1980s are considered the digital immigrants.

In the context of teacher education, it is evident from generation theory that most of teacher educators fall in the category of Generation-X i.e. digital immigrants (Kinash, Wood, & Knight, 2013). Teachers educators don't possess the sufficient digital knowledge, competencies, and experiences that are obligatory for them to teach with digital technologies as they didn't grow up with digital technologies and were not even taught through technology (Prensky, 2001a; NCATE, 1997; Rosenthal, 1999; Office of Technology Assessment, 1995). These teacher educators often cleave to negative

attitudes towards technology utilization and are cynical for using digital technology in teaching. Bahr et al. (2004) argue that the teachers who are digital immigrants don't reflect positivity towards digital technology in teaching.

Teacher are the main decision makers for choosing what technologies to be used in the teaching and the ways how these technologies are utilized. As criticized by Eteokleous (2008), teacher educators are more often found hesitant and unwilling to utilize emerging digital technologies in their teaching.

2.4.3 Digital Divide

Conventional educational practices (teaching and learning) no more are deemed to fulfill the digital needs of prospective teachers to provide them with all the necessary digital skills and experiences. The utilization of emerging digital technologies in education entails new roles and responsibilities of teacher educators, new teaching methods and ultimately new approaches to teacher education. Technology can successfully be integrated in teaching if teacher educators possess the skills and knowledge to use them, and abilities to organize the learning environment in the novel ways by merging digital technologies with teaching. It leads to the fact that to teach in digital era, the most invincible abilities are digital literacy, digital competencies of teacher educators to teach with technology and to modify the content accordingly.

Teachers educators essentially espouse flexibility and adaptability of new technologies being progressed each day that has changed not only the ways of students' learning, but requires new ways for how the teachers teach.

Here is a divide between teachers and students of teacher education.

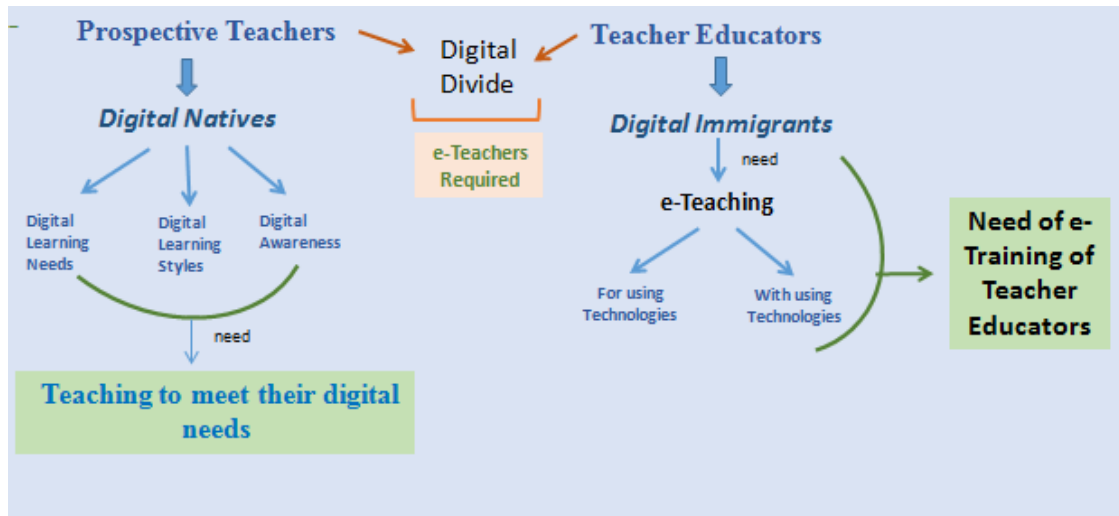


Figure 2.4 : Digital divide between teacher educators and prospective teachers

Teacher educators need the e-Teaching skills which include digital teaching and online teaching to meet the learning needs of prospective teachers. e-Teaching has two significant dimensions i.e. teaching for the use of technologies and teaching with the use of technologies. First dimension specifies the objective of teaching to use technology successfully for learning while second one specifies the via/means of teaching with technology. First is referred as digital teaching whereas second one is regarded as online teaching.

2.5 Need for the Training of Teacher Educators

In some recent research studies, it is suggested that there must not prevail distinct boundaries between digital immigrant and digital natives regarding use of technologies. It leads to the need of training of teachers educators to cater the digital learning needs of prospective teachers. For addressing these challenges, digital and online strategies and methods must be employed in teacher training in the domains of teaching, content, and digital skills (Koehler, Mishra, & Yahya, 2007). The need for e-Learning based training

for teachers and teacher educators has been specified high precedence by the governments in developed world.

2.6 e-Learning Practices Teacher Education

e-Learning is applied in the domains of e-Teaching and e-Training in teacher education where teaching and training via online mode by utilizing digital tools and technologies is promoted.

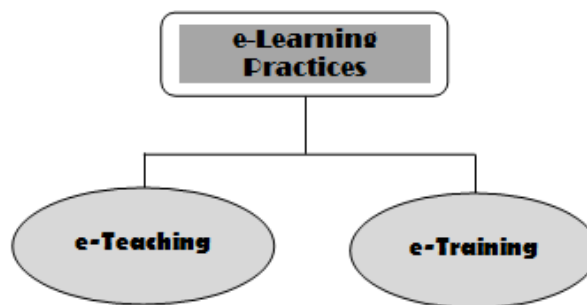


Figure 2.5 : e-Learning practices in Teacher education

2.6.1 e-Teaching

e-Teaching is an innovative and sprouting concept in teaching and learning around the world. A number of innovative technological tools, technologies, and digital/online platforms have enabled students and teachers to collaborate in synchronous and asynchronous modes of e-Teaching.

Donnelly & McSweeney (2008) enunciate that there doesn't exist a general definition of e-Teaching which is suitable to all the contexts and student because the terms 'e-teaching' and 'e-learning' are skewed and context-dependent. Kent (2004) gives definition of e-Teaching as new pedagogy that involves the use of e-Learning resources, digital tools and emerging technological trends for enhancing teaching skills and practices. He further states that e-Teaching is fundamentally a set of

experiences/activities that engrosses employing digital tools and technologies to present a concept, explore the repercussions, place the concept in variety of contexts, create associations with available knowledge, and lead the discussions that expedites students' understanding.

Devedžić (2006) writes that e-Teaching process can be best created through the teachers for attainment of goals of e-teaching/e-learning. e-Teaching scenarios can be broken into two major tasks. Those are: i) teaching FOR using digital technologies and tools and ii) teaching WITH the utilization of digital tools and technologies. Teaching 'for' use of technology requires digital knowledge of teachers, while teaching 'with' the use of technology requires digital competencies of teachers.

Mukwa (2011) recommends to the teacher education institutions to adopt e-Learning because these online and digital technologies have worldwide recognition as tools for facilitating and enhancing the teaching/learning process through diverse technological methods.

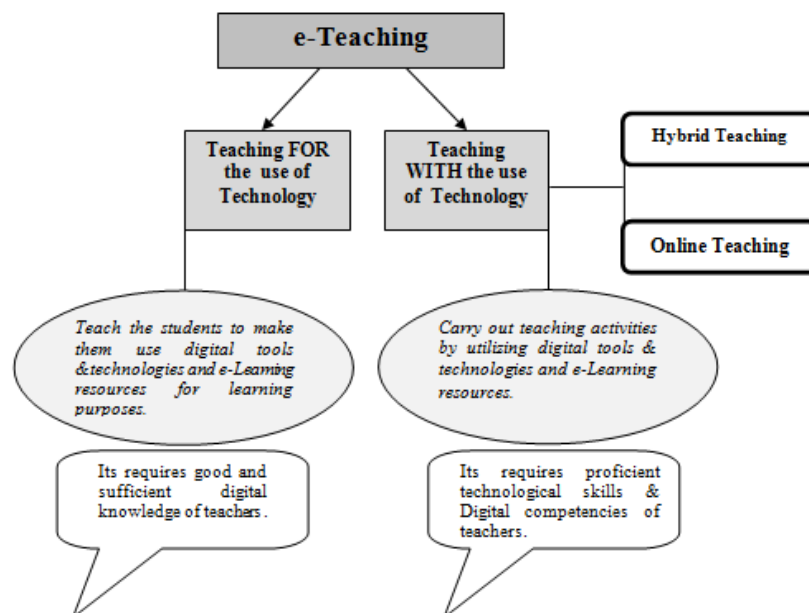


Figure 2.6: Perspectives of e-Teaching

Teaching with technology can further be categorized as i) Hybrid teaching & ii) Online teaching. Hybrid teaching involves using digital tools and technologies integrated with face to face mode while online teaching comprises web/online technologies with virtual learning environments. Formal teaching and teaching in online environment are somehow similar in many contexts, as in both, the needs of learners are assessed; content is conferred/prescribed; learning activities are organized; and learning is evaluated. However, the insidious prompt of the online and digital medium develops an exclusive environment for learning and teaching. Teachers believe that introducing technologies in teaching to facilitate active student-centered learning. currently, swift alteration in emerging technologies allows the teachers to transform traditional F2F learning activities to online learning activities.

2.6.1.1 Need of e-Teaching

Chen et al. (2009), Vanderlinde & Braak (2011) and Fullan (2001) emphasize the need for investigating teacher perceptions about utilizing technological devices and e-Learning resources in their teaching practices. Digital natives expect their professors to use information technology to communicate their knowledge more effectively (Kvavik and Caruso 2005; Thompson, 2007). The rapidly evolving landscape of digital technologies and the increasingly digitally knowledgeable student population has increased the technological competence required by most higher education faculty (Dahlstrom, Brooks, Grajek & Reeves, 2015; Oblinger & Oblinger, 2005; Nugent et al., 2008; Prensky, 2009). As more and more students who have grown up with digital

technology continue to enter higher education, the demand for faculty to integrate technology into the classroom will continue to increase (Nugent et al., 2008).

2.6.1.2 Digital Competencies of e-Teachers

For acquiring the probable results of educational process, teachers utilize e-Learning in teaching/instruction, and diverse models of multimedia teaching. e-Teaching requires the skills and mastery of teachers which is considered crucial in the fundamental dimensions of professional competencies.

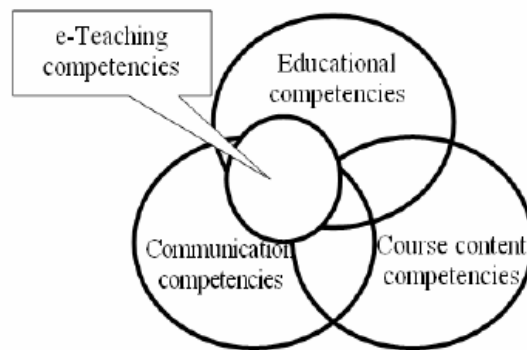


Figure 2.7: Structure of teachers' Digital competence (Bjekić et al. 2008)

Competence of teachers in e-teaching includes: i) didactical knowledge of the teaching, learning, instruction, and educational e-possibilities. E-teaching competence involves the combination of the individual, technological, didactical, and organizational elements that are essential for modeling e-learning and e-Teaching.

In digital age, teachers educators are required to reorganize their fundamental suppositions about learning process, teaching, and most importantly, about their role as educators

Awouters et al. (2008) states three dimensions of digital competencies of teachers:

1. *e-Awareness* : Knowledge of teacher about teaching activities where e-Learning can be utilized.
2. *e-Readiness* : Necessary skills for teacher to use digital tools and technologies, and
3. *e-Practice* : Knowledge of teachers for the pedagogical-didactical dimensions of e-Learning and digital technologies and tools.

2.6.2 e-Training

e-Learning systems generates defying position for teachers and requires greater attentiveness by presenting a wider range of new teaching techniques and teaching styles (UQA, 2001).

e-Training can be broken into two distinguished categories. i) What to trained for? and ii) How to give training?

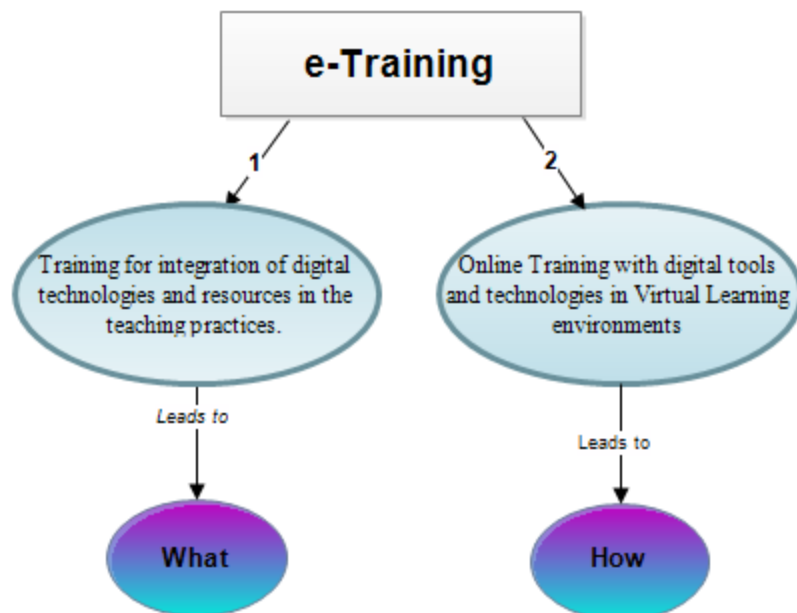


Figure 2.8 : e-Training Dimensions

e-Training is vital for equipping modern university teachers with sophisticated and innovative learning tools. Comprehensive e- training of the teachers is considered necessary for implementation of e-Learning in classroom tasks as it is felt that trainers/ educators, and instructors need to be sufficiently skilled for utilizing of e-learning models.

The teaching faculty can't attain the effective outcomes except the professional training must be initiated immediately before it is too late. The trainings should keep on going from time to time. In order to achieve the e-Training objectives, the institutional support is also an important factor. Last but not least, teacher educators and in-service teachers always need prompt managerial/ technical support also in order not to hinder the active learning process. It is because of the fact that tools and equipment need off and on maintenance to keep the things up to date ready to use status.

Teacher educators as adult learners possess different learning styles and time constraints (e.g. due to job and family responsibilities), and their prospects and goals differ from traditional teachers. Additionally, being adult learners, the preceding experiences of teacher educators are vital to direct their learning for career-orientation or personal goals.

Training for technology integration is traditionally offered via face-to-face workshops or short courses facilitated through centralized educational development offices (Garet, Porter, Desimone, Birman, & Yoon, 2001). While training courses can provide prologue for using précised digital technologies. Over the past several years, there has been a growing recognition that effective educational development needs to incorporate opportunities for faculty to work together in furthering their professional

growth. The utilization of various forms of Faculty Learning Communities (FLCs) has become a common element in many educational development programs. These communities provide a venue for faculty from different disciplines to collectively and critically reflect on their teaching practices (Cox, 2001).

2.6.2.1 e-Training Trends

Table below shows the e-Training trends in different Asian countries in the light of literature.

i) Singapore

The Academy of Singapore Teachers (AST), as part of the MOE, provides professional development such as training courses for:

- support for teachers. Equipping schools with the basic ICT infrastructure and training teachers with a basic level of ICT integration, i.e. internet, digital devices, and word processor.
- Training all teachers with basic ICT skills to begin the design and practice of ICT-based lessons modeling how ICT can be effectively used to help students learn better in differentiated educational settings

ii) Hong Kong

Hong Kong provides training opportunities to teachers for:

- Focusing on one-shot workshops with best-practice introduction and hands-on practice of ICT use for learning and teaching and e-pedagogical practices for developing and enhancing digital competencies of teachers.
- Enhancing teachers' resource sharing and professional dialogs for subject specific e-Learning pedagogy, on top of one-shot workshops.

- Advancing teachers' communities to observe, engage, and reflect and succeed good practices for e-Learning

iii) Taiwan

Taiwan intends to offer:

- e-Learning based Training programs with web-based learning communities for implementation of ICT into schools and classrooms
- Offer university-based Teacher training programs for e-Pedagogy, online resources provision, and online delivery.
- BYOD (Bring Your Own Device) Project for e-Teaching and e-Learning

iv) China

Chinese education system focuses the teachers' training programs for:

- ICT integration into the classroom teaching
- Designing task-driven activities for teacher's engagement in e-Learning practices in classroom teaching
- Promoting self-directed online teacher training through online learning communities

2.6.2.2 Teachers' Professional Characteristics through e-Training

Today's students need educators who have the knowledge and skill to facilitate their participation in a collaborative, Web-based learning culture (AlDahdouh et al., 2015). They need teachers who know how to create a learning culture that looks and functions like the real and virtual workspaces of today. Equally important, they need educators who can join forces with their colleagues and communities to transform their schools from teaching organizations into genuine learning organizations. According to Kerr (2006), such teachers would be able to:

- Facilitate and inspire student learning and creativity so that all students achieve in the global society. Teachers must engage today's digital-age learners if they are to meet the goals of producing the highest percentage of college graduates in the world by 2020 and closing the achievement gap, so that all students graduate from high school ready to succeed in college and careers.
- Enable students to maximize the potential of their formal and informal learning experiences. Teachers will work within a technology-empowered learning ecology and must know how to help students orchestrate the resources of this new learning environment to meet their individual learning needs.
- Facilitate learning in multiple modalities. In an open learning ecology, teachers must embrace a greater diversity of spaces, times, resources, media, and methods for learning. Twenty-first century learning environments are synchronous and asynchronous, face-to-face and virtual, local and global. The rapid growth of virtual high schools and courses underscores the need for teachers with the skills to teach both in classrooms and online environments.
- Work as effective members of learning teams. Teachers will be part of learning teams with a wide range of knowledge and skills, whose expertise is orchestrated to improve learning. Teams consisting of novice and accomplished educators, students, and subject matter experts in the community will collaborate in a blend of face-to-face and online learning that turns schools into hubs in a networked learning ecology.
- Use the full range of digital-age learning tools to improve student engagement and achievement. Teachers will draw on digital technology to customize learning activities

for individual student needs. They will contribute to the continued evolution of these tools and continuously develop their knowledge of how to use them to improve learning.

- Work with their students to co-create new learning opportunities. Teachers must respect their students' abilities to contribute to the work of their learning team; they need to encourage divergent inquiry that goes beyond compliance with monolithic learning standards.

- Use student data to support student learning and program improvement. Teachers will know how to collect and interpret student assessment data to enhance and improve teaching effectiveness, school performance, and student growth.

- Be lifelong learners. Teachers must continuously engage in formal and informal professional development to upgrade their skills in a rapidly evolving knowledge-and technology-based global society.

- Be global educators. Teachers must empower their students to live and work successfully in a globally integrated community. They must engage their students in learning opportunities that extend the boundaries of the classroom and consistently place knowledge acquisition and skill development in a global context.

Work with policy leaders as change agents. Teachers should communicate established research-based education principles to colleagues, parents, and society at large to continuously improve the educational system.

2.6.2.3 Connectivism based Teacher Training

Teaching is a very dynamic field with regular innovations in pedagogy and technology, and this renders professional development an ongoing, life-long process.

Online Teacher Training seeks to provide rigorous personal and professional training to

teachers in the most effective way possible, with a user-friendly platform where they can access the training materials at their convenience. As teachers connect with the leading minds of the educational sphere, the best teachers are those who develop continuously with holistic learning according to the modern trends of digital time.

Teacher education is a complex system. Many contributors are involved, including state legislatures, state educational agencies and certification boards, national and regional accreditation associations, educational professional associations, teacher unions, teacher education institutions, universities, schools, and the federal government. Zhang & Nunamaker (2003) assert that most of stakeholders agree that teacher education must change to meet the needs of 21st century learners, but diverse policy contexts and a lack of shared vision among the stakeholders pose barriers to collaborative action to effect change.

In an effort to develop a shared vision for a true transformation of the teacher education system, over one hundred leaders from a cross section of teacher education constituency groups met at an invitational summit, *Redefining Teacher Education for Digital-Age Learners*, held December 6-8, 2009 in Austin, Texas. Their goal was to initiate a national dialogue on how to develop educators who can prepare students for success in 21st century colleges, careers, and civic affairs. The summit participants concluded that, although there are individual islands of innovation and excellence in educator professional development, concerted and coordinated action by all stakeholder groups is needed to take these innovations to scale. During the summit, the leaders worked intensely, both in small groups and as a whole to :

- Identify the characteristics of a true 21st century educators

- Define the critical elements of an educator preparation program that produces such a teacher
- Identify the institutional, state, and national policy structures that support the creation of these programs
- Develop a national coalition to reinvent teacher education for digital-age learners to identify and resolve challenges to this transformation, and seize opportunities resulting from these challenges

Duke et al. (2013) explain in their study that schools of education and alternative teacher preparation programs must evolve into agile learning organizations staffed by 21st century educators who adapt their practices to a rapidly changing global society. Such changes will require new supporting policies at the institutional, state, and national level.

2.6.2.4 e-Training of Teacher Educators in Digital Age

To a large extent, online training programs in teacher education are shaped by, but are not limited to institutional, state and regional contexts , institutional policies and procedures and professional training associations. Contemporary e-Training program also must be responsive to the dynamic and fluid societal contexts in which they operate. Wombles (2008) narrates that Teacher educators' development programs must strike a balance among the forces in this complex environment as they work to transform themselves into 21st century learning organizations. National and state leaders have a collective responsibility to make this possible. They must balance a culture of compliance and regulation with an investment in capacity building and empowerment that prepares

educators who can prepare students to succeed in 21st century college, careers, and civic affairs.

2.7 Criticism & Gaps

There are many authors who have a positive view of e-learning, for example Rutenbur et al (2000) claim that e-learning plays a critical role in changing the way we work, we learn, and live. Truly learner-centered instruction is now possible through self-paced and flexible courses that allow individual development while creating a knowledge community between learners amongst themselves, and between learners and teachers. In contrary to this, many researchers give strong arguments against e-Learning. Some researchers believe that interaction is an important element in learning Vygotsky, (1978), quoted by Hay et. al. (2004), was Indeed, interaction has been proposed as one of the key parts of any learning experience, some other researchers suggest that on-line education adversely affects interaction, therefore lowering the quality of the educational experience (Abrahamson, 1998; Rahm and Reed, 1997; Sonner 1999, Hay et. al., 2004). Further studies on-line learning indicated that dissatisfaction with online courses resulting from feelings of isolation and lack of interaction with students and instructors (Hay et. al., 2004). Also Murphy (2015) argued that e-Learning technologies can have a negative impact on learning through distraction and that banning mobile phones can improve outcomes for the low-achieving students.

Whenever new or innovative teaching methods are used, it is normal for skeptics and critics to express concerns about the quality of teaching and learning, as e-learning has attracted some criticism. While an amount of research described teachers' perceptions towards a number of technological tools, such as learning management systems (De Smet

et al., 2012), digital learning environments (Pynoo et al., 2012) and blogs (Lai & Chen, 2011). Studies concerning teachers' perceptions of digital tools and devices are limited (Montrieux et al., 2014; Ifenthaler et al., 2013). Although there is relatively little academic research on the use of smart devices, the exceptions include for instance the work of Burden, 2012; Clark & Luckin, 2013; Clarke & Svanaes, 2014; Montrieux et al., 2014; Cumming et al., 2014; and Heinrich, 2012. More research is needed to unpack the potential of these devices, more specifically research that goes further than the sales hype (Faloon, 2013). Specific research including the influence of the novelty effect when introducing digital technologies and devices, is lacking. Regarding the use of digital tools and resources by their teachers in different teaching and learning tasks, the perspective of university learners remains under-researched (Corrin et al., 2010; El-Gayar, Moran, & Hawkes, 2011).

2.8 Online Training Platforms

The online training platforms also called virtual training environments (VTEs) are web-based platforms focusing digital aspects of courses comprising collection of software tools supporting academic tasks of learning, teaching via internet. These online environments have become essential part of educational infrastructure by providing adaptive forms of delivering course content to students as well as tools for them to engage in individual and collaborative work. Teaching in an open online course in which all of the learning activities take place online enables faculty to share knowledge with a wide range of students around the world as well as enrich theirs and their students' perspectives on their disciplinary knowledge. Distinctive features of online learning environments are:

- Delivery and management of course materials
- Access control : usually password based
- Administration : student tracking, collation of marks, records of progress,
- Time-tabling facilities: some explicit means of pacing materials,
- Assessment : usually formative
- Communication on various levels, one to one, one to many, synchronous and asynchronous,
- Personal space for participants to exchange and store materials,
- A resource base : less formal than learning materials, perhaps an FAQ or database accessed by keyword search,
- Support facilities : for instance, online help about the environment,
- Maintenance tools for creating and updating the learning materials.

Despite learning and teaching, teachers' training in higher education is also conducted in online training platforms throughout the world as an emerging paradigm.

Information rich, collaborative and networked online training platforms called Training Management Systems (TMS) proceed as hallmark in digital age by bridging between traditional and digital training which links high quality teaching with high level of digital competencies. Also novel vision of teaching is promoted by adding significance to the training through interactive and motivating activities in digital training environments. Online training environments usually offer similar sets of features which mainly focus content at the center of training system and offer delivery, assessment and activities, collaboration and communication systems which behave as content-oriented elements of an online training.

2.8.1 Learning Management System (LMS)

Learning Management Systems (LMS) have been widely adopted by higher education institutions globally for over a decade. LMS are a special type of information systems focusing on teaching and learning (Wang et al. 2007). They consist of various features that enable faculty members to share learning materials as well as providing interaction with their students both synchronously and asynchronously (Vovides et al. 2007). The most widely adopted LMS in the region are Blackboard, Sakai, KEWL, and Moodle (Unwin et al. 2010). Institutions use the LMS to supplement traditional face-to-face delivery where faculty members develop and share digital learning materials via the Internet.

Educational institutions especially those offering distance education, have been combining LMS with traditional face-to-face delivery in order to reach more learners across various geographical boundaries (Andersson & Grönlund 2009). In light of these benefits, the adoption of LMS by higher education institutions has continued to increase in recent years. Adkins (2013) predicted that LMS adoption will grow at the rate of 15% per annum between 2011 and 2016.. The increased adoption is further facilitated by the support of several international agencies such as the World Bank (WB), Swedish International Development Cooperation Agency (SIDA), United Nations Development Program (UNDP), African Development Bank Group (AfDB), and United States Agency for International Development (USAID) (Farrell & Isaacs 2007). These agencies have been committing various resources to support institutions in adopting and implementing various LMS.

For utilizing LMS effectively, institutions are required to provide reliable, timely, and effective support services to such users. The support services such as training, and several on-going support services are very important in order for users to continue using the LMS installed in the institutions (Moskal et al. 2013). Studies have shown that many users cannot use LMS effectively due to lack of support services. For instance, a study conducted by Unwin et al. (2010) based on a survey found that many respondents (74%) indicated that lack of training and technical support hindered them from making full utilization of LMS features. As a result, they could either not use the LMS at all or used a relatively small number of features. Similarly, the majority of respondents (77.3%) indicated that lack of training hindered them from using the LMS at the National University of Science and Technology of Zimbabwe (Dube & Scott 2014).

In a survey, 76% of respondents in four universities in Zimbabwe (Chitanana et al. 2008) cited lack of training as the main reason behind low usage of the LMS (Bhalalusesa et al. 2013). Teacher training programs also experienced uses of learning management systems (LMS) like Moodle, Blackboard, CourseSites. According to Paragina et al. (2011), LMS are effective platforms for teacher training where not only the trainees but trainers are also facilitated effectively.

2.8.2 Training Management System (TMS)

Many academic and corporate training institutions around the world currently employ Training Management Systems (TMS) to enhance existing training methodologies with the introduction of virtual and mobile learning environments (Gaurav Kumar & Anu Suneja, 2011). TMS involve a complex combination of participant administration, lessons, courses, curriculum and file management, certifications and

report builders, recovery solutions, exams, quiz and assignment design, evaluation, communication tools, progress monitoring and reports, authentication and enrollment methodologies, extension modules, payment integration, social network tools, and email notification systems (Gaurav Kumar & Anu Suneja, 2011). According to the 2009 American Society for Training and Development (ASTD), 91% of those surveyed training management systems in their companies.

2.8.3 Difference between LMS and TMS

LMS is a software solution designed to offer a web-based learning experience to your students. Increasing the efficiency and effectiveness of the training programs, the software helps your students access all the learning materials, training sessions, and assessments in one place (Watson & Watson, 2007). An LMS can store, track and report on learning and training which will help you tremendously in tracking your student attendance and progress and overall course progress right from your screen. Collaborative Learning Tools, User Portal, Trainee Tracking Management, Assessment Management, User Access Control, Test Scoring and Grading and Trainee Behavior Tracking are some of the features comes with an LMS software. Parr & Fung (2006) portray distinctiveness of LMS as:

- Easy learning experience - The system allows your students to find all the learning materials and assessments in one place and access anytime anywhere.
- Easy student tracking - As the software comes with advanced tracking tools, you can see how many students are following each course, each of their progress and more with a click of a button.

- Easy collaboration - With online forum feature of an LMS enables your students and teachers collaborate easily.

A TMS (Training Management System) is a modern tool which helps you in managing all your back-office tasks of your training centre. This includes managing your courses, students, employees, resources, finances and more. What's special being the LMS module comes with the TMS, the software helps professionals tackle all the learning management and administration operations with one software. According to the American Society for Training & Development (Learning Circuits, 2005), TMS is a modular software comes with functional modules such as Student Management, Finance Management, HR Management, Registration Management, Online Trainee Portal, Inventory Management and more.

According to Cozzi (2004), some of the benefits of a TMS are:

- Saves a lot of administration time - Giving you access to every single information from student to inventory management the system saves a lot of time waste in entering, analyzing and finding data.
- Simplify administration process - When you can view every transaction, every process and progress from your screen administrations become simpler, easier and more accurate.
- Inbuilt LMS - When you have an LMS inbuilt within your TMS your extra money, time and effort for several systems purchasing and integrations will be saved.

- Track and report - Reporting and analyzing tools will produce in detailed reports within seconds for you.

Pradeep (2016) in his study maintains main differences between LMS and TMS. He writes that LMS is all about courses and learning management, while a TMS can help to manage all the administrative processes including learning management. If organizations are looking for a way to improve learning management system, LMS is a good option but challenges in the administration of trainings are the biggest problems to be solved TMS is the best option.

2.9 Other Online Training Applications

In scenarios of teaching and learning, terms such as Web 2.0 (Greenhow, Robelia & Hughes, 2009), social networking (Livingstone & Brake, 2010), social software (Owen, Grant, Sayers & Facer, 2006; Minocha, 2009) or simply the internet are used. Web 2.0 is the most frequently used term in relation to social media, however it's meaning has changed over time, and is often mistakenly used by teachers and academics to refer to any dynamic website regardless if it involves social, cooperative or collaborative interactivity. As narrated by Henderson, Snyder & Beale (2013), 'Social media' and 'Social Networking applications' are mostly recognized as phenomenally adequate in literature because of emphasizing social interaction, reflecting the authors' interest in leveraging the unique affordances of the technology in facilitating students, teachers and others working with each other for a variety of purposes.

Online platforms, according to Kaplan and Haenlein's (2010), are web-based learning environments with groups of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User

Generated Content'. These interactive applications encompass, amongst others, social networking services (e.g. Facebook), blogs (e.g. Blogspot), Microblogs (e.g. twitter), wikis (e.g. wiktioNary.org), forums (e.g. minecraftforum.net), video sharing (e.g. YouTube), and image sharing (e.g. Flickr) enabling people to connect for purposes of 'collaboration, contribution and community' (Anderson, 2007). This also includes virtual worlds (e.g. SecondLife) and massive multiplayer online role playing games (e.g. World of Warcraft) however these have been excluded from this review due to their diversity and complexity which require a more detailed response than can be given here. It is important to recognize that wikis, blogs and other social media can be used in ways that take no advantage of the technology's social affordances. Zywica, Richards & Gomez (2011) state that the researchers have noted the use of Facebook by teachers to inform students of upcoming assessments. However, the same task could be accomplished by email, and does not leverage the networked environment beyond the fact that a network exists. As a consequence, this review carefully excludes or otherwise considers critically those studies where social media are used essentially as one-way publication or broadcast sites. We recognize that such usage may be highly valuable (e.g. the use of a blogging tool to create a portfolio of learning for self reflection and assessment), however, as we sought to understand the particular opportunities and implications arising from the social interactivity afforded by social media, for the purposes of this review they are not included (Geer & Sweeney, 2010). The focus then of this article is not the use of social media for just communication, but rather the use of social media for meaningful interactions, particularly characterized by cooperation or even collaboration.

2.10 e-Portals

e-Portals are web spaces or platforms used within training management systems. A web portal is specially-designed web space which offers information from various sources in a unified single path (Khalil, 2013). One of the major and most practical applications of such portals is providing a quick response over user's requests. A User Interface (UI) and appearance of a web portal can be displayed as a representative of the content, data, and information included in a site. Coombs (2010) narrates that UI may be demonstrated relevant to layouts and styles, and it may changes during each access. Such changes may be managed by users and portals. Mostly the system selects a design to filter the information for the user, and gives them the ability to navigate through content and pages. Ouadoud, Chkouri, & Nejjari (2018) suggest that for being able to develop a practical eLearning portal, first, one needs to understand the theoretical background about the eLearning portals, their purposes, and functionalities, and the features which the current competitors offer.

e-Portals promote learning via utilizing electronic technologies and resources to access educational curriculum outside of a traditional classroom in purposefully built online training environments with specific training goals. According to Gleson (2002), it refers to a course, program or degree delivered online as digital content. Furthermore, eLearning portals are online systems to provide courses and material to the students who are the audience of such portals.

Learn Share (2013) demonstrate some of the benefits of e-Portal. By the advent of e-Portals, quite many limitations for educational institutes are history now. In the following, the major benefits of using eLearning portals will be discussed. eLearning

materials may be made accessible to the students throughout the day. Such fact makes it possible for students to learn the subject at their own pace and in comfortable environment. Also, unlike conventional learning methods where classroom environment is provided, eLearning ensures the students may complete their studies sooner which such fact leads to enhancing productivity. Once the material of a course is ready, the system may offer the course over and over again. Such a fact will increase the total number of participants could lead to greater financial benefits both for teachers and educational institutions. As a result, the cost of courses for end users, who are students may also be lower. By developing a self-assessment system, a sizeable amount of time from teachers will be saved. Therefore, they may focus their time and resources on providing more beneficial content and material (Nag, 2005). Since it will be up to the students that from where and when they want to start and continue their study tasks, it will lead to a more productive study plan.

2.11 Difference between LMS and e-Portal

Both terms are often used interchangeable, there are situations when LMS is a better choice of words than e-Portal. The most important keyword regarding a learning management system is learning. An LMS is used by teachers and administrators to create courses, assess students, and monitor their learning. LMSs were created to respond to the administrative and managerial needs of schools and universities.

Regarding the e-Portal, being a Training Management system, the stress goes on the word training management, as it is like a gateway between training managers, the trainees and the training content. Ane-Portal is all about the users and their learning needs.

An e-Portal addresses a specific audience.

The same LMS can be used by a kindergarten, a middle school, and a university. Since the age of the students is so different, but e-Portals differ according to the needs of learners. Jezagou (2015) says that each educational institution can pick and choose the LMS features they need in order to create engaging online training courses for their teachers, and personalize their e-Portals.

A learning portal is all about personalization

Organizations can use e-Portals to design personalized training paths for their teachers according to the organizational needs. Haug & Wedekind (2013) write that once trainees log in, they can see personalized dashboards with various aspects like enrollment, training track, objective-oriented training content, training activities, badges, and certifications etc.

2.12 e-Portals' Utilization For Teacher Training

Growing momentum towards online training approaches and resources, and advances in technology-enabled professional training have resulted in the emergence of a plethora of digital platforms and e-Portals which offer easy access to online professional courses, resources and course materials for teachers across the globe, and allow the educators to undertake a vast range of courses online. E-Portals specify an entry point for retrieving information on a single platform. Knowledge is imparted through the gateway of e-Portals that support two ways sharing of knowledge and content, creating a collaborative environment for learning. James (2002) gives a useful metaphor saying that “building an e-Portal is like preparing a meal for someone”, as an e-Portal is an application which associates the web pages together by gathering information from

diverse sources and presenting them in a unified way. Learners effectively share information and work together on projects using a common gateway of e-Portals. The intuitive and familiar interface enables the learners to personalize their learning and creating strong learning-partnership which the participants of learning communities. E-Portals streamline the administration of all the events conducted within them without disturbing or challenging the management of whole LMS functions.

Papazoglou, Traverso, Dustdar & Leymann (2007) have presented a design framework for the development of e-Portals in a higher education institution having differentiating features of knowledge management, learning and student management, and e-Portal technical overall management, shown in Figure below:

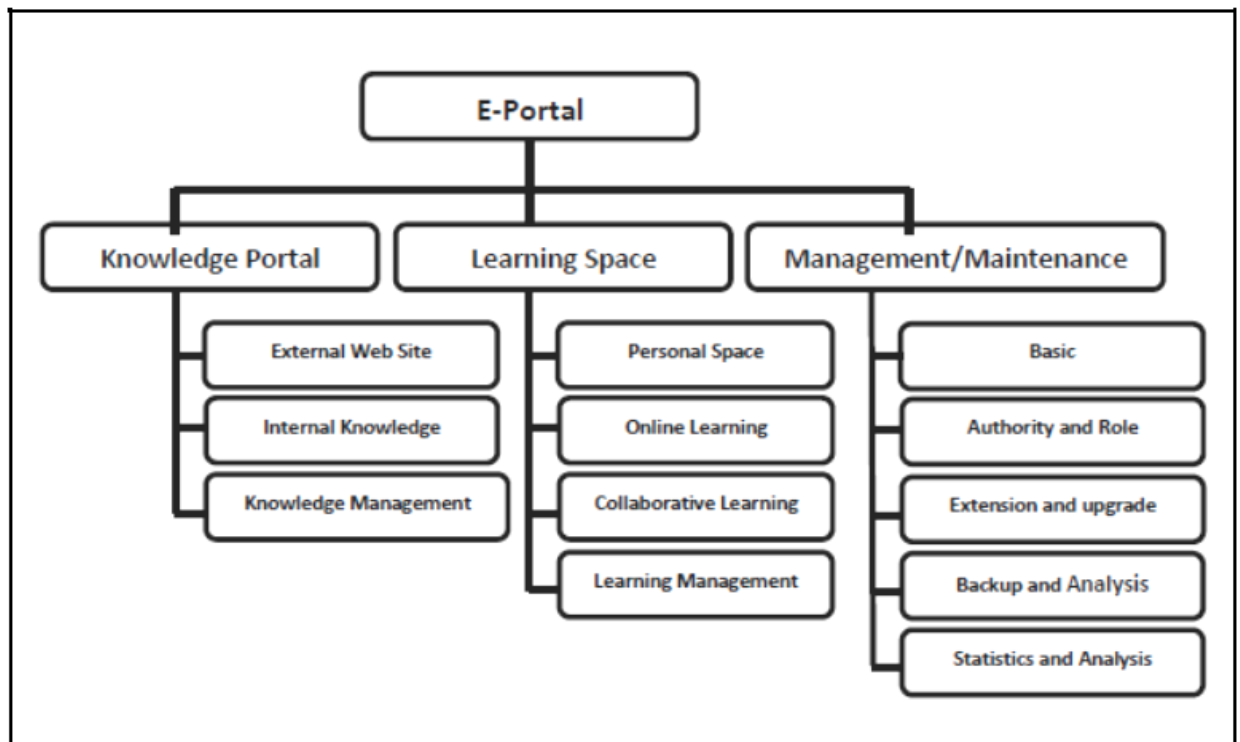


Figure 2.9 : Features of e-Portals

The e-Portals integrate basic learning tools and functionality such as various knowledge construction communication resources, online video and audio support, configuration support for learning communities, and integration new components without redeveloping and modifying the software of LMS. Within e-Portals, the most important element is the learning community where the processes of learning and instructional guidance take place under specific authority settings and within various roles. The instructors in the e-Portal are responsible for the configuration of the learning community. They are normally recommended to get prior training in how to administer the e-Portal framework and how to get a proper understanding of the pedagogical methodologies and educational structure of the e-Portal. Though much has been written about features and usage of e-Portals in teaching and learning practices; the area of utilization of e-Portals in the effective enhancement of digital literacy and digital competencies of teacher educators in the Pakistani context requires much more research.

2.13 e-Portals Used In Different Countries For Teacher Training

e-Portals are widely used in teacher education of different countries in the world to conduct and promote online professional training programs of teachers and teacher educators as well. Literature provides evidences of utilization of e-Portals for teacher trainings as shown in table below.

Table 2.15 : e-Portals used for teacher educators/teachers training

Sr. #	e-Portals for Teachers Training	Organization/Country
1	Iten	e-Portal for inter-American teacher education Network, USA
2	SOFTICA	e-Portal for online teachers training, Ukraine
3	QEP	Drake University, Iowa
4	ProEd	e-Portal for Professional Educators' training, Tennessee, USA
5	OTT	Teachers training portal, Oxford University, UK
6	PEGE	Promundo teachers' training for gender equality, Portugal
7	IOL	Inclusion online Learning Portal, Victoria State Govt., UK
8	UTT	Ubiquitous Training for Higher Education Teachers, Mexico
9	NCTE	e-Portal of National Council for Teacher Education, India
10	MEROLT	Teacher Education Portal, California State University, USA
11	e-Teaching.org	e-Portal for Digital technologies to improve teaching, Germany

2.14 e-Portals, Connectivism & e-Training

A recent theory under discussion is connectivism (Downes, 2006; Siemens, 2004). According to Siemens, connectivism is the integration of principles explored by chaos, network, complexity and self-organization theories. Due to the information explosion in the current age, learning is not under the control of the learner. Changing environments, innovations, changes in the discipline and in related disciplines all suggest that learners have to unlearn what they have learned in the past, and learn how to learn and evaluate new information. What must be learned is determined by others and is continually changing. And since machines are becoming smart with the use of intelligent agents, Siemens also asks whether, in fact, learning may reside in machines. Some knowledge will reside in machines while some will reside in humans. The challenge for educators, therefore, is how to design instruction for both machines and humans, and how the two can interact with each other. For example, if there is a change in a procedure on how to use a machine, the wireless capability in the machine will allow the updated procedure to be downloaded into the machine's memory. When a learner goes to interact with the recently updated machine, that learner will be informed that the procedure has changed and that the machine will guide them through the procedure (Siemens 2004).

According to Siemens (2004), connectivist theory is for the digital age, where individuals learn and work in a networked environment. As a result, we do not have control over what we learn since others in the network continually change information, and that requires new learning, unlearning old information, and/or learning current information. Siemens proposes some guidelines for designing learning materials for the learner, based on connectivist theory. Below is an elaboration of these guidelines for the

development of online learning materials. Because of the information explosion, learners should be allowed to explore and research current information.

Learners of the future need to be autonomous and independent learners so that they can acquire current information to build a valid and accurate knowledge base. Appropriate use of the Internet is an ideal learning strategy in a networked world. Some information and procedures become obsolete because of changes in the field and innovation; learners must therefore be able to unlearn old information and mental models and learn current information and mental models. The information that is valid today may not be valid tomorrow. According to Ally(2005), the rapid increase of information available from a variety of sources means that some information is not as important or genuine as other information. As a result, the learner must be able to identify important information from unimportant information. Learners must have the ability to recognize what knowledge is no longer valid so they can acquire the new knowledge for a discipline. This requires that learners keep up-to-date in the field and be active participants in the network of learning. Because of globalization, information is not location-specific, and with the increasing use of telecommunication, technologies experts and learners from around the world can share and review information. Learning and knowledge rests in a diversity of opinions. As a result, learners must be allowed to connect with others around the world to examine others' opinions and to share their thinking with the world. Mobile learning promises to help learners function in a networked world where they can learn at any time and from anywhere.´

The world is connected by telecommunication technology. Hence, information for learning should not be taken from one source but should be assembled from many

sources to reflect the net worked world and the diversity of thinking. Learning should be delivered in a multi-channel system where different communication technologies are used to deliver the learning materials to facilitate optimal learning (Mukhopadhyay & Parhar, 2001). The field of digital technologies is altering the learning process. The intelligent agents that are being built into devices and appliances will affect how students learn and where they obtain their learning materials.

Hence, what learners need to learn depends on the type of equipment they use and their prior knowledge. Because of the information explosion, learners of the future must be willing to acquire new knowledge on an ongoing basis. Online teaching strategies must give learners the opportunity to research and locate new information in a discipline so that they can keep up-to-date in the field. In addition to using the Internet to deliver flexibility, instruction must be designed for experiential and authentic learning (Schmidt & Werner, 2007). The Internet is expanding education into a global classroom, with learners, teachers, and experts from around the world. As a result, learners must network with other students and experts to make sure that they are continually learning and updating their knowledge. As a result of innovation and our increasing use of technology, learning is becoming more multidisciplinary. Learners must be exposed to different fields so that they can see the connections between the information in the fields. For example, learning about learning theories requires that learners be exposed to what the research says in psychology and information technology. Siemens (2004) suggests that because of the networked society, globalization, and the constant changes to information and new information, educators need to look at new ways to design learning materials. He proposes a theory based on connectivism to prepare learners to function in the digital and

networked age; however, further work needs to be done on how this theory can be used by educators to design and develop learning materials.

2.15 Need To Develop e-Portal

Open source software (OSS) has gradually entered the field of education to meet the need of affordable and customizable tools. Many countries have paid great attention to the development of open source software for education. However, many problems occurred in its application, which hindered growth, particularly in developing countries. This was especially true for Learning Management Systems (LMS) (Ssekakubo, 2011). E-Portals have gained rapid popularity in recent years. Most educational institutes of Europe or North America have either obtained commercial e-Portals or adapted to open source. Eventually, open source e-Portals gained more popularity, as they provide more flexibility and support than commercial or self-developed tools (Paulsen, 2003). Rise of e-Portals for professional development purposes is a good example of how one open source e-Portals can meet the need of a large number of teacher training institutes (Lakkhan, 2008). However, these open source tools were not popular in developing countries of Asia and Africa. Although it had more aspect in these countries because of affordability and flexibility.

Organizations take a lot of considerations into account with regards to whether they should build training portals in-house, or buy e-Portal software and customize it for their training purposes. There are many reasons why an organization might choose one over the other. On one side, there is the process of developing everything needed, ensuring that the platform fully fits the look and the usage of the company, while on the other hand there is the cost-effective method of finding an e-Portal that will be able to fit

an organization's needs. When deciding whether to build or buy an e-Portal, there are several things to consider when deciding what best suits organizational or institutional needs.

This process allows for the creation of a more customized system that can have an exact fit in the company. This is because, there is direct contact between the software team and the people that would be using the system and so they can tailor the system in a way that it could incorporated some or most of the wishes of the users. This approach requires that the company possesses a group of or team of programmers, business analysts etc. that work closely together within the company with a common reporting line, which makes it easier to coordinate between teams. The individuals in the team should be experienced in developing and implementing IT system and have a thorough understanding of the company's business processes and once it is implemented they should be able to maintain as well as improve the system and adapt it to changing business requirements.

2.15.1 'Development' vs 'Off-the-shelves/Open-source Acquisition' of e-Portals

Organizations always have options to develop their own training portals or to charter from open-source. Ruchkin (2012) prefers the development of software by organizations as their internal option where an organization performs all developmental phases itself. Hissam, Seacord & Lewis (2002) confer building in-house software as better choice for flexible development, easier transformation of goals, and desired version of environment. Whereas Meyers & Oberndorf (2001) argue that buying, outsourcing or hiring software may be considered less flexible due to potential disparity between organizational needs and acquired system. Sai (2003) narrates that compatibility of in-

house built software with organizational patterns, costs of development and deployment should be properly estimated. In-house development is more predictable than relying on out-sourcing a software because of internal data ownership (Brownsword, Sledge & Oberndorf, 2010). Alves & Finkelstein (2003) further write that scalability is possible for in-house built applications as those own the capabilities of modification and adjustment if organizational requirements are not properly met or expected to change. Ever changing organizational environment produce massive requirement-related gaps which are possible to be elucidated by internally built applications (Allman, 2012). Paul Leavoy, Senior content manager at Docebo also inscribes the potential benefits of building in-house applications in terms of costs, innovation, ownership, branding, organizational preferences, scalability and deployment.

Erdem (2013) narrates that if a web application well-designed, and purposefully developed and used properly, bestows competitive and effective advantage to the organization. The main benefit of in-house built software system is flexibility gained from determining design and development of the software applications (Erdem, 2013). According to Ibrahim & Silong (1997) purposefully internally built software applications ensure contextual and cultural compatibility. In-house built online learning applications are better because open-source online application may not possess the capabilities of standardization and interoperability (Bianco et al., 2005; Pina, 2010; Leal & Queirós, 2012).

According to Ruchkin (2012) a decision to build application in-house was firstly decided in 1996. Oneto et al. (2009) suggest that educational institutions can tailor online system to fit unique needs of their learning programs. Many universities have developed

their own online applications (Mikulecká, 2005) ensuring the advantages of flexibility and unique requirements fulfillment (Alma, Koc & Coskun, 2016). In addition to that, Trimi et al. (2005) mentioned that the greatest challenge of open-source online applications is the costs related to systems implementation which includes investing to acquire software, hardware, consultant fees, in-house staff (in charge of the installation process), staff operating on the system and finally the user training which is considered a very important cost influencing factor.

In educational scenarios, higher education institutions design and develop online learning systems or migrate from off-the-shelves open-sources systems to their own. MacNeill & Kraan (2010) established that many UK-based HEIs reviewed their existing LMS only because of adding the new academic and organizational requirements like more administrative integration, pedagogical changes, emergence of web-based online learning and teaching trends and massive access to social networking sites for learning purposes. Massey University in New Zealand obliged to modify their in-house LMS by adding properly structured teacher-centered approach to flexible online environment, which made it significant to utilize institutional branding across variety of courses (Brown et. al., 2010). Waikato University also developed their in-house online learning system to overcome the narrower functionality and ownership issues faced by open-source LMS (White & Robertson, 2009). If an online platform like e-Portal may be developed for teacher education institutions, it may function as a brand for all TEIs nationwide because, according to (), it can provide a competitive edge to share this platform amongst other learning organizations and knowledge share may be made

possible by still maintaining all the educational processes unique to the programs (Virginia Tech, 2015).

2.15.2 Pitfalls of Open-Source e-Portals

Both in-house and outsourcing practices have been in use all over the world since last few decades with all their advantages, disadvantages and risks associated with them. Decisions for in-house development of e-Portal are taken when the disadvantages of using open-source/free/out-sourced online applications are studied in detail. Some of the pitfalls which incline organizations to move towards in-house development of online applications are followings.

i- Un-scheduled System Shut Down

In point of view of Alves & Finkelstein (2003) it is complex to predict and accommodate the technical failures and shutdown problems of open-source or out-sourced applications.

ii- Organizational Risks

Open-source application are being modified on continual basis which can make it difficult to ensure that the application is compatible with organizational needs and context. Buying or acquiring an open-source e-Portal may lock in certain processes and features embedded in them (Meyers & Oberndorf, 2001) which might cause risks to the organizational goals because the ingrained processes might inflict not an optimal approach for organization to be orderly organized.

iii- Maintenance &Up-gradation Issues:

Maintenance support and activities are bought from vendors who have significant influence on clients' system maintenance and upgrade activities (Ng, Gable & Chan, 2003). When clients receive upgrades or maintenance for the software, there is no guarantee that it will include what you need from it. Additionally, with any software system that is not built specifically for your program, you face the threat of an unwelcome change in the software. According to Clapp & Taub (1998), the new version forces changes in the operational capabilities of the system because it no longer supports those capabilities in the same way or at all.

iv- Deployment Issues

According to Alam & Soomro (2016), platform incompatibility and non-availability of support for new technology and hardware can lead deployment complexities. Haider et al. (2016) propose that a highly expert team and in-time problem solutions are required for handling the deployment issues so that working of application may be made smooth.

v- Utilization Complications

Open source web portals and LMS has been exceptionally reprimanded for its absence of ease of use. Generally, the innovation is not inspected by ease of use specialists and does not gratify to the larger part of the computer user (Koohang & Harman, 2005). In opinion of Coppola & Neelley (2004), Open source application is generally designer driven, and without framework organization experience or the learning needed to control programming language, utilization of the software and capability

to alter bugs as they emerge is regularly restricted to those with specialized ability. Open Source e-Portals, in most cases, can be extremely complicated to use, especially for beginners. The user interface is usually complex and not user friendly which makes it difficult to administer. Further, they tend to have an overly complex deployment procedure and it needs technical skills and knowledge to upgrade and customize the e-Portals.

vi- Technical Support Issues

Unlike the commercial e-Portals, many e-Portals do not come with a dedicated technical support. Most support is forum based, and it is often hard to find a solution within a stipulated time frame. As the customization and administration of an Open Source e-Portal is organizational responsibility, organizations have to do de-bugging and upgrading of software on their own (Singh & Jha, 2013). There are tutorials available on the internet, but it may take time to understand them and solve the problem. You will need to have a dedicated technical team for administration and support or you will need to hire someone to do it for you but it will again cost you money.

vii- Hidden Costs

Many organizations do not take account of system and network management tools as part of the cost of their open-source e-Portals deployment. According to Sissons & Westoby(2010), for acquiring and integrating many required features and functionalities, organizations do

not commonly anticipated additional expenditures of such managerial, functional, user-centric, interface-related tools. Though an Open Source e-Portal does not have any license fee, there are other costs like setup and hosting fees, customization cost, support and maintenance charges, and upgrade cost that you have to incur while implementing one. Fish (2016) in a whitepaper narrates that organizations have to manage the maintenance and support on their own or they have to hire someone to do it for them which will cost the organizations money.

viii- Need Technical Expertise

Open Source Learning portals are not ‘out of the box’ solutions. Right from installation to deployment to administration and support, they need a dedicated technical team to manage all e-Portal activities. According to Zhang et al. (2004), if a team of experts with the ability to benefit from open source technologies is absent, licensed software is preferred, and entry cost of this software is high. At many organizations, it can be difficult to have someone with dedicated time for e-Portals, especially with small IT departments.

ix- Irrelevant Content/Features

Open-source web portals and LMS comprise many features which are not always required by all the client organizations to fulfill their usage purposes (Abrar & Andy, 2008). Open-source software applications comes with standard features, which are not the requirement of all the organizations and make the system complicated for use e.g. United Arab

Emirates is a tax free country but all the accounting software or known ERPs come with this feature.

x- Control Risks

Taking software application from someone else outside the organizations means losing control over acquired application. As argued by Khan & Khan (2014), Outsourcing organization possess and share the controls ultimately shifting managerial authority to the hands of the outsider organizations, which means home organization cannot manage and control the processes according to their own goals and culture (Rowe, 2008).

xi- Replication Issues

Replication entails the process of making and maintaining duplicate versions of database objects in the system of distributed database (Moiz, Sailaja, Venkataswamy, & Pal, 2011; Oo, Soe & Thinda, 2010). Any database management system behind an open-source online application manages multiple copies of database instances. Cecchet (2008) narrates that Data duplication issues arise when open-source application fail to manage independent database instances each time so redundant data instances lead to serious issues of data security and recovery.

xii- Copyright & Legal Licensing

The fundamental purpose of open source licensing is to deny anybody the right to exclusively exploit a work. In a research study, Wheeler & Dunn (2013) report that selecting a licensing scheme of open source online software is of more concern and need a little more technical understanding

of different types of licenses. One should know their rights for the source code they are using. Online application's license is not necessary to be a contract but still we have copyright to protect our work (Alam & Soomro, 2016).

xiii- Security Risks

Confidentiality and privacy of the organizational data and customer's privacy is also at stake because a lot of confidential data has to be provided to the external organization (Rowe, 2008). Sometimes due to secrecy, security or to minimize risk the things are not provided in black & white form so due to this the result never meet up to the maximum.

xiv- Interoperability Issues

The main strength & most challenging part of open source software is interoperability. Integration of an open source software into current system is a major concern, as according to Leal & Queiros (2012) either the open source e-Portal will be integrate-able into the existing system or not and up to which level it is interoperable? are the main concern.

2.15.3 Distinctive Characteristics of In-House Built e-Portals

Following are the characteristics which prompt towards development of e-Portals in-house by superseding to acquire online applications from open-source due to their sizable pitfalls.

i. Ownership

The organization possesses the ownership of the developed system in addition to its source code and the knowledge acquired during developmental phases Setende (2012). In thriving organization, all employees have aligned interests and share the same vision. It means that they will give their best to meet the company's goals. Such a commitment is hardly possible with freelancers who are not fully involved in your business.

ii. Copyright

Organizations that build in-house online applications rather than acquiring from open-source, copyright is obtained by the simple act of creating the original work (Bourgeois, 2014). According to Cummings, Zagrodny & Day (2015), owner organizations are in position to bring legal action against someone who has used a work without permission.

iii. Security

Mushi (2008) infers that for ensuring goals and target achievement by organizations, there must be cost-effective means of making certain that the in-house developed online applications like e-Portals or LMS installed in the organization's computers are adequately secured to provide reliable and accurate and reliable processing and functioning. Mushi and Bukhari (2012)

state this can be achieved by integrating source code scanners in the early stages of information systems development life cycle. Organizations continually take risk management measures for making the source code, organizational data and users data ever-secure (Metcalf, 2016). Legal and ethical issues of data sharing are controlled in own software system/applications as there is no risk of exposition of confidential data of organization. Risk analysis is also controlled by the organization itself.

iv. Organizational needs

Having in-house development, developers team is usually more productive to develop and implement a system which means to fulfill specific organizational needs. According to Nitman, 2010), it makes available a developed software which is more customized that can have an exact compatibility with the organizational context and culture and fits just to the business requirements of organization (Setende, 2010).

v. Services Timeframe

There is a relationship between the development team and the user base which helps in communication and expectation delivery. Developing a product in-house enables you to monitor all the steps in the process. If something goes wrong, you can spot it immediately. Turnaround time in fixing the problem is shorter than it would be in the case of outsourcing.

vi. Deployment Facilitation

Existing technology support for the thick client architecture: popular implementation frameworks of that time favored the client-server paradigm.

Hence, Spice (2016) describes the initial development investment was low, and the system was quick to deploy.

vii. Technical control

Organizations have their own IT teams for technical support of software for any updation, maintenance or up gradation tasks. Bourgeois (2014) relates that owner organization provide technical support teams and get technical control of e-Portals by their own by disallowing and avoiding external bodies interference.

viii. Managerial control

It gives you full managerial control over the system and its functionality (Reeves, 2013). Organizations do not wedge on others' development roadmap as they recurrently append un-necessary features and functionalities. you don't care about, or delay release of features that would make a big impact on your bottom line

ix. Cost effectiveness

Although developing own software costs expensive but it's a onetime expenditure. When organizations have own software, there is no need to spend money for updation, Operationalization and maintenance time to time (Bogelsack et al., 2011). It also saves hosting expenditures and hidden charges which outsourcing companies charge again and again in a time period. Annual expenses are controlled. Trimi et al. (2005) stated that organizations adopting open-source online systems face a lot of financial challenges, e.g., change management, costs related to cost of infrastructure,

software licenses, consultant fees, in-house staff time, operating costs and user training costs.

x. Reliability, economy & efficiency

Developing own e-Portal gives the organizations the freedom to efficiently decide what features to include, and not include which makes in-house developed applications more reliable and efficient (Elragal & El Kommos, 2012). Moreover Kim et al. (2009) argue that building custom software in-house is less expensive than contracting for the same software, because you don't have to pay the contractor's profit. The main benefit is control, and the opportunity to develop your own competitive advantage over time.

xi. Independency

Developing own in-house e-Portals avoids the dependency issues on outsourcing companies for any sort of queries or problems during the application usability (Rao, Nilekani & Mousavi, 2014; Livari, 1990). Organizations become independent in running their tasks with their own online systems.

xii. System shut down handling

As outsourcing companies continuously shut down their systems for different purposes, it causes loss of data or disturbance in the scheduling of organizational tasks (Ruchkin, 2012). Having own software, organizations handle system shut down issue amicably with prior intimation without any loss of precious data.

xiii. System Stability

Ruchkin (2012) states that if organizations are developing a product or a solution which will require a long-term commitment, then it's better to build the team of developers in-house. They can be fully committed to this product, know it inside out, and easily and quickly make changes or fixes when needed.

xiv. Customization

A custom built system can possess certain functionalities that could not be available in the vendor systems that could provide the company with competitive advantage. (Nitman, 2010). According to Setende (2012), in-house development of software application allows for the creation of a more customized system that can have an exact fit in the company. This is because, there is direct contact between the software team and the people that would be using the system and so they can tailor the system in a way that it could incorporated some or most of the wishes of the users.

xv. Scalability

Top management keeps on requesting to add new features (Mohamed, Ruhe & Eberlein, 2007). In-house built applications contain scalable architecture (Ruchkin, 2012) and suitability of ready-to-deploy newly added components (Li et al., 2006). Alves and Finkelstein (2002) contend that if requirements for the system are expected to change internally-built software application might be a better solution to embed required variations. In the organic case

it is at least theoretically possible to evolve a system for the new needs, while many commercial solutions cannot be changed sufficiently

xvi. Interoperability

Interoperability is an overlooked feature of online applications like e-Portals (Leal & Queiros, 2012). The interoperability features of a system, as described by Elvesæter et al. (2006), reflect the operational environment where it is expected to be deployed. The operational environment of an e-Portal includes different systems and services with which it may have to communicate and exchange data. Robert et al. (2019) suggest that interoperability should be built into the workflows of relevant institutional systems, including administrative processes dependent on such metadata.

xvii. Branding

According to Ghodeswar (2008), a brand is an identifiable software application augmented in such a way that the organizations perceive relevant and unique to match their organizational needs most closely. In-house built e-Portals may be used as a brand between educational organizations to fulfill their institutional goals.

xviii. Simplicity of Initial Functionality

The internally-built system provided only basic support for information exchange with only few complicated business rules. Therefore, these rules are easy to change (Brownsword, Oberndorf & Sledge, 2010). Simple functionalities may be enhanced afterwards on the basis of needs and requirements.

2.16 Development of e-Portal for University Teacher Educators

An effective professional learning program depends upon a great deal of work, analysis, and management at all levels. An e-Portal is a sophisticated tool that can help create a space for educators to connect, share, and learn what it takes to make for exceptional student experiences in the classroom and online. During online trainings, e-Portal allows teacher educators to build and adapt a course or curriculum continuously, over many iterations. Edits to course offerings, the manner in which it's delivered can all be analyzed to determine the impact on learner engagement and success with actually learning the material. With version history, administrators and educators can re-use content that has shown success, mapped to student data and outcomes. With this methodology, courses can be continuously improved and made more effective to ensure that professional learners have the greatest chance at success.

Providing teachers educators in universities with the course content they need, when they need it, requires a great deal of managerial effort. By providing learners with a single location to find all the professional learning resources they require can save them time and energy, and help increase their chances at learning success. Using an e-Portal allows educators to complete their training and professional learning at a pace that suits them best. Instructors can more realistically get through their day of teaching and learning when they can access professional learning content through an e-Portal. This means that they can work where and when suits them, including offline and on their phones.

Teacher educators will become more comfortable and confident using an e-Portal as training environment, which in turn can reflect on the manner with which they use the

same system in their classrooms. Educators can develop a deeper empathy towards their students by sharing the same experience with learning through an e-Portal. Like their students, educators need to have varied content, deep engagement, and moments of self-expression. Providing a single location for student, teacher, and staff learning can create an environment of learning success, supported by the entire community. As pedagogy shifts towards the blended learning environment, educational institutions will be at the center of this community and be education technology leaders of the future.

Teacher educators are passionate about the work that they do. Professional learning programs seek to create communities of educators across schools, districts, states, and even the globe. The more stakeholders involved in sharing and communicating new pedagogy, the better for the success of their students. An e-Portal used at the institutional level can enable teacher educators to share resources, develop their own professional learning courses, and communicate with ease and efficiency. It will ultimately be reflected by the student teachers in teacher education institutions or departments at universities.

Teacher educators have to cope with many different challenges during their online professional training programs. e-Portals are used to organize access to on-line training of teacher educators throughout the world as e-Portals have possibilities for creating closed rooms where teacher educators can collaborate without the barriers of location and others.

Teacher education of Pakistan needs a systemic revolution to integrate online and digital technologies so e-Portals are better choice to coop with the need. Rather than hiring or outsourcing e-Portals from developing companies, it is always a better choice to

develop own e-Portal for online training of teacher educators. This strategy is crucial to overcome all the disadvantages and limitations of outsourcing e-Portals from business companies. e-Portals in teacher education work on the principles of e-Learning systems design and development. Therefore it is important to consider critical success factors of e-Learning system design for a purposeful and corrective development of e-Portal for training of university teacher educators.

2.17 Critical Success factors of e-Portals as e-Learning system designs

The developments of computerized management systems are expanding over the past years and most of these systems are increasingly replacing the manual system. As depicted by Frimpon (2012), “critical success factors (CSFs) are variables that are fundamental to the success of the design and implementation, and an organization must handle these CSFs well in order to have a successful implementation”. These factors are fundamentals and indispensable for successful organizational strategies. Critical success factors steer the strategies forward. According to Schreurs (2009), critical success factors for E-learning framework occupy an underlying functioning in the design and development of supportive, upholding, and cost-effective digital system in education. As Schreurs (2009) argues that critical success factors are illustrious than other factors which may be important but not imperative and domineering ones for the success of E-learning framework. He further states that if all the factors may be represented by a pyramid, the critical success factors stay at the topmost level.

Researchers reveal that there exist many categories of factors, requirements, and standards which are desirable for designing and development of E-learning systems in higher education. CSFs mention the key areas which are vital to be activated and must be

accomplished to achieve the mission and goals of E-learning in HEIs. The influential factors affecting the success and quality of E-learning has been referred by many researchers. Many studies have highlighted the critical success factors, some of those are:

2.18 e-Portal Development Process

The description of process given here is intended to cover both complete software applications and their individual components. There are important aspects of application-level process that are not covered here. For example, iterative development is an important approach that allows development to proceed while permitting some changes in requirements.

For experienced software developers, the component-level process is often less conspicuous, involving well-established and automated patterns of thinking. This does not diminish its importance. Software developers need good automated thinking habits to free their minds for dealing with more complex issues.

2.18.1 Phases of e-Portal Development

Livari & Juhani (1987) suggest some of the activities in the software development process are sequential in nature, dividing the process into the following phases.

- **Requirements analysis** - specifying the functional capabilities needed in the software. Use-cases are an important tool for communication about requirements between software developers and their clients. Products: software requirements documents for the software Objectives: capture the client's needs and wants
- **Domain analysis** - developing concepts, terminology, and relationships essential to the client's model of the software and its behavior. Conceptual-level class

diagrams and interaction diagrams are important tools of domain analysis. Products: client-oriented model for the software and its components Objectives: capture the client's knowledge framework

- **Client-oriented design** - specifying components of the software that are visible to the client and the components' behavior in terms of their attributes, methods, and relationships to other components. Specification-level class diagrams and interaction diagrams are important tools of client-oriented design. Products: client-oriented specifications for components Objectives: define the structure of interactions with the client, providing methods that satisfy the client's needs and wants, operating within the client's knowledge framework
- **Implementation-oriented design** - determining internal features and method algorithms for the software. Products: implementation-oriented specifications for components Objectives: define internal structure and algorithms for components that meet client-oriented specifications
- **Implementation** - writing and compiling code for the individual software components. Products: source code and binary code for software components and their test software Objectives: produce coded components that accurately implement the implementation-oriented design
- **Integration** - putting the software components into a context with each other and with client software. Products: Objectives: test the software components in the context in which they will be used

- **Packaging** - bundling the software and its documentation into a deliverable form.

Products: software and documentation in an easily installed form Objectives:

2.18.2 System Development Life Cycle (SDLC)

Software development life cycle (SDLC) is important for the software project success, the good software engineer should have the enough experience and knowledge to prefer an choose one model than another based on the project context. Therefore, it may be required to choose the right SDLC model according to the specific concerns and requirements of the project. Rather & Bhatnagar (2015) write on how to choose the right SDLC, you can follow this link for more information.

2.18.3 Models of Software Development Life Cycles (SDLC)

Following SDLC models are used for the development of online applications on the basis of their distinctive developmental process and traits of each model.

- Waterfall Model
- V-Shaped Model
- Evolutionary Prototyping Model
- Spiral Method (SDM)
- Iterative and Incremental Method
- JAD (Joint Application Development)
- Agile development

1- Waterfall Model

The waterfall Model is a linear sequential flow. In which progress is seen as flowing steadily downwards (like a waterfall) through the phases of software implementation.

This means that any phase in the development process begins only if the previous phase is complete (Boehm, 2000). The waterfall approach does not define the process to go back to the previous phase to handle changes in requirement. The waterfall approach is the earliest approach and most widely known that was used for software development. Projects which not focus on changing the requirements, for example, projects initiated from request for proposals (RFPs), the customer has a very clear documented requirements

2- V-Shaped Model

It is an extension of the waterfall model, Instead of moving down in a linear way, the process steps are bent upwards after the implementation and coding phase, to form the typical V shape. The major difference between V-shaped model and waterfall model is the early test planning in the V-shaped model. Karlm (2006) describes v-Model as:

- Software requirements clearly defined and known
- Software development technologies and tools are well-known

3- Prototyping Model

It refers to the activity of creating prototypes of software applications, for example, incomplete versions of the software program being developed. It is an activity that can occur in software development. Accoding to Taya (2011), It used to visualize some component of the software to limit the gap of misunderstanding the customer requirements by the development team.

This also will reduce the iterations may occur in waterfall approach and hard to be implemented due to the inflexibility of the waterfall approach. So, when the final

prototype is developed, the requirement is considered to be frozen. Rastogi (2015) suggested some of types as:

- Throwaway prototyping: Prototypes that are eventually discarded rather than becoming a part of the finally delivered software
- Evolutionary prototyping: prototypes that evolve into the final system through an iterative incorporation of user feedback.
- Incremental prototyping: The final product is built as separate prototypes. At the end, the separate prototypes are merged in an overall design.
- Extreme prototyping: used at web applications mainly. Basically, it breaks down web development into three phases, each one based on the preceding one. The first phase is a static prototype that consists mainly of HTML pages. In the second phase, the screens are programmed and fully functional using a simulated services layer. In the third phase, the services are implemented
- This process can be used with any software developing life cycle model. While this shall be chosen when you are developing a system has user interactions. So, if the system does not have user interactions, such as a system does some calculations shall not have prototypes.

4- Spiral Model (SDM)

It is combining elements of both design and prototyping-in-stages, in an effort to combine advantages of top-down and bottom-up concepts. This model of development combines the features of the prototyping model and the waterfall model. The spiral model is favored for large, expensive, and complicated projects. Dwiwedi (2016) suggests this

model uses many of the same phases as the waterfall model, in essentially the same order, separated by planning, risk assessment, and the building of prototypes and simulations.

5- Iterative and Incremental Model

It is developed to overcome the weaknesses of the waterfall model. It starts with an initial planning and ends with deployment with the cyclic interactions in between. The basic idea behind this method is to develop a system through repeated cycles (iterative) and in smaller portions at a time (incremental), allowing software developers to take advantage of what was learned during the development of earlier parts or versions of the system. According to Messy (2012), It can consist of mini waterfalls or mini V-Shaped model It is used in shrink-wrap application and large system which built-in small phases or segments. Also, can be used in a system has separated components, for example, ERP system. Which we can start with the budget module as a first iteration and then we can start with inventory module and so forth.

6- Agile Model

It is based on iterative and incremental development, where requirements and solutions evolve through collaboration between cross-functional teams. It can be used with any type of the project, but it needs more engagement from the customer and to be interactive (Foster, 2014). Also, it can be used when the customer needs to have some functional requirement ready in less than three weeks and the requirements are not clear enough (Foster, 2014).

7- Joint Application Development (JAD) Model

JAD is a SDLC which is based on requirements-definition and user-interface design methodology in which end-users, executives, and developers attend intense off-site meetings to work out a system's details. So the Joint Application Development (JAD) methodology aims to involve the client in the design and development of an application. JAD focuses on the business problem rather than technical details. Wohlen et al. (2012) claim that it is most applicable to the development of business systems, but it can be used successfully for systems software. It produces its savings by shortening the elapsed time required to gather a system's requirements and by gathering requirements better, thus reducing the number of costly, downstream requirements changes. Its success depends on effective leadership of the JAD sessions; on participation by key end-users, executives, and developers; and on achieving group synergy during JAD sessions.

In contrast to the Waterfall approach, JAD is thought to lead to shorter development times and greater client satisfaction, both of which stem from the constant involvement of the client throughout the development process. On the other hand, with the traditional approach to systems development, the developer investigates the system requirements and develops an application, with client input consisting of a series of interviews. Rapid application development (RAD), a variation on JAD, attempts to create an application more quickly through strategies that include fewer formal methodologies and reusing software components.

2.19 Planning e-Training Courses for UTEs

the goal of any instructional system is to promote learning. Therefore, before any learning materials are developed, educators must tacitly or explicitly know the principles of learning and how students learn especially for online learning according to the ICT competency framework for teachers, UNESCO (2011). The development of effective online learning materials should be based on proven and sound learning theories. As discussed above, the delivery medium is not the determining factor in the quality of learning per se; rather, course design determines the effectiveness of the learning (Rovai, 2002).

There are many schools of thought on learning, and no one school is used exclusively to design online learning materials. As there is no single learning theory to follow, we can use a combination of theories to develop online learning materials. In addition, as research progresses, new theories that should be used are emerging and evolving. A recent example is connectivist theory (Siemens, 2007), which is needed for the emerging age of distributed and network learning. Some may question the need for a new learning theory, however, especially when there are already well-established theories used successfully to design instruction. Also, past learning theories have been adapted to address new and changing learning contexts. These existing learning theories, however, were developed before distributed and networked learning was used widely by educators.

According to Siemens (2004), we now need a theory for the digital age to guide the development of learning materials for the networked world. Educators should be able to adapt existing learning theories for the digital age, while at the same time using the principles of connectivism to guide the development of effective learning materials. What

is needed is not a new stand-alone theory for the digital age, but a model that integrates the different theories to guide the design of online learning materials. To select the most appropriate instructional strategies, the online developer must know the different approaches to learning. Strategies should be selected to motivate learners, facilitate deep processing, build the whole person, cater to individual differences, promote meaningful learning, encourage interaction, provide relevant feedback, facilitate contextual learning, and provide support during the learning process. The remaining sections of this chapter present the different schools of thought on learning and suggest how these different schools of thought can be used to develop effective online materials.

2.19.1 ADDIE for e-Training Planning And Design

There are different schools of thought on how best to design courses, whether mobile, online or otherwise. One very useful model for design also known as instructional design is represented by the acronym [ADDIE](#). As written by Wolf (2010), It is a design process model that is made up of five distinct parts: Analysis, Design, Development, Implementation and Evaluation. Nuraini & Mohd (2014) look at each part in turn and describe how they can be applied in the development of an e-Learning based course.

Analysis

In this phase of the process, the instructional designer will need to analyze all the factors needed to develop a timely, relatable course.

1. The goals of the organization in offering the training. In other words, what problem(s) that the organization has identified will be solved within the training.
2. Identify the skills or knowledge the students already have, to avoid duplication or redundant information. Also, spot skills and knowledge they need to have prior to taking the course, in order for it to be effective.
3. Establishing the links between the learning objectives and real world concepts from the work environment to ensure that the students retain a maximum amount of information.
4. Are there any barriers to using e-Learning as the method of delivery? For example, if all the designated students don't have access to mobile technology.

Design

According to Johnson & Liber (2008) In this phase of the design process, the goal is to plan and specify the course objectives, each topic within it that is reviewed, what media and resources will be used to support the e-Learning effort, the actual content of the course, and finally, how the students and the effectiveness of the course itself will be evaluated. Essentially, this is the meat of the course development, where the content is meted out in a detailed fashion.

Development

This is the phase where the actual development of what was planned in the Design phase takes place. Assuming that e-Learning is the platform through which the course

will be delivered, the bulk of the development phase centers around the actual production of the course itself. Wilson (2008) found that in order to facilitate the development of training materials,

1. All the resources and materials are collected including instructional aids, resources, tools and so on.
2. The content and the various resources, tools and evaluation methods need to be combined into a cohesive presentation.
3. The content is evaluated at this stage to ensure that it is meeting the organization's goals that were identified in the Analysis phase. This is sometimes referred to as testing the course.
4. In addition to resources collected, some parts of the course content or the resources / aids / materials will need to be created so that they specifically reflect the objectives of the course and the needs of the students.

Implementation

This is quite literally the phase where the course is launched and made available to the students identified as requiring the information provided. In an e-Learning environment, this can involve an online component being activated for chatting and questions with the instructor, as well as group sharing activities, testing and other evaluation techniques.

Evaluation

Following the implementation of the course, a system of feedback is necessary to ensure that the e-Learning module has met the needs of the organization, the students,

and has been presented as effectively and with all the necessary tools and aids. An online survey, for example, can be used to elicit this feedback online from students and from management levels. McLoughlin & Lee (2010) argue that this is particularly important with e-Learning to ensure that the materials are relevant to the students: both in terms of the content and the timeliness of the delivery of said content.

2.20 Theoretical Compendium of Course Modules

Training is essentially the instructing new information to trainees and its application. It may, and often does, involve the teaching of new skills, methods and procedures. According to Hart & Christensen (2002), the basic element in training 'the content' is developed according to specific training needs and achievable objectives. These needs and objectives are essential components of a meaningful learning experience, providing learning satisfaction and motivation for moving on to complete the whole subject. Learning theories provide the foundation for the selection of instructional strategies and allow for reliable prediction of their effectiveness. Dedicated training programs tend to keep abreast of theory and practice as an essential part of training courses. Integration of particular theoretical principles to any course makes the content more compatible with the trainees needs and training goals.

2.20.1 Connectivism

With the propagation of emerging technologies for learning and teaching, particularly in the social networking and online spaces, learning theory of Connectivism could offer means of creating and evaluating learning in social networks where knowledge is distributed across networks of connection nodes (Siemens, 2005; Downes,

2007). The point at issue is whether connectivism can provide a theoretical lens for creating effective technology-enhanced learning environments.

The theory of connectivism (Siemens, 2005) is characterized as the learning theory of the digital age. One underlying assumption in this theory is that knowledge is distributed and “can reside outside of ourselves” (Siemens, 2005). Downes (2007) contends that “knowledge is distributed across a network of connections, and therefore learning consists of the ability to construct and traverse those networks”. This actionable knowledge is assembled from a network of connections arising from experience and interactions within a community (Garcia & Ferreira, 2014). This is a different assumption from that used, for instance, in constructivism where knowledge is constructed by the learner (Piaget, 1976). Collaboration whereby members of a group collectively help each other towards achieving a pre-established goal is a key concept in Connectivist learning. “In this form of learning knowledge is acquired through interaction” (Garcia & Ferreira, 2014). Collaboration makes the process of learning efficient and relevant because of an assumption that knowledge and expertise reside in the networks. There is room for individual and group learning in these interactions.

The Connectivist principles outlined suggest new roles for the teacher or instructor. One role involves assisting each learner to build and make the relevant connections in their learning networks. The other roles include directing students to appropriate resources and other experts, as well as creating experiences that stimulate continual learning. In this framework, the interaction occurs “between other humans and network resources and is critical for connection building and network formulation” (Wang, Chen, & Anderson, 2014). Learning occurs as the learner engages in different

forms of network formation at the neural (cognitive), concept, and social levels (Siemens, 2005; Wang et al., 2014).

The learner is central to the learning process in connectivism. However, the networking processes in connectivism adds a dimension to the social context in which the collaborative activity enhances knowledge construction in a slightly different way. In constructivism, learning is “determined by the complex interplay among learners’ existing knowledge, the social context, and the problem to be solved” (Tam, 2000). In connectivism, the concern is more with an understanding of the distribution of expertise and intelligence over the learning network, and the role of technologies in assisting the learner to construct knowledge (Ng’ambi, 2013). In my view, the connectivist theory and the framework for interaction (from Wang et al., 2014) open up a way of thinking about the object of learning differently. The object of learning becomes distributed across human and non-human resources. This in turn affects the way one thinks about designing training activities and how they are enacted in technology-supported training environments. When designing a training activity, identifying the rationale for learning can be a challenge. Dewey’s (1938) view was that the problematic or context was the driver behind the design of any learning activity. From a connectivist perspective, the driver is the activation of trainee participation in interactions resulting in the formation of different types of networks (cognitive, concept, and social) supported by technology (Siemens, 2004; Wang et al., 2014). The training activity should therefore be designed in a manner that develops, supports, and maintains network formation and human connections.

2.20.2 Digital Micro-Learning (DML)

Digital Micro-Learning (DML) is a method of training through short, digestible, well-planned units that the trainee consumes via digital media. The model promises enormous benefits for trainees and trainers alike. The most consequential benefit of Digital Micro-Learning is emerged in this digital age i.e. the diminishing time allowable for consuming and designing training.

The method of DML provides training efficiently, practically, and easily. It Moves at the Trainee's pace and delivers easily-digestible information that may be retained for long. So DML presents information in bit-size units that each covers a sub-concept constituent to the larger one, so that they collectively form a complete understanding of topic being taught. So DML means more completion, more understanding and more engagement.

DML (Digital Micro-Learning) is the notion of imparting learners with small bite sized nuggets of knowledge or information, which serves all the necessary content in one bite. According to Fernandez (2015), "DML is a method of training through short, digestible, well-planned units that the learner consumes via digital media". It allows the learners to gain knowledge of the concerned topic in the best, short and effective manner, rather than pouring over them gallons of learning and training material, of which most of it is not required at all. This modern trend has emerged in the digital age which diminishes time allowable for both consuming and creating content termed as micro-content.

DML guides proficiently, easily and practically having compatibility with the trainees' pace and looks for minimizing their cognitive load (Rahim, 2017; Greany, 2017;

Freeman, 2016; Grovo, 2015; Hartley, 2010). Mr. Allen Comm, an experienced instructional designer of DML proposes that "DML means more than just small. Micro-learning is not only tamped but also focused providing right amount of information required to assist a learner achieving specific, actionable objective. This makes micro-learning in training contexts especially valuable."The goal of DML is to deliver easily-digestible micro-content that the trainees retain for long, as human memory ingests information in small chunks and process them into larger more meaningful concepts. According to ATD (2016), the average time available per employee for training is just over 33 hours per year, factored out, that's less than one hour per week. So teacher educators look for ways to maximize precious training time which can be make feasible by serving up bite-sized chunks micro-content of training is one idea to successfully work for targeted and objective based e-Training programs.

e-Training through DML follows the modular approach where training activities include short-term lessons, projects, or assignments with smaller amounts of information. Zufic & Jurcan (2015) append that course material is broken into smaller lessons or modules, rather than teaching a broad topic all at once. Although the course may be broken down into smaller modules, hosted on digital training environments like training portals of organizations, e-Portal or LMS which are easily accessible through mobile devices too.

Literature does not provide sufficient evidences of DML to be utilized in teacher education or in the e-Training of teacher educators whereas it is an advantageous strategy for said purpose. This research study is exclusively conducted to highlight the benefits of DML in the e-Training of teacher educators to enhance their digital competencies to coop

with the trends of digital age and learning requirements of prospective teachers by integrating digital technologies in their teaching.

2.21 Online Training of UTEs through e-Portals

it is evident that Pakistan is far behind from many other countries where e-Learning is established practice in universities or institutions of teacher education. As in case of Pakistan, technology in teacher education is focused on the level of ICT, the concept of twentieth century. Very small evidences are there to prove the utilization of latest digital and online trends in teacher education and teacher training. The “ICT in Education Master Plan– 2007” describe the approaches to use ICT for enhancing student learning, increasing educational opportunities, and mounting facilities for all levels (HEC, 2015). The initiatives of e-Learning in Pakistan comprise; The Virtual University of Pakistan (Toor 2005; Sherazi & Ikram, 2002), COMSAT Virtual Campuses (VCOMSAT, 2015) and e-Learning tributary of Allama Iqbal Open University (Shah & Saman, 2016). Findings of the study indicate a grey picture of non-availability of e-Learning in teacher education of formal public universities of Pakistan as none of the universities are practicing e-Learning in learning, teaching and training domains. Teacher education institutions/departments in formal public universities are lacking e-Learning strategies/plans/vision, technological infrastructures, fund allocation for e-Learning, e-Teaching (digital & Online) practices. Even ICT competencies are not considered significant as induction criteria of teacher educators in most of the TEIs.

Teachereducators face many challenges while getting online professional trainings. Acceptance of emerging technologies is one of the major challenges for teacher educators. Particularly university teacher educators, being highly educated and highly

professionals, face acceptance challenges. However acceptance level of UTEs can be measured at the end of course by using many models. Technology Acceptance Model (TAM) is most widely used model for this purpose. Most of educational researches on e-learning, m-Learning or latest technologies utilize TAM (Technology Acceptance Model) to measure the acceptance of technology in educational institutions by different working groups such as teachers, students, Managers, administrators, principals, curriculum planners

2.22 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) developed by Davis is a representation that how users accept technology and use it. Researches provide evidences for utilizing TAM for acceptance of technology as teaching tool (Nair & Das, 2012), acceptance of LMS and online applications in teaching, learning and training (Eraslan & Kutlu, 2019; Sezer & Yilmaz, 2019; Biyamin, Rutter & Smith, 2017; Jamil, 2017; Alshammari, Ali & Rosli, 2016; Hock et al., 2015; Alharbi & Drew, 2014; Jansen, Rensburg & Davis, 2012; Almarashdeh et al., 2011; Abbad, 2010).

TAM implies that when a new technology is presented to the users, their decisions about using that technology are mainly influenced by two factors. These factors are:

(PU) Perceived usefulness – Fred David defined PU as "the extent to which an individual believes/accepts that using a specific technology would increase his/her job performance".

(PEOU) *Perceived Ease-of-Use* – Davis defined PEOU as "the extent to which a person believes /accepts that employing a particular technology would be free from effort"

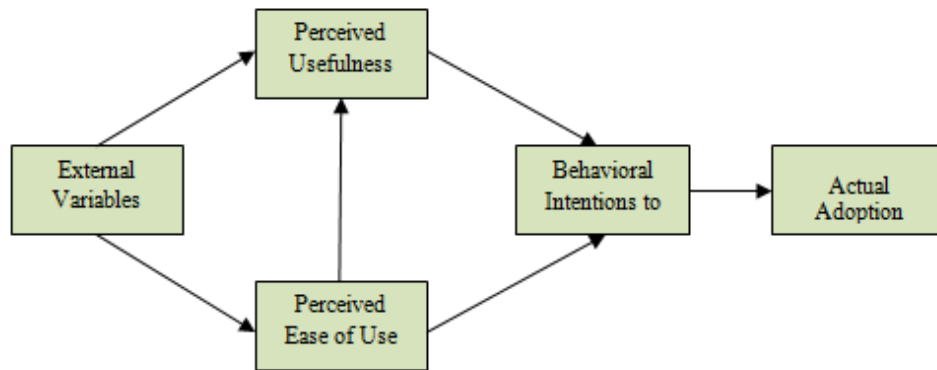


Figure 2.10 : *Technology Acceptance Model (TAM)*

Therefore, even if a teachers do not welcome an technological application in profession or training, the probability that they will use it is high if they perceives that the system will improve his performance at work. Besides, the Technology Acceptance Model hypothesizes a direct link between perceived usefulness and perceived ease of use. With two systems offering the same features, a user will find more useful the one that he finds easier to use

Keeping in view the gaps in online training of UTEs in teacher education institutions/departments and dire need of online training programs, this study is being held to design and develop an e-Portal as an innovative approach to online training. This will compliment in bridging the training gaps, digital literacy and competency gaps, TMS gaps, and digital divide between teacher educators and prospective teachers.

2.23 Compatibility of e-Portal, Training Modules and UTEs

To conduct training of university teacher educators (UTE) by utilizing e-Portal with properly developed e-Training module, there must be amply maintained compatibility between e-Portal, modules and the users (i.e. UTEs). Training needs of UTEs are necessary to be recognized through need analysis; and e-Portal and modules are essentially to be validated by employing validation methods. All the features and functionalities of e-Portal must work in well-matched, companionable and friendly way with course content and activities to successfully fulfill the goals and objectives of training programs organized for university teacher educators in accordance with their assessed needs.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter starts with methodological framework used to carry out this study. This research study emphasizes on the importance and need of e-Training of University Teacher Educators (UTEs) and developing an exclusive online training application for conducting e-Training. In the light of problem of the statement, the study focuses on the development of an e-Portal for conducting online training courses for UTEs. This study is comprised of 7 distinctive phases. Each research phase had its own methodology and research process. Each research phase was based on a well-defined research objective and successive research questions and research hypotheses. Therefore this chapter is written phase-wise. Each phase in this chapter is presented following a distinguished research methodology. The implementation of a variety of research methods and approaches was a crucial part to achieve the objectives of this study. Below the methodological framework for the research study and for each research phase is discussed separately.

3.2 METHODOLOGY FRAMEWORK FOR RESEARCH

Methodology is an organized, systematic, theoretical analysis of the approaches employed to search or solve the research problem (Industrial Research Institute, 2010). Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques (Imy& Rose, 2005). In Methodology, The researcher has used different criteria in the methodology to solve/search specified research problem.



Figure 3.1 : Methodological Framework of Research Study

The overall research methodological framework followed by this research study is Mix-method sequential design. The table illustrates the framework pursued in this study.

Table 3.1 *Research methodological Framework*

Research paradigm	<i>Pragmatic</i>
Research Design	<i>Mixed Method sequential transformative Design</i>
Research Method	<i>Quantitative Qualitative</i>
Research Approach	<i>Deductive Inductive</i>

In table 3.1 of research methodological framework, it is shown that pragmatism is applied as paradigm of this study as pragmatism is outcome-oriented which determines the meanings of phenomena and focuses on the product of research. Also pragmatism is characterized by focusing on shared meaning-making in order to create practical solutions to social problems (Biesta, 2010; Johnson & Onwuegbuzie, 2006; Tashakkori & Teddlie, 2003). Pragmatism also believes in the contextuality and

transferability of theories in different situations. Researcher has maintained subjectivity in own reflections on research and objectivity in data collection and analysis. This research study has employed mixed method research which involved the collection and analysis of quantitative and qualitative data both, and integrated these two sets of results for the purpose of drawing inferences from the quantitative and qualitative results. Whereas sequential transformative design of mix method research is applied which is characterized by the collection and analysis of both quantitative and qualitative data and their results are integrated to draw meaning from inferences in interpretation phase. Inductive and deductive approaches to research are applied by the researcher. Deductive approach is associated with quantitative method of research and is employed for hypothesis testing and generating meaning from data. Inductive approach in this study is associated with qualitative data which is aimed to solve the research questions to narrow the scope of study which has explored new phenomena looking at previously researched facts from different perspectives.

Present study consists of seven phases. The researcher has used different criteria for solving/searching the given research problems. Each stage is discussed in a unique format in methodological perspective. The visual presentation in figure 3.1 clearly outlines the methodological framework overview employed on each stage of this study.

3.3 POPULATION AND SAMPLING

The population of the study comprised of :

- Formal Public universities of all provinces of Pakistan where teacher education is being imparted.
- All HODs/Chairperson/Deans of Faculty/Department of Education of these universities.
- All University Teacher Educators (UTEs) in these universities
- All students of these universities enrolled in Teacher Education programs.

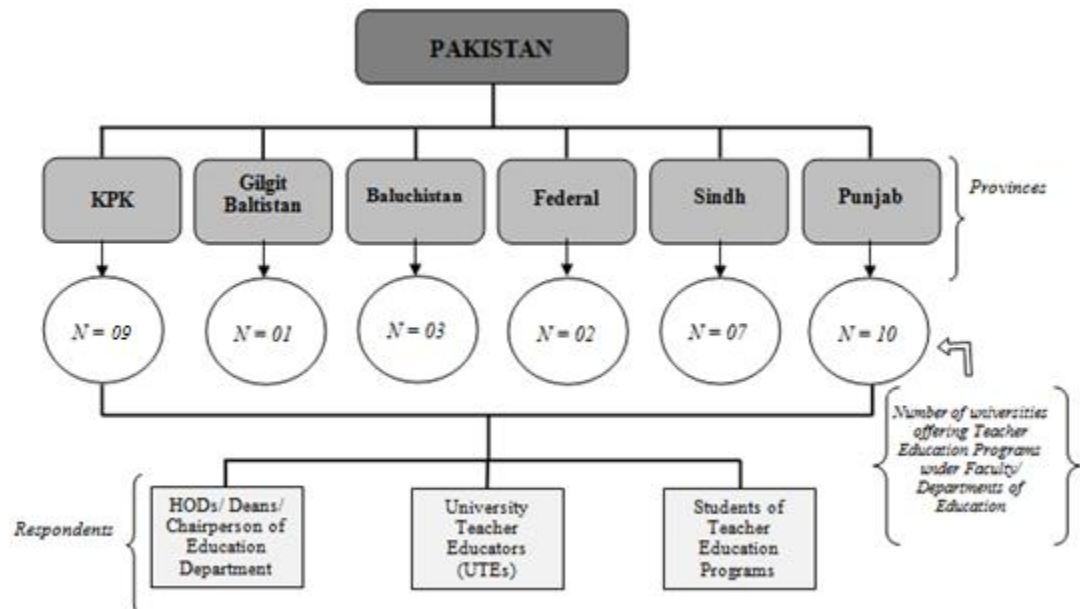


Figure 3.2 : Graphical representation of Population of study

In this study, probability and non-probability both sampling techniques were applied for defining and selecting sample at different levels. i.e.

Table 3.2 *Sampling techniques and sample size*

Units of Sample Selected	Sampling Techniques	Sample Size
Provinces of Pakistan	Cluster Sampling	6
Selecting Punjab out of all clusters	On the basis of maximum number of Teacher Education Institutes/Departments of Universities	1
Selection of Universities of Punjab	Purposive Sampling	10
Selection of HODs/ Chairperson/ Dean	Census	All (41)
Selection of University Teacher Educators (UTEs)	Census	All (385)
Selection of Students (prospective Teachers)	Convenient Sampling	4575

Following visual presents the sampling techniques applied on different level of studies.

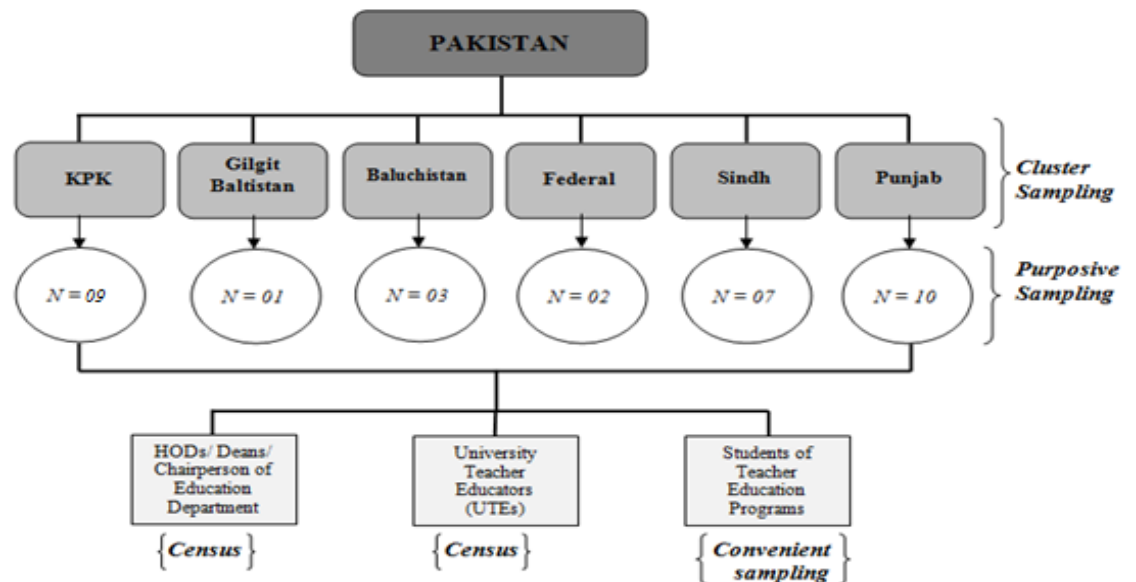


Figure 3.3 : Graphical representation of Sample and sample size

3.4 INSTRUMENTATION

Three questionnaires for situation analysis were developed by following the Operationalization and conceptualization process. All the concepts derived through literature review and then operationalized were used as constructs and factors in questionnaires for item generation. The main purpose of these three questionnaires was to conduct the situation analysis about prevailed conditions of e-Training and e-Learning in relevant faculties/departments of universities involved in study. Also this survey was based on finding the gaps in the UTEs' training practices and the need of e-Training programs for university teacher educators (UTEs) in Pakistan. The details of questionnaires are described below.

- i) Questionnaire-1 – for HODs/Deans/Chairperson of Education departments of universities where teacher education programs are being offered.
- ii) Questionnaire-2 – for University Teacher Educators (UTEs) of relevant universities.
- iii) Questionnaire-3 – for students of teacher education programs (prospective teachers) in relevant universities.

1- An interview was designed as data collection tool for different purposes and tasks during this study. The respondents highlighted the need, scope and importance of e-Training for UTEs in Pakistan.

2- Three questionnaires were developed to be administered before, during and after practical orientation course.

- i) Readiness survey
- ii) Engagement survey

iii) Acceptance survey

3- This research study employed validation and evaluation tools. The purpose of these tools.

i) Software evaluation tool

ii) Online course evaluation tool

iii) Content and face validity assessment of questionnaires

3.5 PHASE-1

Objective:

To conduct situation analysis for e-training of university teacher educators

Table 3.3 *Research methodology for phase-I*

Research Method	- Quantitative - Qualitative
Research Technique	- Survey - Documents Review
Research Tools	- Questionnaire - Interview - Policy & plans documents - Organizational reports

3.5.1 Research Process

Conceptualization and Operationalization:

To carry out situation analysis, three survey questionnaires were used which were administered with different samples. a) Chairperson/HODs/Principals, b) University Teacher Educators (UTEs), c) students of Teacher education (prospective teachers)

i) *Questionnaire Tool used for Chairperson/HODs/Principals*

As number of respondents was not sufficient to run factor analysis on the data collected from *Chairperson/HODs/Principals* of teacher education departments/institutions, questionnaire was developed through reviewing the existing literature. Questionnaire intended to i) conduct situation analysis for e-Learning and e-Training, and ii) identification of components, features and functionalities of e-Portal. Variables and factors were identified from literature and tool was developed followed by the identified constructs. Each construct was operationally defined.

Vision/Mission: Mission is a declaration that is used by teacher education departments/institutes to describe the purpose of using digital technologies and e-Learning in teaching and learning and other organizational commitments. Vision is a future-oriented declaration that teacher education departments/institutes use to describe their high-level and long-term goals regarding digital technology and e-Learning. These high-level goals are supposed to be achieved by successfully fulfilling their e-Learning mission.

Recruitment Process (of UTEs): This is operationally defined as process of selecting and appointing pool of potential suitable candidates as teacher educators in teacher education institutions/departments of universities with pre-specified criteria of knowledge, skills and experience of e-learning and teacher trainings.

Financial Resources: This is defined as need and availability of monetary resources with which teacher education departments/institutions obtain and manage funds they need to finance their e-learning infrastructure, and provision of digital tools and technologies to faculty and students for their technology-related activities to operate successfully.

Digital Competence (of UTEs): These are the skills required by the UTEs to efficiently incorporate digital tools, technologies and methods in their instructional activities which enables the students to use technology for their learning activities.

Awareness: In the context of this study, awareness is defined as university teacher educators' familiarity and understanding of digital needs of the students to successfully integrate e-learning in their learning.

Barriers of e-Learning: Barriers are the circumstances or the obstacles which keep the stakeholders of teacher education away/apart from using emerging digital tools and technologies in their relevant professional/institutional/learning activities.

e-Training: This construct in the study is employed to reveal different characteristics and practices of online training of UTEs which emphasizes the use of e-learning means and methods in their professional trainings.

ii) *Questionnaire Tool used for University Teacher Educators (UTEs)*:

A questionnaire was developed to collect data from UTEs and then it was operationalized through Exploratory Factor Analysis (EFA). Sample for factor analysis was as followed:

Table 3.4 *Sample for Factor Analysis - UTEs*

Sr.#	Name of University	No. of Respondents (UTEs)
1	Islamia University, Peshawar	3
2	IER, University of Peshawar	12
3	University of Quetta	12
4	NUML University, Islamabad	13
5	International Islamic University, Islamabad	17
6	IER, Gomal University, DI Khan	12
7	Hazara University, Mansehra	10
<i>Total</i>		79

UTEs were asked for providing their opinions about different aspects of e-learning and e-Training state and needs in their professional practices and also in teacher education overall. Relevant constructs were operationally defined as:

Significance of e-Learning: This reveals the importance and effectiveness of e-Learning being a novel and worthy mode by using digital technologies and tools in teaching/learning process.

Potential of e-Learning: Operationally, potential of e-Learning describes the capacity and latent qualities of digital/web-enhanced mode of teaching/learning that may be used to develop digital abilities and competence which may lead to future success in the field.

Barriers of e-Learning: Barriers are the circumstances or the obstacles which keep the stakeholders of teacher education away/apart from using emerging digital tools and technologies in their relevant professional/learning activities.

Satisfaction: it is defined as fulfillment of needs and expectations of UTEs regarding establishing e-learning environment and digital experiences in the field of teacher education regarding teaching/learning/training.

e-Training for UTEs: This construct in the study is employed to reveal different characteristics and practices of online training of UTEs which emphasizes the use of e-learning means and methods in their professional training programs.

iii) *Questionnaire Tool used for Students of Teacher Education*

Sample for factor analysis was as followed:

Table 3.5 *Sample for Factor Analysis – Students (Prospective Teachers)*

Sr.#	Name of University	No. of Respondents (Students)
1	Islamia University, Peshawar	36
2	IER, University of Peshawar	77
3	University of Quetta	54
4	NUML University, Islamabad	72
5	International Islamic University, Islamabad	50
6	IER, Gomal University, DI Khan	65
7	Hazara University, Mansehra	70
<i>Total</i>		424

Students of Teacher education institutions/departments were put into a survey to gather their opinions about familiarity, importance, usefulness, attitude etc. regarding e-learning. The constructs used in the questionnaire were operationally defined as:

Significance of e-Learning: This illustrates how much students understand the importance of e-learning as vital mode of learning and value of digital tools and technologies in learning activities as future teachers.

e-Learning Potential: In the context of this study, potential reveals the capacity of e-Learning as it provides different distinctive features to the students by making the use of digital technologies and tools vital in learning aspects.

e-Learning usefulness: usefulness is defined as the quality of utilization of e-Learning in different domains of learning.

e-Learning Effectiveness: Effectiveness is the degree to which e-Learning can be used for successful fulfillment of variety of learning activities.

e-Learning Provision: Provision is action of making e-Learning resources and opportunities available to the students of teacher education.

Attitude towards e-Learning: This construct is defined by a internal traits that characterize students' inclination and interest towards use of e-Learning and digital tools and technologies in learning tasks.

Barriers of e-Learning: Barriers are the circumstances or the obstacles which keep the stakeholders of teacher education away/apart from using emerging digital tools and technologies in their relevant professional/institutional/learning activities.

3.5.2 Validity and Reliability of Tools

Reliability and validity of two questionnaires for UTEs and students of teacher education was calculated statistically after running CFA and EFA. Validity of one questionnaire which was intended to collect data from HODs/Chairperson/Principals was ensured by calculating CVI (Content Validity Index) and expert validity.

Inter-Item reliability of two tools (UTEs & students) was calculated through Cronbach Alpha. Following cut-off values were used to ensure reliability:

Table 3.6 *Cut-off values of Reliability Measures*

A	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable

Construct validity was calculated from model fit data obtained during CFA.

Following cut-off values were used to ensure construct validity:

Table 3.7 *Cut-off values for construct validity*

Name of Category	Name of Index	Level of Acceptance
	Chi-Square (χ^2)	p-value > 0.05
<i>Absolute Fit</i>	RMSEA(Root Mean Square error of Approximation)	RMSEA < 0.08
	RMR(Root Mean Square Residual)	RMR < 0.08
	CFI(Comparative Fit Index)	CFI > 0.90
<i>Incremental Fit</i>	NFI(Normed Fit Index)	NFI > 0.90
	GFI(Goodness of Fit Index)	GFI > 0.90
<i>Parsimonious Fit</i>	Chisq/df	Chi-square/df > 3.0

In SEM, Absolute fitness, incremental fitness and parsimonious fitness of model refer to the construct validity of the model.

QUESTIONNAIRE NO.1 : UTEs

Initially 78 items were extracted during EFA. On the basis of Eigen values > 1, total 21 constructs were identified. Rotated factor matrix indicated 74 items having loadings > 0. EFA under extraction method of Principal Component Analysis with rotation

method of Varimax with Kaiser Normalization was employed to find the relationship pattern between items and latent variables. While performing CFA, each dimension was taken as a model and model fit was calculated.

Model-1 :e-Learning

i) INTERNAL RELIABILITY

Table 3.8(a) *Internal reliability of Model-1*

No. of items	Cronbach Alpha (r)
15	.72

In Table 3.8(a) the value of $r = .72$ determined that inter-item reliability of items was acceptable.

ii) CONSTRUCT VALIDITY

Table 3.8(b) *Construct validity of model-1*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.147
	RMSEA	.076
	RMR	.054
<i>Incremental Fit</i>	CFI	.911
	NFI	.889
	GFI	.847
<i>Parsimonious Fit</i>	Chisq/df	3.166

Good absolute fitness of model is shown in table as Chi-square=.147, RMSEA=.076 and RMR=.054 fulfill the good fit of model. Incremental fitness of model is ensured as CFI=.911, NFI=.889 and GFI=.847 fulfill the good fitness criteria for the

model. Parsimonious fitness of model is evident from value 3.166 which indicates good fit of model. As absolute fit, incremental fit and parsimonious fit fulfill the fitness criteria and model-fit values lie within cut-off range of acceptability, so the construct validity of model-1 was made sure.

Model-2 : e-Learning Barriers

i) Internal Reliability

Table 3.9(a) *Internal reliability of Model-2*

No. of items	Cronbach Alpha (r)
12	.791

Table 3.9(a) shows that model-2 has good reliability as $r=.791$.

ii) Construct Validity

Table 3.9(b) *Construct validity of model-2*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.366
	RMSEA	.044
	RMR	.040
<i>Incremental Fit</i>	CFI	.953
	NFI	.877
	GFI	.794
<i>Parsimonious Fit</i>	Chisq/df	8.057

Construct validity of model is shown in table 3.9(b). Chi-square=.366, RMSEA=.044 and RMR=.040 fulfill the good absolute fit of model. Incremental fitness of model is ensured as CFI=.953, NFI=.877 and GFI=.794 fulfill the good fitness criteria for the model. Parsimonious fitness of model is evident from value 8.057 which indicates good fit of

model. As absolute fit, incremental fit and parsimonious fit fulfill the fitness criteria and model-fit values lie within cut-off range of acceptability, so the construct validity of model-2 was made sure.

Model-3 : e-Training

i) Internal Reliability

Table 3.10(a) *Internal reliability of Model-3*

No. of items	Cronbach Alpha (r)
11	.861

Table 3.10(a) illustrates that model has good reliability as $r=0.861$

ii) Construct Validity

Table 3.10(b) *Construct validity of model-3*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.505
	RMSEA	.039
	RMR	.078
<i>Incremental Fit</i>	CFI	1.462
	NFI	.931
	GFI	.813
<i>Parsimonious Fit</i>	Chisq/df	7.980

Good absolute fitness of model is shown in table as Chi-square=.505, RMSEA=.039 and RMR=.078 fulfill the good fit of model. Incremental fitness of model is ensured as CFI=1.462, NFI=.931 and GFI=.813 fulfill the good fitness criteria for the model. Parsimonious fitness of model is evident from value 7.980 which indicates good fit of model. As absolute fit, incremental fit and parsimonious fit fulfill the fitness criteria and

model-fit values lie within cut-off range of acceptability, so the construct validity of model-3 was made sure.

Model-4 :Online Training Applications

i) Internal Reliability

Table 3.11(a) *Internal Reliability of Model-4*

No. of items	Cronbach Alpha (r)
20	.793

Table 3.11(a) illustrates the good internal consistency of model-4 as $r = .793$.

ii) Construct Validity

Table 3.11(b) *Construct validity of model-4*

Name of Category	Name of Index	Calculated Values
Absolute Fit	Chi-Square	.409
	RMSEA	.041
	RMR	.027
Incremental Fit	CFI	2.032
	NFI	1.031
	GFI	.757
Parsimonious Fit	Chisq/df	11.427

Good absolute fitness of model is shown in table as Chi-square=.409, RMSEA=.041 and RMR=.027 fulfill the good fit of model. Incremental fitness of model is ensured as CFI=2.032, NFI=1.031 fulfill the good fitness criteria for the model while GFI=.757 is near to good fit. Parsimonious fitness of model is evident from value 11.427 which indicates good fit of model. As absolute fit, incremental fit and parsimonious fit fulfill the

fitness criteria and model-fit values lie within cut-off range of acceptability, the construct validity of model-4 was made sure.

Model-5 : e-Training Success Factors

i) Internal Reliability

Table 3.12(a) *Internal reliability of Model-5*

No. of items	Cronbach Alpha (r)
11	.902

In table 3.12(a), $r=.902$ shows that model-5 is internally consistent as value of r lies in cut-off range of cronbach's alpha values.

ii) Construct Validity

Table 3.12(b) *Construct Validity of Model-5*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.142
	RMSEA	.063
	RMR	.074
<i>Incremental Fit</i>	CFI	1.02
	NFI	1.401
	GFI	.866
<i>Parsimonious Fit</i>	Chisq/df	12.693

Good absolute fitness of model is shown in table as Chi-square=.142, RMSEA=.063 and RMR=.074 fulfill the approximately good fit of model. Incremental fitness of model is ensured as CFI=1.02, NFI=1.401 fulfill the good fitness criteria for the model while GFI=.866 indicates to good fit. Parsimonious fitness of model is evident from value 12.693 which indicates good fit of model. As absolute fit, incremental fit and

parsimonious fit fulfill the fitness criteria and model-fit values lie within cut-off range of acceptability, the construct validity of model-5 was made sure.

CONTENT VALIDITY AND FACE VALIDITY OF QUESTIONNAIRES

Table 3.13 *Content and face validity of questionnaire-1*

Sr.#	Validity Criteria	%age
1	General Characteristics	84
2	Scales and pre-determined Alternative Responses	96
3	Sequencing Items	95
4	Language & Grammar	100
5	Items' Layout and Format	75

QUESTIONNAIRE NO.2 : STUDENTS (Prospective Teachers)

Model-6: Significance and Potential of e-Learning

i) Internal Reliability

Table 3.14(a) *Internal reliability of Model-1*

No. of items	Cronbach Alpha (r)
15	.783

Table 3.14(a) illustrates the good internal consistency of model-6 as $r = .783$.

ii) Construct Validity

Table 3.14(b) *Construct validity of Model-6*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.153
	RMSEA	.078
	RMR	.089
<i>Incremental Fit</i>	CFI	.997
	NFI	1.618
	GFI	.792
<i>Parsimonious Fit</i>	Chisq/df	10.604

Good absolute fitness of model is shown in table as Chi-square=.153, RMSEA=.078 and RMR=.089 fulfill the approximately good fit of model. Incremental fitness of model is ensured as CFI=.997, NFI=1.618 fulfill the good fitness criteria for the model while GFI=.792 indicates approximately good fit. Parsimonious fitness of model is evident from value 10.604 which indicates good fit of model. As absolute fit, incremental fit and parsimonious fit fulfill the fitness criteria and model-fit values lie within cut-off range of acceptability, the construct validity of model-6 was made sure.

Model-7: Usefulness & Effectiveness of e-Learning

i) Internal Reliability

Table 3.15(a) *Internal Reliability of Model-7*

No. of items	Cronbach Alpha (r)
11	.805

Table 3.15(a) illustrates the good internal consistency of model-7 as $r = .805$.

ii) Construct Validity

Table 3.15(b) : *Construct validity of Model-7*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.201
	RMSEA	.089
	RMR	.068
<i>Incremental Fit</i>	CFI	1.522
	NFI	.722
	GFI	.878
<i>Parsimonious Fit</i>	Chisq/df	22.321

Good absolute fitness of model is shown in table as Chi-square=.201, RMSEA=.089 and RMR=.068 indicate approximately a good fit of model. Incremental fitness of model is ensured as CFI=1.522, NFI=.722 and GFI=.878 fulfill the good fitness criteria for the model. Parsimonious fitness of model is evident from value 22.321 which indicates good fit of model. As absolute fit, incremental fit and parsimonious fit fulfill the fitness criteria and model-fit values lie within cut-off range of acceptability, so the construct validity of model-7 was made sure.

Model-8 :Provision of e-Learning

i) Internal Reliability

Table 3.16(a) *Internal reliability of Model-3*

No. of items	Cronbach Alpha (r)
7	.682

Table 3.16(a) illustrates the acceptable internal consistency of model-8 as $r = .682$.

ii) Construct Validity

Table 3.16(b) *Construct validity of Model-8*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.046
	RMSEA	.026
	RMR	.055
<i>Incremental Fit</i>	CFI	.853
	NFI	.676
	GFI	.880
<i>Parsimonious Fit</i>	Chisq/df	22.321

Good absolute fitness of model is shown in table as Chi-square=.406 shows acceptable value but RMSEA=.026 and RMR=.055 indicate a poor fit of model. Incremental fitness of model is ensured as CFI=.853and GFI=.880 fulfill the good fitness criteria but NFI=.676 doesn't indicate good fitness of the model. Parsimonious fitness of model is evident from value 22.321 which indicates good fit. As parsimonious fit fulfill the fitness criteria but values of absolute fit, incremental do not lie within cut-off range of acceptability, so the construct validity of model-8was not ensured in true gist.

Model-9:Attitude towards e-Learning

i) Internal Reliability

Table 3.17(a) *Internal reliability of Model-9*

No. of items	Cronbach Alpha (r)
12	.806

Table 3.17(a) illustrates the good internal consistency of model-9 as r =.806.

ii) Construct Validity

Table 3.17(b) Construct validity of Model-9

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.062
	RMSEA	.084
	RMR	.091
<i>Incremental Fit</i>	CFI	1.421
	NFI	1.217
	GFI	.863
<i>Parsimonious Fit</i>	Chisq/df	8.225

Good absolute fitness of model is shown in table as Chi-square=.062, RMSEA=.084 and RMR=.091 fulfill the approximately good fit of model. Incremental fitness of model is ensured as CFI=1.421, NFI=1.217 and GFI=.863 fulfill the good fitness criteria for the model. Parsimonious fitness of model is evident from value 8.225 which indicates good fit of model. As absolute fit, incremental fit and parsimonious fit fulfill the fitness criteria and model-fit values lie within cut-off range of acceptability, the construct validity of model-9 was made sure.

Model-10 : Barriers to e-Learning

i) Internal Reliability

Table 3.18(a) Internal reliability of Model-10

No. of items	Cronbach Alpha (r)
12	.911

Table 3.18(a) illustrates the excellent internal consistency of model-10 as $r = .911$.

ii) Construct Validity

Table 3.18(b) *Construct validity of Model-10*

Name of Category	Name of Index	Calculated Values
<i>Absolute Fit</i>	Chi-Square	.243
	RMSEA	.073
	RMR	.084
<i>Incremental Fit</i>	CFI	.842
	NFI	1.041
	GFI	.906
<i>Parsimonious Fit</i>	Chisq/df	6.025

Good absolute fitness of model is shown in table as Chi-square=.243 fulfills the good fit while RMSEA=.073 and RMR=.084 indicate approximately good fit of model. Incremental fitness of model is ensured as CFI=1.421, NFI=1.217 and GFI=.863 fulfill the good fitness criteria for the model. Parsimonious fitness of model is evident from value 6.025 which indicates good fit of model. As absolute fit, incremental fit and parsimonious fit fulfill the fitness criteria and model-fit values lie within cut-off range of acceptability, the construct validity of model-10 was made sure.

CONTENT VALIDITY AND FACE VALIDITY OF QUESTIONNAIRE

Table 3.19 *Content and face validity of questionnaire-II*

Sr.#	Validity Criteria	%age
1	General Characteristics	70
2	Scales and pre-determined Alternative Responses	84
3	Sequencing Items	80
4	Language & Grammar	95
5	Items' Layout and Format	65

QUESTIONNAIRE NO.3 : HODs

CONTENT VALIDITY AND FACE VALIDITY OF QUESTIONNAIRE

Table 3.20 *Content and face validity of questionnaire-3*

Sr.#	Validity Criteria	%age
1	General Characteristics	84
2	Scales and pre-determined Alternative Responses	92
3	Sequencing Items	90
4	Language & Grammar	90
5	Items' Layout and Format	75

CONTENT VALIDITY INDEX (CVI)

Five panel members were asked to rate items of questionnaire in order to indicate their relevance to the constructs as per the theoretical definitions of constructs created by reviewing existing literature. A four-point ordinal scale was [1-Not Relevant, 2-Somewhat Relevant, 3-Quite Relevant, 4-Highly Relevant] was employed for this purpose. I-CVI (Content validity index for items) and S-CVI (content validity index for scales). Lynn

(1986) has recommended I-CVIs no lower than .78 and Davis (1992) has recommended a S-CVI not lower than .80 if there are five judges to validate the content.

Table 3.21 *Content Validity Index of questionnaire (HODs)*

Construct#	Item#	I-CVI	S-CVI/AVE	S-CVI/UA	S-CVI
1	1	1	0.94	0.77	0.85
	2	0.8			
2	3	1			
	4	1			
3	5	1			
	6	1			
	7	0.8			
4	8	1			
	9	1			
5	10	1			
	11	0.8			
6	12	1			
	13	1			
	14	1			
	15	1			
	16	1			
	17	0.6			
	18	0.8			
	19	1			
	20	0.8			
	21	1			
7	22	1			
	23	1			
	24	1			
	25	0.8			
	26	1			
8	27	0.6			
	28	1			
9	29	1			
	30	1			
	31	0.8			
10	32	0.8			
	33	1			
	34	1			
	35	1			
	36	1			
	37	1			
	38	1			
11	39	1			
	40	1			
	41	1			
	42	1			
	43	1			
	44	1			
	45	1			
	46	0.4			
	47	1			

3.5.3 Conducting Situation Analysis

As this phase was about conducting the situation analysis for the e-training of university teacher educators, the process of situation analysis was carried out in three steps, i.e. i) Context Analysis, ii) Gap Analysis, and iii) Need Assessment. Framework for the situation analysis is as following:

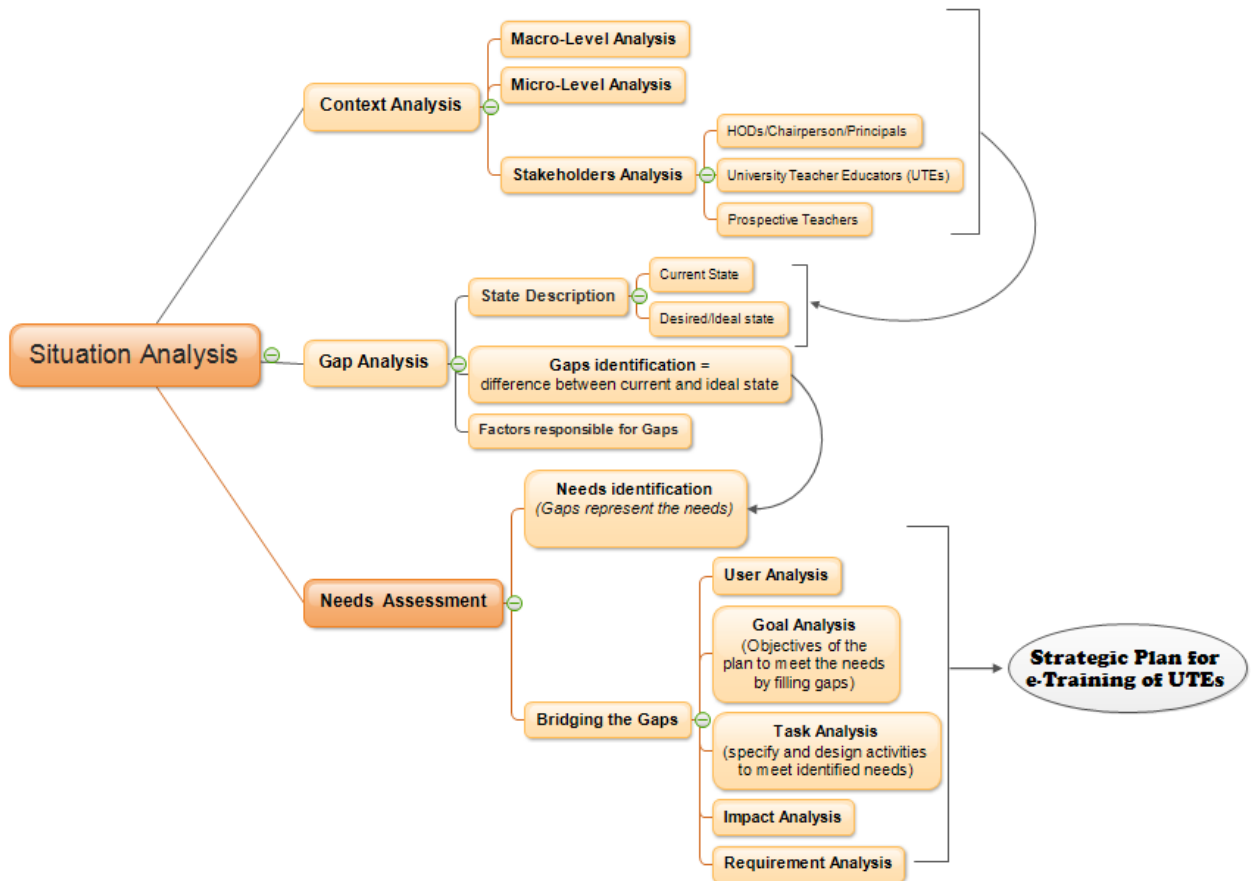


Figure 3.4 : Situation Analysis Framework

1- Context analysis

First step in conducting situation analysis was context analysis. Context analysis was conducted on three different levels, those were i) Macro-level and ii) Micro-Level

i- Macro-Level Context Analysis:

At Macro-level, international context was studied with different dimensions. This analysis was done through systematic review of literature involving different countries of world. e-Learning and e-Training situations and practices were premeditated in detail in literature particularly for teacher education and teacher training. The study reviewed different sources to collect information in international contexts involving research papers, review papers, white papers, background papers, plans, project reports, IT policies, organizational infrastructure etc.

ii- Micro-Level Context Analysis:

In this step, national level study was carried out which was implicated at three sub-levels, i.e.

a) National Context

e-Learning/IT policy, teacher training practices in universities, e-Learning projects, technology trends followed and challenges faced for digital technology integration at national level were brought under study.

b) Organizational Context

Education departments of universities where teacher education programs are being offered were thoroughly studied. For this, at organizational level, vision/mission pertaining to digital technologies, strategic plans for technology integration and utilization, their technology-based teacher training practices, technological infrastructure were brought under analysis.

c) User Context

User context was deliberated with two categories of users, i.e.

- 1- HODs/Chairperson/Deans and University teacher Educators (UTEs)
- 2- Students of Teacher Education Programs (prospective Teachers)

Their institutional e-Learning provision policy, IT infrastructure and availability of digital resources, their behavioral aspects towards technology utilization, digital knowledge and competencies, their awareness about latest digital tools and technologies, purposes of using digital technologies, needs, expectations, preferences, challenges etc. were analyzed on both levels of users.

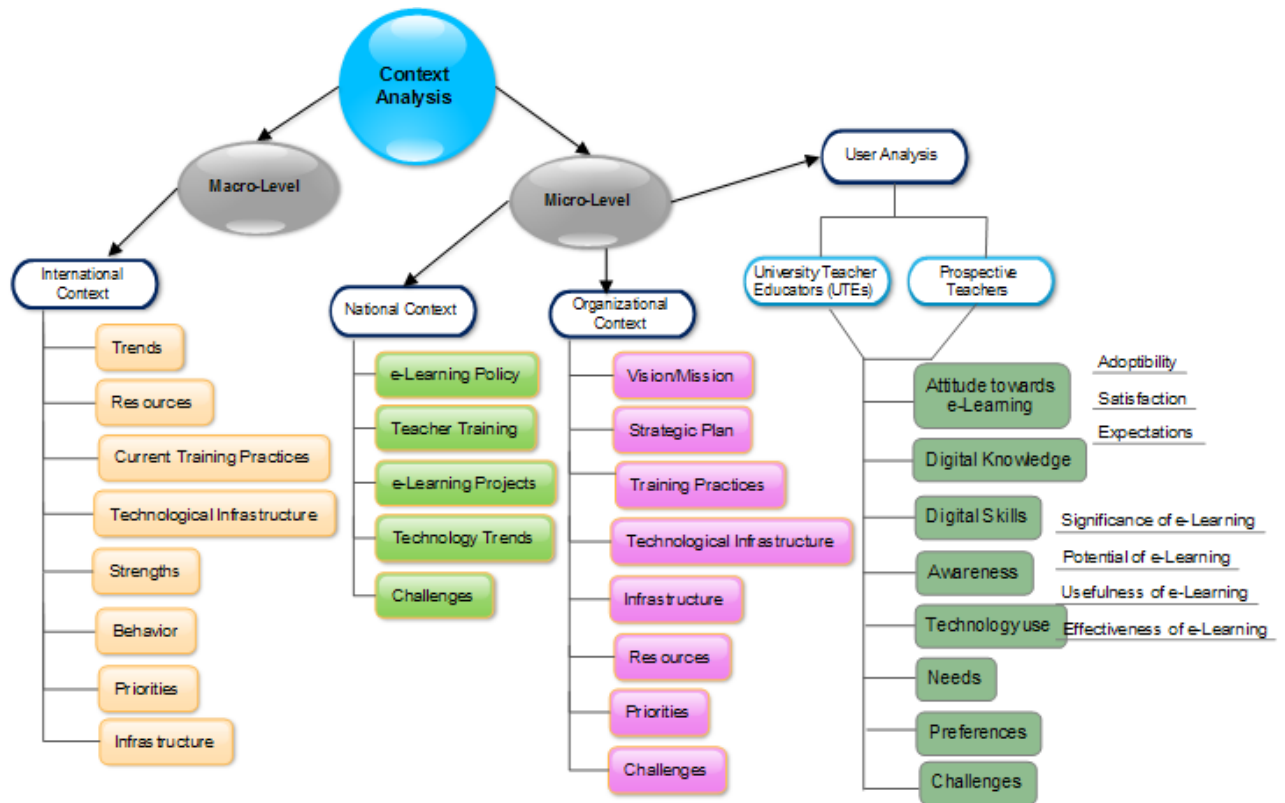


Figure 3.5 : Context Analysis Diagram

2- Gap Analysis

The data obtained during situation analysis phase was used to make a comparison between international and national level of digital practices for learning, teaching and

training. From this comparison a gap was diagnosed between current state of e-Training of UTEs in Pakistan and also the desired state extracted from international level studies. The gaps were then identified and factors responsible for those gaps were also discussed. Visual presentation of gap analysis is as follows:

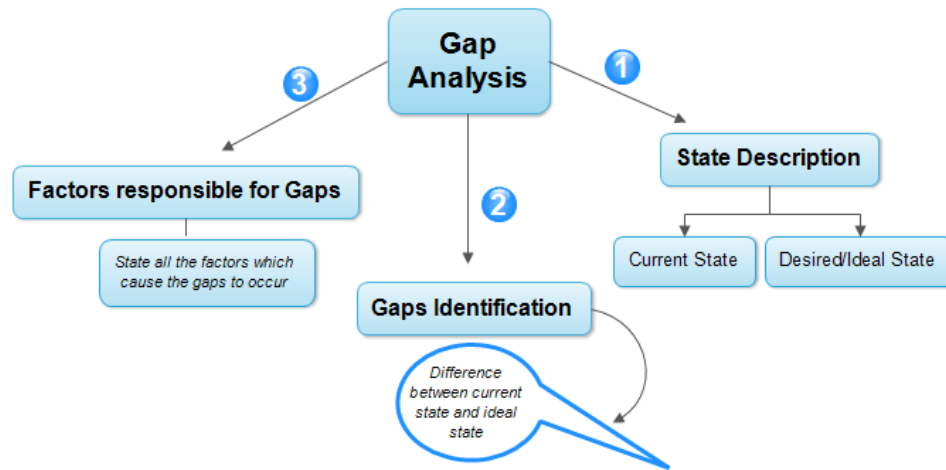


Figure 3.6 : Gap Analysis

3- Need Assessment

Needs for e-Training of University Teacher Educators (UTEs) and a Training Management System (TMS) for conducting e-Training were assessed using the facts of gap analysis phase. Needs were represented by the gaps already identified. In the light of need, a strategy was proposed to fill those gaps by meeting identified needs.

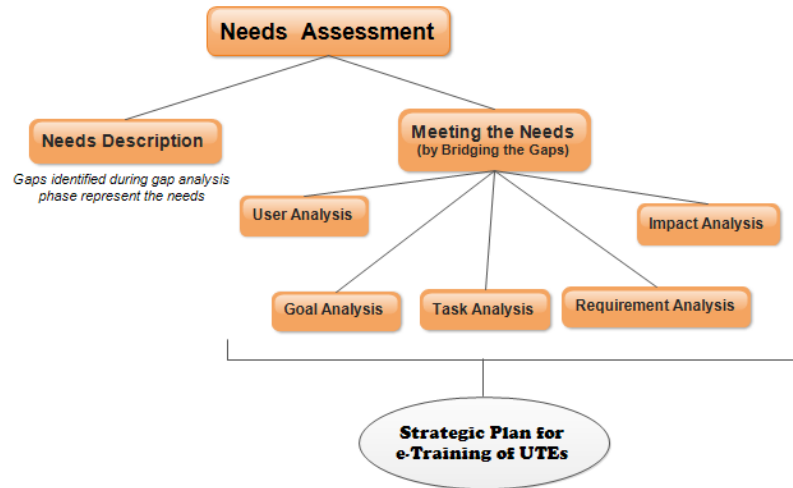


Figure 3.7 : Need Assessment diagram

3.6 PHASE-II

Objective

To propose a Developmental Framework (DFW) of e-Portal for online training of UTEs

Table 3.22 *Research methodology for Phase-II*

RESEARCH METHODOLOGY	
Research Method	- Qualitative method
Research Technique	In-depth review of: - Theories - Philosophies - Processes
Research Tools	- Document review

3.6.1 Research Process

Proposing a Developmental Framework (DFW) for e-Portal consisted of four constituent processes. Those were: i) conceptual foundations, ii)

Methodological Paradigm, iii) Critical success factors (CSF) of e-Learning systems, and iv) Software Development blueprint.

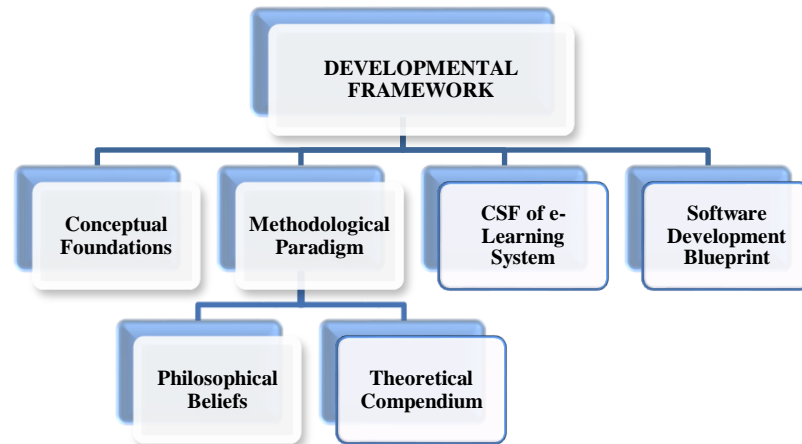


Figure 3.8 : Developmental Framework for e-Portal

Before discussing Developmental Framework, constituents of a training system were discussed as the diagram explains.

1- Conceptual Foundations

A concept is an idea or a plan which has specific components and is defined by those components. (Deleuze&Guattari (1991) state that every concept must be understood “relative to its own components, to other concepts, to the plane on which it is defined, and to the problem it is supposed to resolve”. To elaborate a concept or related concepts of e-Portal and online training, conceptual prototype was developed so that the concept within the mind of researcher might be explicated and justified qualitatively. It seems difficult to rationalize concepts without upholding a conceptual foundation that illustrates the relationships and provides broader context to the concepts under study. Developing the conceptual foundations of given phenomenon is an imperative field to understand "thinking or notional concepts", creating relationship amongst those concepts, and provide holistic representation of concepts and their inter-relationships. A conceptual

prototype was proposed by the researcher in this study to provide a vision and complete plan and strategies for conducting to develop a distinctive TMS called e-Portal for online training of UTEs.

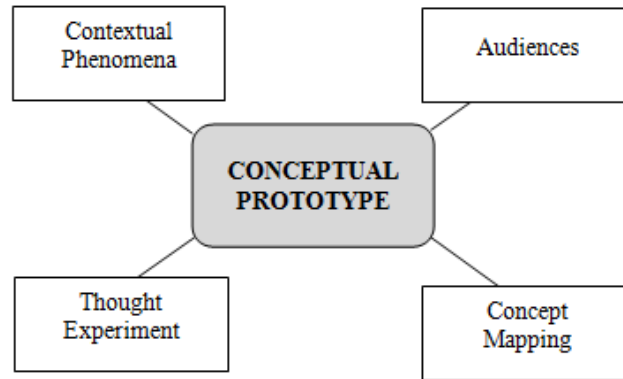


Figure 3.9 : Conceptual Fundamentals of e-Portal

i) Contextual Phenomena:

In this step, the need of new idea/concept within the existing context was discussed. This included the facts and inferences from national, organizational and user perspectives by describing the analyzed needs of e-Training for UTEs during situation analysis phase of research. The description was comprised of answers of following questions:

- What is rationale and need for deciding e-Training for UTEs?
- Why e-Training is the best approach to bridge the gaps diagnosed?
- What are drivers of e-Training?
- Why e-Training of University Teacher Educators is necessary?
- Why TMS (e-Portal) is required for online training of University Teachers educators?

ii) *Audiences*

This step involved detailed 'User Analysis' for whom development framework was proposed, i.e. University Teacher Educators (UTEs). While analyzing UTEs different aspects were brought under study through literature and also empirically. Those aspects are shown in figure.

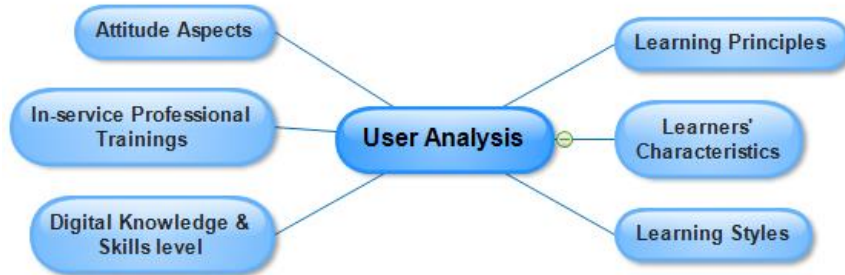


Figure 3.10 : User analysis for DFW

iii) *Thought Experiment*

At this stage, the practical implications and requirements for the implementation and experimentation of DFW were discussed. This step was comprised of implementation rations of DFW and finally building a developmental model.

a) *Goal Analysis*

Goal analysis is attributed as a technique for analyzing goals for identification of order of decisions and operations required to achieve these goals (Dick, 2009). This step involved classifying and writing goals and objectives statements and ascertaining outcomes. Operations and goals of e-Portal development as well as online training were stated in detail. Following was the flow of Goal analysis in this study:

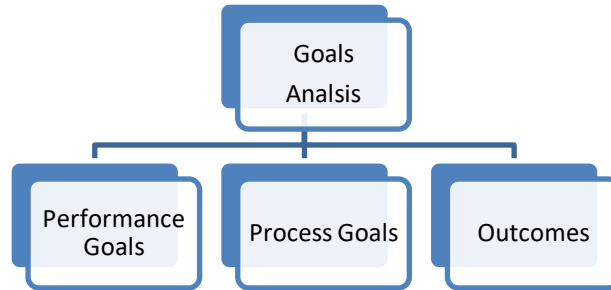


Figure 3.11 : Goal Analysis for DFW

b) Requirements Analysis

The requirements of trainees, e-Training, organizations and system were identified in the process of requirement analysis.

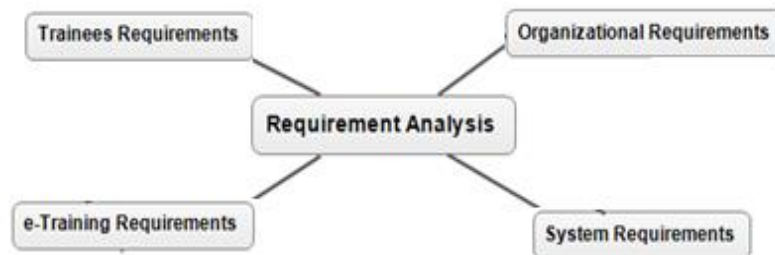


Figure 3.12 : Requirement analysis for DFW

c) Task Analysis:

The process of task analysis consisted of four major tasks. Those were about taking decisions and development of e-Portal, development of training modules, implementing e-Portal for training of UTEs and assessing e-Portal and e-Training.

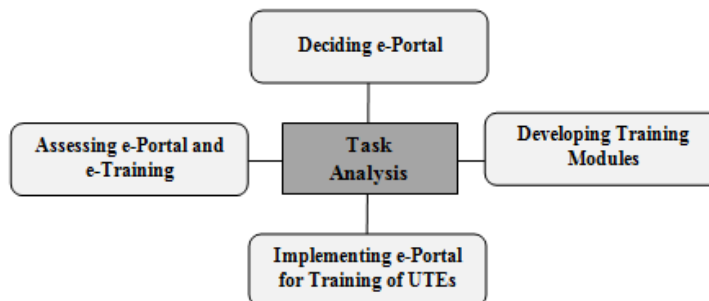


Figure 3.13: Task Analysis for DFW

d) Impact Analysis:

The process of impact analysis was meant to determine the direct and indirect impact of utilization of e-Portal for online training of UTEs.

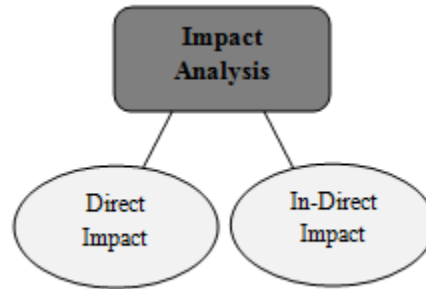


Figure 3.14 : Impact Analysis for DFW

iv) Concept Mapping

Concept Mapping is a structural technique which is useful for organizing the concepts and ideas while formulating DFWs. This step involved:

i) Experiential Data:

- a. Existing process of Training
- b. Existing components of training
- c. Existing TMS for online training
- d. Empirical data sources
- e. Embed newness in existing training process
- f. Integrate e-Learning in all components of training

ii) Identifying, naming, integrating/relating concepts

It comprised of descriptive and visual representation of mixture of content, existing training process, existing TMS (Training Management Systems) and digital technologies & e-Learning.

iii) Integrative Diagram

This step involved the graphical version of the concept of e-Training for UTEs by illustrating the concepts and their inter-relationships.

2- Methodological Paradigm

This step involved the guidelines to adopt the philosophical and theoretical beliefs being followed by DFW, used to establish the set of practices in e-Portal planning and online training of UTEs. This step took account of:

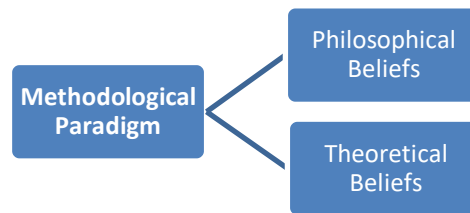


Figure 3.15 : Methodological paradigm for DFW

i) *Philosophical Beliefs*

Epistemological and ontological aspects of 'Pragmatic Approach' were deemed for modeling and analyzing the design principles for the e-Training of UTEs. It outlined the beliefs and agreements on how to get started for e-Training which involved facilitated participants' engagement in online, practical, relevant and challenging e-Training content and activities in online Environments.

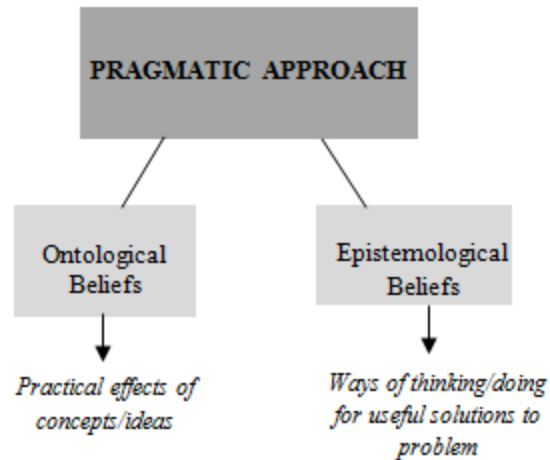


Figure 3.16 : Pragmatic Approach of DFW for e-Portal

So the pragmatic approach to e-Training involved three practical stages, which were:

- a) Explain the destination (End results/outcomes of e-Training)
- b) Provide a Road Map (How to get to the end results/outcomes?)
- c) Remove the Road blocks (Answer the queries/questions/problems that come up and take out the barriers during e-Training of UTEs)

ii) *Theoretical Beliefs*

A compendium of relevant theories for e-Learning was utilized to propose a DFW for e-Training of UTEs. Systematic review and narrative synthesis of existing theories was discussed and the theories relevant to the e-Training of UTEs were integrated in DFW. Specific postulates or components of four theories were derived from literature.

3.7 PHASE-III

Objective

To identify components for the development of e-Portal for online training of University Teacher Educators (UTEs)

Table 3.23 *Research methodology for Phase-III*

RESEARCH METHODOLOGY	
Research Method	- Qualitative method - Quantitative Method
Research Technique	- Interview protocol - Survey
Research Tools	- Interview - Questionnaire

3.7.1 Research Process

This phase of research study was conducted to identify the UTEs' preferences and choices for developing a Training Management System (TMS) for e-Training. Also the features, functions and interface for a TMS was also ascertained.

- Instruments:

This step involved two research instruments, i) Survey Questionnaire, and ii) Interview. By using both tools, researcher collected the opinions and preferences of UTEs regarding the selection of a TMS and preferences for use, design and develop the features, functions and interface of a TMS for e-Training.

- Sample for Interview:

From 10 public universities of Punjab, 10 UTEs were selected for interviews on the basis of familiarity and utilization of e-Learning for teaching and training purposes. So for interview, this was the purposive sampling fulfilling the certain criteria of prior experiences of e-Learning and e-Training in the profession.

- Conceptualization and Operationalization

Following concepts were explicated in this research phase.

- 1- Preferences for the choice of TMS for e-Training of UTEs (New or open-source)
- 2- Preferred TMS for e-Training of UTEs (from survey questionnaire)
- 3- Components of TMS (from survey questionnaire)
- 4- Features of TMS (from Interview)
- 5- Interface of TMS (from Interview)
- 6- Expectations of UTEs regarding TMS
- 7- Social interactivity
- 8- Focus of e-Training
- 9- Willingness to take e-Training course (from questionnaire and interview)

3.8 PHASE-IV

Objective

To develop an e-Portal for the training of University Teacher Educators (UTEs)

Table 3.24 *Research methodology for Phase-IV*

RESEARCH METHODOLOGY	
Research Method	- Modular method of software development
Research Technique	- SDLC Model - Software development languages - Software development framework
Research Tools	- Interface : PHP 5.2 - Database : Mysql 5.0 - Apache 2.2

3.8.1 Research Process

This phase of research was followed by Software development cycle which have six distinctive steps. Those are:

1- Requirement Gathering and Analysis Phase

In this phase, the system and software requirements were gathered from two types of analyses:

a. Requirement Analysis

It comprised of the data and opinions collected during requirement analysis phase of research. It determined the requirements of UTEs, e-Training and system to be developed. These requirements were then analyzed for taking decisions to possibly be incorporated into the system.

b. Feasibility Study

Feasibility study was performed to determine whether the solutions considered to accomplish the requirements was practical and workable in the software. The purpose of feasibility study was to establish the rationale for developing an e-Portal that was acceptable by the stake holders and adaptable to conduct the e-Training of UTEs. Information such as resource availability, cost estimates for software development, advantages of software to the organizations and UTEs, and cost needed for software maintenance were analyzed during three steps of feasibility study, i) Technical feasibility, ii) Operational feasibility, and iii) Economic feasibility.

2- Design Phase

The system design and software design was prepared from requirement specifications studied in the analysis phase. Model of System Development Life Cycle (SDLC) was adopted which was supposed to be used as backbone during development phase. System Design helped in stipulating hardware and the system requirements. It also assisted in defining the overall system architecture. System design specifications served as input for development phase of the model. Test strategy for testing the software was also prepared in this phase. This step consisted of following visual descriptions:

- a. Data Flow Diagrams (DFDs)
- b. Flow Charts
- c. Entity Relationship E-R Diagrams
- d. Model of SDLC
- e. Testing strategy (A test strategy is an outline that describes the testing approach of the software development cycle.)

3- Development/ Coding and Implementation Phase

On the basis of requirement specification and design documents, the work was divided into modules and the coding process was started by the developer. This was the longest phase of Software Development life cycle. When the software was developed, it was implemented for a pilot study to examine the functionality of software properly.

4- Testing Phase

In this phase, already designed testing strategy was followed by i) Black-box testing, ii) White-box testing, iii) Smoke Testing, and iv) Sanity testing. Developed software was tested against the requirements to ensure that the product was actually fulfilling the needs addressed and collected during the requirement phase. All types of functional and non-functional testing was carried out. During testing, software was assessed for the errors and bugs appeared were documented.

5- Deployment Phase

After successful testing, the e-Portal was deployed for practical use and beta testing was done. During beta testing, some bugs were caught and reported to developer. The reported bugs were fixed and final deployment took place.

6- Maintenance or Evolution Phase

When the software was practically implemented for e-Training, actual issues were come up and needed to be solved time to time for up-gradation or problems fixation. Without maintenance a software doesn't remain up-to-date.

3.9 PHASE-V

Objective:

To develop training modules for e-Portal for e-Training of University Teacher Educators (UTEs).

Table 3.25 *Research methodology for Phase-V*

RESEARCH METHODOLOGY	
Research Method	- Quantitative - Qualitative
Research Technique	- Survey - In-depth Review - Models of Instructional Design
Research Tools	- Questionnaire - Document Review - ADDIE Model

3.9.1 Research Process

After massive reviews of documents and literature, ADDIE model was selected to design the e-Training course, and instructional modules and material. It is a 5-step commonly used flexible acronym for building online training courses, ADDIE takes account of cyclic process from initial planning and analysis phases till the ending stage of evaluative process. As a flexible model, ADDIE allows each step of the process to be reviewed, revisited, and refined if indispensable. The course was designed and developed using ADDIE model but the e-Training rationale was taken from CFW developed in the second phase of this research study. That is:

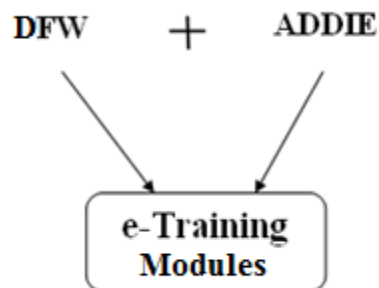


Figure 3.17 : *e-Training Modules theoretical foundation*

Analysis:

In the Analysis step, the course planning and different analyses were made. Some information was gathered Information was gathered about need of e-Training for UTEs and other factors from situation analysis phase of this research study which was necessary in course planning. The data included:

Design:

The information obtained from first stage of analysis was used to prepare a blueprint in combination with learning principles and learning theories used in the CFW of e-Training. This step also determined the strategies to create this online training program. Design was started with establishing the learning objectives and tasks identification was carried out. The entire course design was systematic and logical in which each segment was linked and built on the previous segment. After tasks were segmented, the strategies regarding e-training course delivery methods, the digital tools and technologies, the content material were decided and then e-activities were designed for the participants of course. Also the assessment strategies were planned.

Development:

This stage involved the creation of content material and activities to be utilized in the e-Training course. All those strategies which were selected during design stage were developed and assembled here. It included the development of training modules, lessons, activities, learning resources as well as integration of digital materials such as presentations, videos etc. Also the manuals of course guides and content material were

prepared. This first draft was reviewed and revised until it was shaped in ready form for implementation.

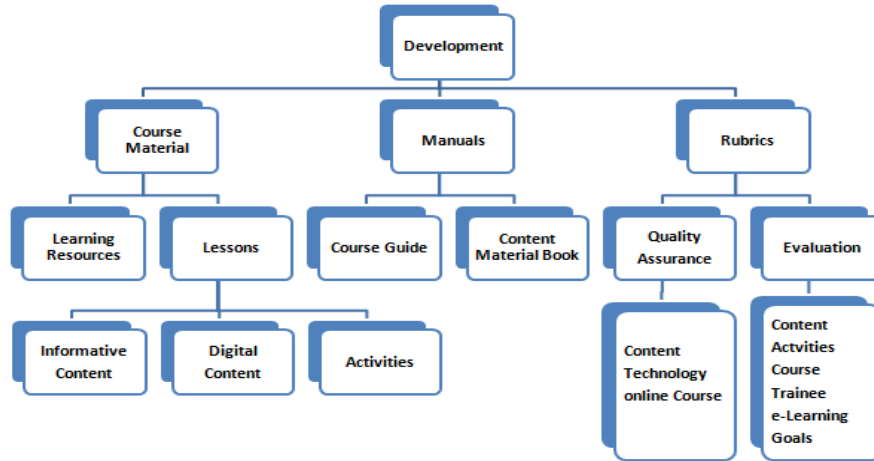


Figure 3.18 : Development of e-Training Course

Implementation:

After the development, the content was implemented to ensure that all developed entities were ready for e-Training. It included deployment of the course modules and testing the equipments, e-Portal, compatibility of content with e-Portal, and all the functions of course. The course material was tested on a group of participants to check that if there exist any weaknesses or problems before actually starting the training. So the validity of course and content was ensured during this phase.

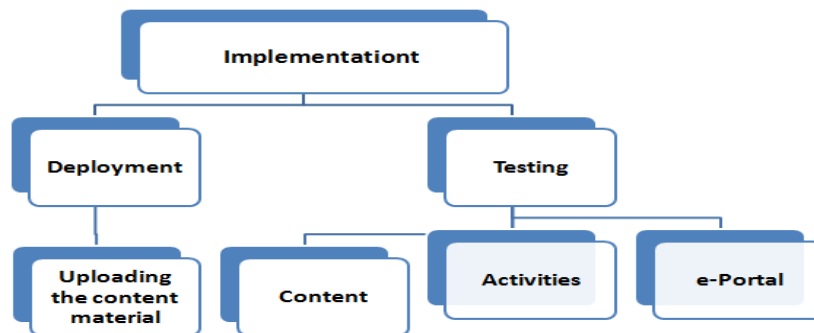


Figure 3.19 : Implementation plan of training on e-Portal

Evaluation:

Evaluation was the last step in ADDIE. The validation results of testing were analyzed by using evaluation rubrics and evaluation criteria. The process was revised and modifications were made on the basis of rubric outcomes. Three types of evaluation took place during this step:

- Feedback
- Surveys

After this step, the e-Training course was ready to be utilized for University Teacher Educators (UTEs) using e-Portal.

3.10 PHASE-VI

Objective:

To apply e-Portal for pilot testing and practical orientation course for University Teacher Educators (UTEs)

Table 3.26 *Research Methodology for Phase-VI*

RESEARCH METHODOLOGY	
Research Method	- Experiment
Research Technique	- Survey (for measuring readiness and engagement level of participants) - experiment
Research Tools	- e-Portal (UTeT) - online questionnaire

3.10.1 Validation of Tools

Questionnaire 4 : Readiness Level of Participants before e-Training

1. Content Validity And Face Validity Of Questionnaire

Table 3.27(a) *Content and Face validity of Readiness questionnaire*

Sr.#	Validity Criteria	%age
1	General Characteristics	92
2	Scales and pre-determined Alternative Responses	100
3	Sequencing Items	100
4	Language & Grammar	100
5	Items' Layout and Format	75

2. Content Validity Index (CVI)

Table 3.27(b) *Content validity index for Readiness questionnaire*

Item#	Rater1	Rater 2	Rater 3	Rater 4	I-CVI	S-CVI/AVE	S-CVI/UA	S-CVI
1	4	4	3	4	1	0.93	0.80	0.87
2	4	4	4	4	1			
3	4	4	4	3	1			
4	4	4	4	4	1			
5	4	4	3	4	1			
6	4	4	4	4	1			
7	4	2	4	4	0.75			
8	4	4	4	4	1			
9	4	2	4	4	0.75			
10	2	3	2	4	0.5			
11	3	4	4	4	1			
12	4	3	4	4	1			
13	4	4	4	4	1			
14	4	4	4	4	1			
15	3	4	3	4	1			

Questionnaire-5: Engagement Level Of Participants during e-Training

1. Content Validity And Face Validity of Engagement Questionnaire

Table 3.28(a) *Content and face validity of Engagement questionnaire*

Sr.#	Validity Criteria	Means
1	General Characteristics	81
2	Scales and pre-determined Alternative Responses	87
3	Sequencing Items	75
4	Language & Grammar	92
5	Items' Layout and Format	67

2. Content Validity Index (CVI)

Table 3.28(b) *CVI for Engagement Questionnaire*

Item#	Rater 1	Rater 2	Rater 3	Rater 4	I-CVI	S-CVI/AVE	S-CVI/UA	S-CVI
1	4	4	4	4	1	1.00	1.00	1.00
2	4	4	4	4	1			
3	4	4	4	3	1			
4	4	4	4	4	1			
5	4	4	4	4	1			
6	4	4	4	4	1			
7	4	3	4	4	1			
8	4	4	4	4	1			
9	4	3	4	4	1			
10	4	3	4	4	1			
11	4	4	4	4	1			
12	4	4	4	4	1			

Validation of e-Portal

e-Portal was validated from beginning till end by employing four software testing methods. Those were:

- i) Black box testing
- ii) White Box testing

- iii) Smoke Testing
- iv) Sanity Testing

After sanity testing, e-Portal was made bugs-free and was ready to be utilized for e-Training of UTEs.

e-Portal evaluated by Experts:

e-Portal, before starting online training, was evaluated by four experts for the usability and maintainability of its features and functionalities.

Table 3.29 *Evaluation of e-Portal*

CRITERIA	EXTENT THE SOFTWARE FULFILLS	%age
Understandability	Easily understood	89
Documentation	Comprehensive, appropriate, well-structured user documentation	81
Buildability	Straightforward to build on a supported system	93
Usability	Straightforward to use on a supported system	94
Learnability	Easy to learn how to use its functions	96
Identity	Project/software identity is clear and unique	91
Governance	Easy to understand how the project is run and the development of the software managed?	83
Accessibility	Evidence of current/future ability to access	89
Testability	Easy to test correctness of source code	97
Portability	Usable on multiple platforms	98
Supportability	Evidence of current/future developer support	88
Analyzability	Easy to understand at the source level	92
Changeability	Easy to modify and contribute changes to developers	90

Validation of Training Modules

Training modules were validated through three experts from which one was e-Learning expert and rest two were content experts from teacher education. Results of validation ensured the researcher to employ training modules for practical orientation course.

Table 3.30 *Evaluation of Training Modules*

Criteria	Low (%age)	Med. (%age)	High (%age)
Objectives of training		33.3	66.7
Compatibility with e-Portal			100
ADDIE		33.3	66.7
Connectivism			100
Theoretical Compendium of DFW			100

Validation of Modules content

Four curriculum experts validated the content of training modules and evaluated the relevance of content with e-Training course. Content validity index was calculated in the light of feedback of all experts.

Table 3.31 *CVI for content of Modules*

Item #	R1	R2	R3	R4	R5	Number Agreements	I-CVI	S-CVI/AVE	Total Agreement	S-CVI/UA	S-CVI
1	4	4	4	3	4	5	1	1.00	8	0.67	0.83
2	4	4	3	4	4	5	1				
3	3	4	4	3	4	5	1				
4	4	3	4	3	4	5	1				
5	4	4	4	4	4	5	1				
6	3	4	4	4	3	5	1				
7	4	3	4	4	4	5	1				
8	4	4	4	4	4	5	1				

3.10.2 Research Process

This phase of research was experimental which was held to fulfill two purposes, those were, i) Pilot testing of e-Portal, and ii) practical orientation of e-Training course with UTEs. For this, certain steps were taken:

- i) The UTEs included in sample were sent course invitations via emails. In the invitation letter, the process of registration in the course on e-Portal were outlined.
- ii) Interested UTEs were registered and were provided with trainee logins to enter the e-Portal and take the course. A course calendar including course sessions and events was also provided to the participants.
- iii) Participants were provided a survey questionnaire to analyze their e-Readiness and expectations to take this course.
- iv) Participants were guided towards course modules where lesson with content were imparted according to the course calendar.
- v) In the mid of the course, another survey was administered with participant to analyzed their e-Engagement with course and digital environment.
- vi) During course a number of activities were provided to the trainees to show their participation with content and course. Assessments were also taken in the form of descriptions and quizzes.
- vii) At end of the course, another survey was launched to analyzed the, i) acceptance level of participants for practical orientation course with e-Portal and ii) success of e-Portal utilized for online training of UTEs.

3.11 PHASE-VII

Objective:

To explore the participants' acceptance level and success of e-Portal after taking practical orientation course.

Table 3.32 *Research methodology for Phase-VII*

RESEARCH METHODOLOGY	
Research Method	- Quantitative
Research Technique	- e-Survey
Research Tools	- online questionnaire

Reliability and Factor Loadings regarding TAM

Table 3.33(a) Cronbach's Alpha (Reliability) of TAM Questionnaire

Scale	Cronbach's Alpha
Perceived Ease of Use (PEOU)	0.73
Perceived Usefulness (PU)	0.87
Attitude Towards Using (ATU)	0.78
Intentions to Use (ITU)	0.64

Table 3.33(b) *Factor Loadings – TAM Questionnaire*

Scale Item	1	2	3	4
PEOU_1	.602			
PEOU_2	.617			
PEOU_3	.758			
PEOU_4	.764			
PU_1		.502		
PU_2		.642		
PU_3		.602		
PU_4		.875		
ATU_1			.792	
ATU_2			.705	
ATU_3			.604	
ATU_4			.844	
ITU_1				.667
ITU_2				.648
ITU_3				.709

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.

3.11.1 Research Process

Participants of the course were asked to fill the questionnaire at the end of course which was intended to know the opinions of trainees about the acceptance of e-Portal as an online training application for UTEs. Technology Acceptance model (TAM) was applied on the data to explore the acceptance level of UTEs for e-Portal.

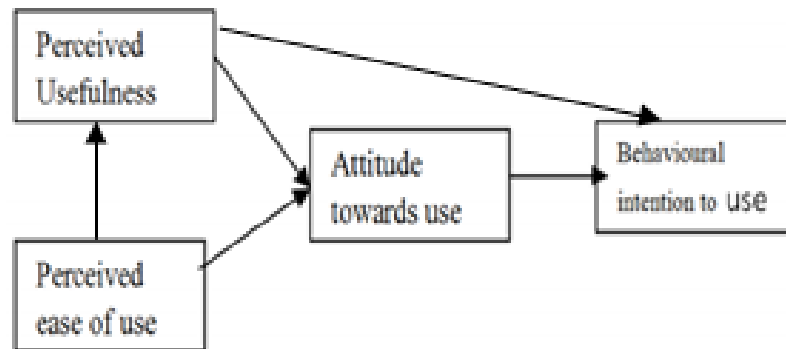


Figure 3.20 : TAM for the acceptance of e-Portal

After all seven phases of research were completed and data were collected according to the methodology and procedure, the data were thoroughly analyzed to meet the objectives, to test the hypotheses and to answer the research questions. Detailed analysis of data is given in chapter 4 of this study.

CHAPTER 4

DATA ANALYSIS

The study was undertaken to find the need of e-Training for University Teacher educators and then to develop an e-Portal for online training of UTEs. To find the need of e-Training, a situation analysis was conducted. Questionnaires, interviews, and documents reviews were used as tools to get data. On the basis of needs, an e-Portal was developed for online training of UTEs. In addition to this, e-Training modules compatible with the features, interface and functionality of e-Portal were developed. Then a practical orientation course was launched for the pilot testing of e-Portal. At start and mid of the course, e-Readiness and e-Engagement of participants was measured. At the end of practical orientation course, an online survey was conducted to find the acceptance level of participants for using e-Portal in their training programs.

This chapter presents the analysis of data which were collected from the samples already discussed in chapter-3 of this study. As this research was conducted and proceeded in seven distinct phases and the results are illustrated objectives-wise.

4.1 OBJECTIVE: 1 (Phase-I)

To conduct situation analysis for e-training of University Teacher Educators(UTEs)

To carry out situation analysis, three survey questionnaires were used which were administered with different samples. a) Chairperson/HODs/Principals, b) University Teacher Educators (UTEs), c) students of Teacher education (prospective teachers).

Situation analysis was conducted using a distinct framework discussed in detail in methodology chapter. Context analysis, Gap analysis, & Need Assessment were separate

processes progressed in detail. Firstly, the data of context analysis were analyzed to acquire the findings and results of situation analysis.

4.1.1 Context Analysis:

In accordance with the methodology, context analysis was proceeded at macro and micro levels.

I Macro Level : International Context

Ii Micro Level : National, Organizational and User context

4.1.1.1 Macro Level Context Analysis:

Documents analysis was conducted followed by thematic analysis approach where data gained from documents were interpreted and examined for eliciting meanings and understanding of prevailing situation of e-Learning trends, e-Training and online training applications utilized in online training of teachers in Higher education and teacher education institutions at international level.

i) e-Learning in Educational policies and Digital Progress Reports

Educational plans and policies of different countries were reviewed for analyzing e-Learning trends and practices being prevailed in Finland, Austria, Belgium, Sweden, UK, Germany and France. Strengths and weaknesses regarding e-Learning were examined and need of e-Training of teachers was analyzed, whereas the prevailing situation of e-Pedagogy, e-Curriculum, Digital resources and digital competencies of teachers were also brought under analysis process.

Whilst analyzing Policy and plan documents of Finland, it was found that teachers own advanced digital skills and e-Teaching practices are observed while VLEs are utilized in teaching and teacher training. Teachers are digitally literate and have positive

attitude towards digital technologies uses whereas less use of digital technologies by students is evidenced. It is also revealed that teachers of Finland require e-Training for seeking digital pedagogy and e-Curriculum development, and also for the enhancement of digital literacy.

In European countries, according to Europe's digital Reports 2017 and Educational reports of Austria, Belgium and Sweden, it is found that teachers in these countries are digital champions and owe faster digital progress with basic level of digital skills. These countries allocate funds for digitized teacher training and e-Teaching practices to promote digitized learning. It is analyzed that teachers lack advanced digital competencies and also less e-Pedagogical skills are evidenced. Virtual environments for learning and training are lacking while less training programs are conducted using VLEs.

Findings of review of EDPR-2017 and Technology Partnership Report-2016 reveal that UK provides digital skills development training to the teachers while online teaching and learning are done by utilizing e-Curriculum. Reports provide evidence of shortage of ICT-skilled professionals while highlighting their high demands. Teachers lack training programs for the enhancement of digital competencies, digital literacy and e-Content development. Policy documents of Germany highlight the higher digital skills and prevailed practices of e-Curriculum utilization in online education. Germany has developed specific digital education strategy and high investments are made for developing digitized infrastructure for online education. It is found that educational institutions are provided with less bandwidth facilities while shortage of online teacher and e-Teaching practices is evidenced. It is obvious from documents that teachers need e-Training programs to prepare digitally skilled professionals.

In Digital Education Plan – 2015, EDPR-2017, DSJC-2016, and DESI-2016 of France, it is found that high investments are made on digitization of education. Essential digital skills are provided to teachers through digital training courses while high internet usage for learning is being evidenced. Documents show that practices of online teaching and learning are lacking while less training programs for teachers are conducted as teachers own insufficient digital competencies of e-Teaching and e-Content development.

ii) *e-Learning Strategic Plans and Digital Progress Reports*

e-Learning strategies, strategic plans of universities of different countries were reviewed to find the patterns of e-Learning, e-Teaching and e-Training being provided there. Online strategies of three universities of UK revealed that e-Learning is being integrated in teaching, training and content. e-Teaching practices are common while blended, mobile and collaborative e-Learning is applied in online learning environments. Besides online training and professional development course for university teachers are being organized to develop and enhance digital competencies and digital literacies of teachers.

It was found that e-Teaching, e-Learning and online training are practiced in universities of USA, Australia, Croatia and Norway. These universities are provided with digital infrastructure as students and teachers are having availability of latest digital tools and technologies, and e-Resources are easy to access. Digital skills are found as mandatory in universities of USA with familiarity and use of e-Curriculum. VLEs and LMS utilization practices are established. Web portals and e-Portfolios are being used in University of South Australia.

Findings of review point out the need of online training programs to be conducted for university teachers which are considered obligatory for inductions and promotions of teachers in the universities. These training programs should be aimed at developing and enhancing e-Pedagogical skills, e-Learning skills, e-Content development and digital literacy and competencies of teachers. In Croatia, e-Learning strategy of University of Zagreb proposes to give weightage to e-Learning knowledge and skills as criteria for recruitment and promotions of teachers.

iii) *Digital Policies for Teacher Education and Teachers Training in different Countries*

Digital policies of USA, Canada, Australia, Europe and Asian countries were analyzed to study teacher education and teacher training trends. Digital policy documents of six universities of USA depicted that teacher trainings are organized and conducted through webinars, MOOCs while digital tools and technologies are utilized for training purposes. The some of the major objectives of most of teacher training programs are developing digital literacy, e-Pedagogical skills and e-Curriculum development skills in teacher education of these universities, Teacher Training programs of two Canadian universities focus the use of LMS, web portals and smart devices and hybrid designs to promote and enhance digital literacy, virtual pedagogical skills, and e-Courses designing. Australian universities are evidenced to conduct teacher training courses mainly focused on e-Teaching competencies, learning analytics and digital learning resources while utilizing social network, video conferencing, teleconferencing VLEs, mobile apps, CMS and tablet-enabled classrooms.

Digital policies of Asian countries emphasize on the need of teacher training with the focus of MOOCs, x-spaces, web portal, virtual classrooms to enhance the competencies of e-Teaching and e-Content designing. European universities conduct teacher training programs to promote the emerging Trends of visual teaching, e-Content designing skills and digital literacy whereas highlighting the need to utilize VLEs, MOOCs, OERs, blogs, virtual tutoring and Webinars.

iv) *E-Learning Strategies for Teacher Education and Teachers Training*

Many countries have developed their e-Learning strategies for teacher education and teacher training. These countries include USA, UK, Norway, Croatia, Scotland, Australia, Taiwan, China, Thailand, Japan, France and Vietnam. Teacher education and teacher training in these countries focus on the latest patterns in e-Learning, e-Teaching and online training of prospective teachers and teacher educators. Emerging trends suggested by strategic plans comprise of blended learning, self-paced hybrid learning, mobile learning, transformative learning, online collaborative learning, e-Tutoring, and virtual teaching. Digital resources utilized in teacher education and teacher training include digital tools and technologies, moodle, LMS, web portals, VLEs, e-Content, digital libraries and OERs. Whereas these training programs intend to develop and enhance digital literacy, e-Content design, e-Teaching skills and e-Pedagogical knowledge. e-Curriculum is suggested by the plans to be designed, developed and implemented in teacher education and teacher training programs.

v) *E-Portals used in different countries for Teachers Training*

Review of organizational documents (e-Learning strategies, websites, brochures, teacher training reports) provided evidences of utilization of e-Portals for teacher trainings in educational organizations of different countries..

Table 4.1 *e-Portals used for teacher educators/teachers training*

e-Portals for Teachers Training	Organization/Country
Iten	e-Portal for inter-American teacher education Network, USA
SOFTICA	e-Portal for online teachers training, Ukraine
QEP	Drake University, Iowa
ProEd	e-Portal for Professional Educators' training, Tennessee, USA
OTT	Teachers training portal, Oxford University, UK
PEGE	Promundo teachers' training for gender equality, Portugal
IOL	Inclusion online Learning Portal, Victoria State Govt., UK
UTT	Ubiquitous Training for Higher Education Teachers, Mexico
NCTE	e-Portal of National Council for Teacher Education, India
MEROLT	Teacher Education Portal, California State University, USA
e-Teaching.org	e-Portal for Digital technologies to improve teaching, Germany

It was illustrated by Table 4.1 that e-Portals are widely used in teacher education of different countries in the world to conduct and promote online professional training programs of teachers and teacher educators as well.

4.1.1.2 Micro Level Context Analysis:

Documents analysis was conducted followed by thematic analysis approach where data gained from national and organizational documents were interpreted and examined for eliciting meanings and understanding of concepts and themes under study. Data gathered through questionnaire was also analyzed for organizational level and user level for micro level context analysis.

i) National-Level Context

The National Education Policy – 2009 was reviewed in technology perspective to examine the policy focus of technology integration in specific areas of teacher education and teacher training. It was found that policy spotlights technology integration and utilization on basic/surface level in teacher education and teacher education of Pakistan. It was also found that NEP-2009 does not emphasize integration of information and communication technologies and e-Learning in teaching pedagogy and teacher training content. Also ICT and e-Learning knowledge and skills are not considered as compulsory criteria for recruitment and promotion processes of teacher educators in TEIs whereas policy doesn't recommend the allocate funds for establishing ICT and e-Learning based infrastructure in TEIs.

While reviewing the National Education Policy – 2017, it is found that teacher educators in TEIs and universities are not properly skilled according to professional standards, also teacher educators' training is not customary phenomenon. Continuous

professional trainings are not introduced for teacher educators however policy recommends to establish training academy for continuous professional trainings of teacher educators to help them acquire up-to-date knowledge and adopt modernized innovative teacher-learning strategies in classroom. NEP-2017 recommends to set up digital libraries in universities and teacher education institutions.

Higher Education Commission (HEC) of Pakistan offers curriculum pack for teacher education programs in which subjects of ICT and computer literacy are included at knowledge level for prospective teachers while latest technological trends are not made a part of curriculum of teacher education. Additionally, practical application of novel trends of e-Learning and digital learning are not recommended in curriculum of teacher education at any level.

National Professional Standards for Teachers in Pakistan (NPSTP) being the main pillars of quality instruction focus the knowledge and skills of Information and communication technologies obligatory for teachers of Pakistan as 7th standard of NPSTP emphasizes proficient use of ICT by teachers.

In Pakistan Vision – 2025 report, emphasis is put on bringing technological shift in education by utilizing ICT as new forces of technology and innovation are changing the paradigms of development in every sphere of life. Report focuses on opening technology colleges and highlights the importance of training and education. Review of the report reveals the new policy initiatives meant for improving quality and delivery of education which may comprise on establishing trendy and innovative ways to develop standardized curriculum, national standards for education and teachers training to use modern teaching-learning methods.

Findings of National ICT (NICT) Strategy for Teacher Education/Training in Pakistan – 2008 divulge the different areas of focus in National ICT (NICT) strategy-2008 regarding teachers training. Report reveals the NICT recommendation for utilizing TV and radio channels for teachers training, ICT integration in pre-service teacher training, creating online environments for teachers training, integration of ICT in teaching and curriculum. Under NICT, online teachers training courses were also offered with the collaboration of UNESCO and INTEL. Review of the research studies and reports present the e-Learning vision for teacher training of Pakistan. The e-Vision focuses four areas of teacher education. Data shows that Pakistan has laid stress on incorporating digital technologies in learning, teaching, training and curriculum of teacher education and also utilizing online environments for ICT-based trainings of teacher is highlighted.

ii) *Organizational Context*

Data collected from ten public universities were analyzed for different organizational dimensions to study i) e-Learning/ICT as priority in teacher training, and ii) focus of training of teacher educators, while vision and mission statements, strategic plans and objectives were brought under study.

Table 4.2 *Organizational Vision, Mission, Strategic Plans, & Objectives*

Sr. #	University Name	<u>Focus</u>	
		ICT/e-Learning in Teacher Training	Teacher Educators Training
1	Islamia University, Bahawalpur	No	No
2	BahauddinZakariya University (BZU), Multan	No	No
3	University of Gujrat (UoG)	No	No
4	University of Sargodha (UoS)	No	No
5	Govt. College University (GCU), Faisalabad	No	No
6	PMAS-ARID Agriculture University, Rawalpindi	No	No
7	Fatima Jinnah Women University (FJWU), Rawalpindi	No	No
8	Lahore College Women University (LCWU), Lahore	No	No
9	Institute of Education and Research (IER), The University of Punjab, Lahore	No	No
10	University of Education, Lahore	No	No

Table 4.2 depicts data taken from teacher education departments/institutes of 10 formal public universities of Punjab maintains a lucid representation of prevailing situation of ICT in strategic plans, vision and mission of these organizations. Table shows that none of the departments/institutes gives importance to incorporate ICT in teacher education. No department/institute has precedence of utilize ICT in teachers training. Also no teacher education department/institution stresses on organizing the training programs for University Teacher Educators (UTEs).

Table 4.3 *e-Learning strategy and National-level support regarding e-Learning*
(Respondent: HODs/Chairperson/Deans)

Statements	N	No (%age)	Under Process (%age)	Yes (%age)
e-Learning strategy / plan developed	30	46.7	33.3	20
National-level measures to support e-Learning	30	80.0	13.3	6.7

Table 4.3 shows the responses of HOD/Chairperson/Deans of teacher education departments/institutes. For e-Learning strategy/plan, 46.7% respondents said that they have not developed any e-Learning strategy/Plan while 33.3% respondents said that e-Learning plan for their departments/institutes are under process. For national-level measures to support e-Learning, 80% respondents countered that there are no national-level measures to support e-Learning for teacher education for their institutes/departments.

Table 4.4 *Selection Criteria for University Teacher Educators (UTEs)(5-Point Scale)*

Statements	N	Mean
Skills and knowledge of e-learning is one of the selection criteria in recruitment process of University Teacher Educators (UTEs).	30	1.37
University gives weightage to pre-service teacher training certifications of candidates for the selection of University Teacher Educators (UTEs) in recruitment process.	30	3.80

In Table 4.4, Mean=1.37 shows that most of the respondents disagreed that universities prioritize the skills and knowledge of e-Learning/ICTas criteria for the recruitment of

UTEs. While mean=3.80 portrays that respondents were likely to agree that pre-service teacher training certifications are somewhat given priority in recruitment process of UTEs.

Table 4.5 *Fund Allocation for e-Learning services (3-Point Scale)*

Statements	N	Yes (%age)	Rarely (%age)	No (%age)
University/Institute allocates and releases funds for establishing and maintaining e-learning based teaching/learning environment	30	20	33.3	46.6
Allocation of funds for E-learning based Training programs of University Teacher Educators (UTEs)	30	13.3	6.6	80
Funds for Provision of digital technologies to University Teacher Educators (UTEs)	30	43.3	33.3	23.3

As shown in Table 4.5, universities/institutes of teacher education are not inclined towards funds allocation for maintaining and promoting e-Learning in teacher education. 20% of the respondents said that their university allocates and releases funds for establishing e-Learning based teaching/learning environments. 13.3% UTEs responded that their university allocates funds for e-Learning based training programs for UTEs. While 43.3% respondents said that their university allocates funds for the provision of digital tools and technologies to UTEs.

Table 4.6 *Digital Competencies of UTEs(5-Point scale)*

Statements	N	Mean
University/Institute demands digitally competent UTEs to promote e-Learning, e-Teaching and designing and developing e-Learning based curriculum.	30	3.20

In Table 4.6, Mean=3.20 depicts that UTEs have assorted opinions of agreement and disagreement about the priority of university/institute for demanding digitally competent teachers.

iii) *User Context*

Data were collected from two types of users, i) UTEs and HODs/Chairperson of TE departments, ii) Prospective teachers.

a) UTEs Context

Table 4.7 *Availability of Digital Tools to UTEs (Dichotomous scale)*

Digital Tools	N	Responses	
		Yes	%age
Laptop	354	333	94
Smartphone	354	350	99
Tablet PC	354	131	37
IPad	354	67	19
Desktop Computer	354	223	63
Webcams	354	262	74
Interactive Whiteboard	354	57	16
Multimedia Projector	354	223	63

Table 4.7 shows the availability of digital tools to UTEs. Findings describe that 94% of UTEs have the availability of laptops and 99% of UTEs have availability of Smartphone, whereas 37% UTEs own tablet PCs and 19% have iPads with them. It is also obvious from the findings that 74% of UTEs have webcams, 16% UTEs have availability of interactive Whiteboard while 63% of UTEs are provided with multimedia projectors.

Table 4.8 *Frequency of using Digital Tools by UTEs (5-Point scale)*

Digital Tools	N (UTEs having availability)	Mean
Laptop	333	4.77
Smartphone	350	4.62
Tablet PC	131	3.05
IPad	67	2.93
Desktop Computer	223	4.16
Webcams	262	2.34
Interactive Whiteboard	57	1.61
Multimedia Projector	223	3.53

In Table 4.8, Mean values illustrate that digital tools frequently used by UTEs are laptops (mean=4.77), Smartphone (mean=4.62) and Desktop Computer (mean=4.16).while interactive whiteboards (mean=1.61) are rarely used by UTEs. Findings show that sometimes UTEs also use Tablet PCs (mean=3.25) and Multimedia Projector (mean=3.53).

Table 4.9. Purpose of using digital Tools by UTEs

Digital Tools	N	<u>Teaching</u>		<u>Content Development</u>		<u>Research</u>		<u>Professional Communication/ Collaboration</u>		<u>Training</u>		<u>Personal Use</u>	
		N	%age	n	%age	n	%age	n	%age	N	%age	n	%age
Laptops	333	115	34.5	136	40.8	272	81.7	166	49.8	23	6.9	307	92.2
Smartphone	350	32	9.1	35	10.0	72	20.6	255	72.9	32	9.1	350	100.0
Tablets	131	4	3.1	10	7.6	58	44.3	16	12.2	2	1.5	42	32.1
iPads	67	1	1.5	3	4.5	10	14.9	4	6.0	1	1.5	61	91.0
Desktop computer	223	36	16.1	83	37.2	119	53.4	8	3.6	11	4.9	133	59.6
Webcams	262	13	5.0	2	0.8	39	14.9	62	23.7	7	2.7	204	77.9
Interactive Whiteboard	57	6	10.5	0	0.0	0	0.0	0	0.0	1	1.8	0	0.0
Multimedia Projector	223	155	69.5	12	5.4	10	4.5	35	15.7	85	38.1	4	1.8

Table 4.9 shows the findings of use of digital tools by UTEs under six purposes. As elicited by table, 34.5% of UTEs utilize laptops for teaching, 9.1% UTEs utilize smartphone in teaching, tabs utilization is 4% while only 1% UTEs responded that they have ever utilized iPads for teaching purposes. Desktop computers are evidenced to be used in teaching by 36% of UTEs, Webcams are used by 13% of UTEs, interactive whiteboard is used by 6% of UTEs whereas 69.5% of respondents said that they use multimedia projector in their teaching. For training purposes, 6.9% respondents claimed to use laptops, 9.1% of UTEs used smartphone, 1.5% of UTEs used tabs and 1.5% of UTEs used iPads. Moreover only 1.9% respondents asserted the use of desktop computers while 38.1% of UTEs said that they have used multimedia projector in their trainings. Table 4.9 clearly provides findings that only Laptops are comparatively more frequently used by UTEs in their profession while Multimedia projectors are evidenced to be used in teaching frequently. In addition, as table depicts, digital tools are utilized by most of UTEs for personal use.

Table 4.10 *Familiarity of Digital Technologies to UTEs*

Digital Technologies	N	Responses	
		Yes	%age
Blogs	354	120	33.9
Teacher Tube	354	46	12.9
You tube	354	273	77.1
Dropbox	354	28	7.91
Twitter	354	181	51.1
Facebook	354	333	94.0
Slideshare	354	145	40.9
WhatsApp	354	294	83.0
LMS	354	32	9.0
MOOCs	354	7	1.9
Google Docs	354	152	42.9
Skype	354	166	46.8
Discussion forums	354	110	31.0
Google hangouts	354	46	12.9
Email	354	343	96.8
Chat forums	354	7	1.98
LinkedIn	354	262	74.0
E-portfolios	354	14	3.9
E-books	354	117	33.0

Table 4.10 illustrates the familiarity of UTEs with digital technologies. It is obvious from table that 33.90% UTEs were familiar of blogs, 12.99% UTEs have the familiarity of teacher tube while 77.12% UTEs were familiar of you tube. Findings further represent that 7.9% respondents were having know-how of Dropbox while 51.13% of UTEs were familiar of twitter. Facebook was known by 94.07% of respondents while 40.96% UTEs were familiar with Slideshare. Familiarity of Whatsapp was 83.05%, LMS was known by 9.04% UTEs while 1.98% of respondents had intimacy of MOOCs. It was also evident from table that 42.94% of respondents were familiar with Google Docs, 46.89% of respondents were familiar with Skype while 31.07% of UTEs were familiar with discussion forums. Awareness of UTEs for Google Hangouts was 12.99% while for email 96.89% of UTEs were familiar with. Table also depicts the figures for the familiarity of UTEs for Chat forums, LinkedIn, e-Portfolios and e-Books as 1.98%, 74.01%, 3.95% and 33.05% respectively.

Table 4.11 *Frequency of using Digital Technologies by UTEs (5-point scale)*

	Digital Technologies	N (UTEs having Familiarity)	Mean
1	Blogs	120	2.11
2	Teacher Tube	46	1.17
3	You tube	273	4.19
4	Dropbox	28	1.13
5	Twitter	181	3.06
6	Facebook	333	4.61
7	Slideshare	145	1.74
8	WhatsApp	294	4.36
9	LMS	32	1.32
10	MOOCs	7	1.03
11	Google Docs	152	2.16
12	Skype	166	3.78
13	Discussion forums	110	1.81
14	Google hangouts	46	1.56
15	Email	343	4.76
16	Chat forums	7	2.35
17	LinkedIn	262	3.21
18	E-portfolios	14	1.26
19	E-books	117	3.33

Table 4.11 illustrates the frequency of using digital technologies by UTEs. The mean values in the table are decisive for the results. In the table, M=2.11 explains that UTEs rarely use blogs, while M=1.17 depicts that Teacher tube was never used by UTEs. M=4.19 reveal that You tube was often used by UTEs while Dropbox was never used by them (M=1.13). Mean value M=4.61 depicts that UTEs were using Facebook all the times but M=1.74 show that Slideshare was rarely used by UTEs. For Whatsapp, M=4.36 highlights that UTEs had often use of it while M=1.32 depicts that LMS was never used by UTEs. M=1.03 shows that MOOCs were never used, and M=2.16 shows that Google docs were rarely used by UTEs. M=3.78 explains that Skype was often used by UTEs, M=1.81 depicts that Google hangouts were rarely used while M=4.76 represents that UTEs were always using email. As illustrated in the table 4.11, chat forums were rarely in the use of UTEs (M=2.35) but UTEs sometimes used LinkedIn (M=3.21). It is also clear from table that e-Portfolios were never used (M=1.26) but e-Books were sometimes used (M=3.33) by the UTEs.

Table 4.12 *Digital Technologies used by UTEs (on the basis of frequency of use)*

Digital Technologies used by UTEs	
1	Blogs
2	You Tube
3	Twitter
4	Facebook
5	Whatsapp
6	Google Docs
7	Skype
8	Discussion Forums
9	Email
10	LinkedIn
11	e-Books

Table 4.12 portrays the actual representation of digital technologies utilized by the UTEs on the basis of frequency of using these technologies. The digital technologies which were never used by UTEs are not mentioned in Table 4.12.

PURPOSE OF USING DIGITAL TECHNOLOGIES BY UTEs

Findings of the data illustrating the utilization of digital technologies for different purposes are shown below.

Table 4.13 *Purpose of using digital Technologies by UTEs*

Digital Technologies	N	<u>Teaching</u>		<u>Content Development</u>		<u>Research</u>		<u>Professional Communication/ Collaboration</u>		<u>Training</u>		<u>Personal Use</u>	
		n	%age	n	%age	n	%age	N	%age	N	%age	n	%age
Blogs	120	2	1.7	20	16.7	65	54.2	15	12.5	1	0.8	17	14.2
You Tube	273	20	7.3	32	11.7	186	68.1	15	5.5	8	2.9	244	89.4
Twitter	181	17	9.4	0	0.0	31	17.1	11	6.1	0	0.0	94	51.9
Facebook	333	90	27.0	18	5.4	31	9.3	154	46.2	23	6.9	273	82.0
Whatsapp	294	51	17.3	0	0.0	15	5.1	183	62.2	6	2.0	274	93.2
Google Docs	152	19	12.5	11	7.2	22	14.5	5	3.3	3	2.0	55	36.2
Skype	166	13	7.8	0	0.0	16	9.6	29	17.5	9	5.4	93	56.0
Discussion Forums	110	4	3.6	8	7.3	33	30.0	34	30.9	2	1.8	44	40.0
Email	343	49	14.3	66	19.2	196	57.1	269	78.4	166	48.4	210	61.2
LinkedIn	262	0	0.0	0	0.0	47	17.9	205	78.2	0	0.0	97	37.0
e-Books	117	41	35.0	87	74.4	95	81.2	0	0.0	3	2.6	18	15.4

Table 4.13 illustrates that most of the UTEs were involved in using blogs for research purposes (54.36%) while only two out of 120 UTEs (1.92%) said that they were using blogs in their teaching while 0.8% shows null use of blogs for training purposes. It is also shown that that you tube was mostly used for research purposes (68.1%) by UTEs. Only 7.3% UTEs responded that they used you tube in their teaching while 2.9% responded as for their training. It is also clear from findings that that UTEs utilized twitter mostly for personal purposes (51.9%) while only 9.4% UTEs said that they were using twitter in their teaching activities. It is illustrated in the table that Facebook was mostly used by UTEs for personal intentions (81%) while 27.0% UTEs responded that they used Facebook in their teaching while 6.9% UTEs were evidently using Facebook for training purposes. Findings also present that Whatsapp was mostly used (93.2%) for personal intentions while 17.3% UTEs utilized Whatsapp for their teaching tasks and 2% for training purposes. 36.2% UTEs were of the view that they were using Google Docs for personal purposes. Moreover 12.5% of UTEs were evident to use Google docs in their teaching while 2.09% were using in their training. Findings depict that Skype was mostly used by UTEs for their personal intentions (56%). 13 out of 166 UTEs (7.8%) responded that they used Skype in their teaching while 9 out of 166 (5.4%) UTEs said that they used Skype in their trainings. It is obvious from findings that UTEs were mostly using discussion forums for research purposes (30%). Besides 4 out of 110 UTEs (3.6%) said that they used discussion forums in their teaching tasks, while 1.8% UTEs were of the view for using discussion forums in training. Email was used by UTEs for many purposes, i.e. for 14.3% for teaching, 78.4% for professional communication & collaboration and 48.4% for their training purposes while 61.2% UTEs were using email

for their personal purposes. Table shows that LinkedIn was utilized by 78.2% UTEs for professional communication/collaboration purposes whereas 81.2% UTEs were utilizing e-Books for research purposes.

USE OF DIGITAL TOOLS AND TECHNOLOGIES by UTEs
(Students' point of view)

Table 4.14 *Use of Digital Tools and Technologies by UTEs*

Digital Tools	N	Yes	%age	No	%age
Laptop	1700	1054	62	646	38
Smartphone	1700	867	51	833	49
Tablet PC	1700	17	1	1683	99
iPad	1700	17	1	1683	99
Desktop Computer	1700	816	48	884	52
Webcams	1700	34	2	1666	98
Interactive whiteboard	1700	170	10	1530	90
Multimedia Projector	1700	782	46	918	54
Internet/Wifi	1700	561	33	1139	67
Microsoft Office	1700	408	24	1292	76
Learning communities	1700	0	0	1700	100
Blogs	1700	0	0	1700	100
Teacher Tube	1700	0	0	1700	100
You tube	1700	0	0	1700	100
Dropbox	1700	0	0	1700	100

Twitter	1700	0	0	1700	100
Facebook	1700	391	23	1309	77
Slideshare	1700	0	0	1700	100
WhatsApp	1700	697	41	1003	59
LMS	1700	0	0	1700	100
Google Docs	1700	0	0	1700	100
Skype	1700	0	0	1700	100
Discussion forums	1700	0	0	1700	100
Google hangouts	1700	0	0	1700	100
Email	1700	238	14	1462	86
Chat forums	1700	0	0	1700	100
LinkedIn	1700	0	0	1700	100
E-portfolios	1700	0	0	1700	100
E-books	1700	34	2	1666	98

Table 4.14 illustrates the students'(Prospective teachers) point of view about their teachers (UTEs) for using digital tools and technologies. Findings show that UTEs were inclined towards using laptops (62%), Smartphone (51%), and desktop computers (48%). Whereas use of multimedia projector (46%), internet/Wifi (33%) and Microsoft Office (24%) was evidenced from findings. Opinions of respondents portray the UTEs' use of Facebook (23%), Whatsapp (41%), email (14%) and e-Books (2%).

Table: 4.15 *List of digital tools and technologies actually used by UTEs*

	Digital Tools & Technologies	N (Responded 'Yes')	%age
1	Laptops	1054	62
2	Desktop Computers	816	48
3	Multimedia Projector	782	46
4	Internet/Wifi	561	33
5	Whatsapp	697	41
6	Smartphone	867	51
7	Interactive Whiteboard	170	10
8	Microsoft Office	408	24
9	Facebook	391	23
10	Email	238	14

Table 4.15 depicts the actual number and percentage of UTEs using digital tools and technologies (singled out from Table 4.14)

Table 4.16 *Frequency of using Digital Tools and Technologies by UTEs (5-Point)*

Digital Tools & Technologies	N	Mean
Laptop	1054	2.33
Desktop Computers	816	2.12
Multimedia Projector	782	2.49
Internet/Wifi	561	1.38
Whatsapp	697	1.66
Smartphone	867	1.37
Interactive whiteboard	170	1.05
Microsoft Office	408	1.87
Facebook	391	1.24
Email	238	1.2

Table 4.16 shows the frequency of using digital tools and technologies by UTEs are responded by students. M=2.33 describes that Laptops were frequently used by the teachers, M=2.12 shows that UTEs had average use of desktop computers while M=2.49 depicts that multimedia projector was frequently used by the teachers in classroom. Mean value M=1.66 show that UTEs sometimes use Whatsapp with students whereas M=1.87 gives evidence of frequent use of Microsoft Office by the UTEs as responded by prospective teachers.

PURPOSE OF USING DIGITAL TOOLS AND TECHNOLOGIES BY UTEs
(Students' point of view)

Table 4.17 *Purpose of using digital Tools and Technologies by UTEs (Students' point of view)*

Digital Tools & Technologies	N	<u>Teaching</u>		<u>Classroom Activities</u>		<u>Communication/ Collaboration</u>		<u>Research</u>	
		N	%age	n	%age	n	%age	n	%age
Laptop	1054	612	58.1	0	0.0	43	4.1	39	3.7
Desktop Computers	816	402	49.3	0	0.0	0	0.0	0	0.0
Multimedia Projector	782	597	76.3	119	15.2	0	0.0	16	2.0
Internet/Wifi	561	24	4.3	49	8.7	51	9.1	166	29.6
Whatsapp	697	0	0.0	0	0.0	343	49.2	0	0.0
Smartphone	867	9	1.0	10	1.2	561	64.7	0	0.0
Interactive Whiteboard	170	61	35.9	4	2.4	0	0.0	0	0.0
Microsoft Office	408	142	34.8	129	31.6	0	0.0	13	3.2
Facebook	391	9	2.3	5	1.3	179	45.8	0	0.0
Email	239	0	0.0	0	0.0	89	37.2	10	4.2

Table 4.17 illustrates the opinions of prospective teachers regarding purpose of using digital tools and technologies by UTEs. Findings show that 58.1% teachers use laptop in their teaching and 39% teachers use laptops for research tasks whereas desktop computers are utilized by 49.3% teachers in teaching. It is clear from the findings that 49.2% teachers utilize Whatsapp for communication and collaborations purposes while Smartphone are also used for communication and collaboration with students. It is shown in the table that 34.8% UTEs use Microsoft Office in teaching while 31.6% teachers use the same for classroom activities. Moreover email is also utilized (37.2%) for communication and collaboration purposes with students.

Table 4.18 *University demand for Digital Knowledge and Competence of UTEs*

Responses	N	%age
Strongly Disagree	1	3.3
Disagree	9	30.0
Neutral	5	16.7
Agree	13	43.3
Strongly Agree	2	6.7
<i>Total</i>	30	100.0

According to the findings of Table 4.18, 30.0% HODs disagree that digital knowledge and competencies of UTEs are demanded by the university, while 43.3% HODs were agreed that digital knowledge and competencies of UTEs were required by the universities.

Table 4.19 *Digital Knowledge and Competence of UTEs*

Scale	<u>HODs</u>		<u>UTEs</u>	
	N	%age	N	%age
Not at all Familiar	14	46.7	133	41.0
Slightly Familiar	6	20.0	53	16.4
Somewhat Familiar	7	23.3	69	21.3
Moderately Familiar	1	3.3	37	11.4
Extremely Familiar	2	6.6	32	9.9
Total	30	100.0	324	100.0

Table 4.19 illustrates the opinions of HODs and UTEs about their awareness of developing digital teaching/learning resources for their students. It is obvious from the table that 46.7% HODs told that they were not at all familiar with the skills to developing digital teaching/learning resources while 41% UTEs responded as they were not at all familiar with these skills. 23.3% HODs while 21.3% UTEs were moderately familiar with these skills. Table also represents that 6.6% of HODs while 9.9% of UTEs were extremely familiar with the skills to develop online teaching/learning materials/resources for their students.

Table 4.20 *Digital Knowledge and Competence of UTEs (5-point scale)*

Statements	Respondents	N	Mean
I am aware of skills to develop online teaching/	HODs	30	2.07
learning resources to meet the learning needs of prospective teachers.	UTEs	324	2.44

Table 4.20 represents the responses of HODs and UTEs about digital knowledge and competencies. M=2.07 shows that HODs (being UTEs themselves) were not aware of skills to develop online teaching/learning resources to meet the need of prospective teachers. Also M=2.44 represents that UTEs were also not well aware of online resources development for teaching and learning.

Table 4.21 *Satisfaction of UTEs towards e-Learning (5-point scale)*

	Statements	N (Respondents)	Mean
1	E-learning infrastructure established by university/institute	324	1.42
2	Opportunities provided to UTEs to incorporate e-learning (digital tools & Technologies) into teaching and learning.	324	2.14
3	The technical assistance provided to solve e-learning related issues.	324	2.57
4	Provision of digital technologies to University Teacher Educators (UTEs)	324	3.06
5	Adequate/appropriate E-learning based training programs provided to UTEs by university/institute.	324	1.27

Table 4.21 represents the satisfaction of UTEs with e-Learning provision by their departments/Institutes. M=1.42 shows that UTEs were not at all satisfied with the e-Learning infrastructure established by their university/institute. M=2.14 depicts that UTEs were not satisfied with the opportunities provided to them for e-Learning incorporation in teaching and learning. M=2.37 shows the neutrality for the provision of technical assistance regarding e-Learning. M=3.06 explains the neutral level of satisfaction for the provision of digital tools and technologies to UTEs. M=1.27 shows that UTEs were completely dissatisfied with the e-Learning based professional training programs provided by university/institute.

Table 4.22 *Barriers of e-Learning – UTEs Point of view (3-point scale)*

Type	Statements	N	Mean
<i>Infrastructure</i>	Lack of technological infrastructure	354	1.83
	Financial constraints of university/Institute	354	1.37
<i>Resources Availability</i>	Deficiency of technical support to University Teacher Educators (UTEs) and students	354	1.81
	Lack of access to latest digital technologies	354	2.34
<i>Digital Literacy and Competencies</i>	Insufficient digital skills of university teacher educators (UTEs)	354	2.5
	Less familiarity of University Teacher Educators (UTEs) with global patterns of teacher education	354	2.64
<i>Training</i>	Unsatisfactory e-Training programs for university teacher educators (UTEs)	354	1.26
	Short of e-learning trainers	354	1.48
<i>e-Learning Integration</i>	No/least compatibility between teacher education curriculum and e-Learning	354	1.62
	Lack of pedagogical models on how to use e-learning in teacher education programs	354	1.75
<i>Internet Quality</i>	Insufficient Internet bandwidth	354	1.41

Table 4.22 represents the major barriers faced by UTEs for incorporating e-Learning in their teaching. M=1.83 explains that lack of technological infrastructure is moderate

barrier for e-Learning incorporation. Regarding resources availability, table shows the barriers as Mean=1.37 depicts that financial constraints are extreme barrier, M=1.83 explains deficiency of technical support to UTEs as moderate barrier while M=2.34 shows that access to latest digital tools and technologies was not a barrier for e-Learning incorporation in their teaching. Regarding digital literacy and competencies, M=1.46 shows that insufficient/lacking digital skills of UTEs was extreme barrier while M=1.33 represents less familiarity of UTEs with global digital patterns of teacher education was also an extreme barrier for e-Learning incorporation in teaching. M=1.26 depicts that unsatisfactory e-Training programs for UTEs are extreme barrier whereas M=1.48 proves the short of e-Learning trainers as an extreme barrier to incorporate e-Learning in teaching. Regarding curriculum of teacher education, M=1.32 shows that no/least compatibility between teacher education curriculum and e-Learning was an extreme barrier while M=1.75 explains that lack of e-Learning based pedagogical models was moderate barrier. M=1.41 shows that insufficient bandwidth of internet was also an extreme barrier for incorporating e-Learning in teaching by UTEs.

Table 4.23 *Curriculum of Teacher Education*

Statement	N	Mean
Curriculum of Teacher Education fulfills the digital needs of prospective teachers.	354	2.79

Table 4.23 reveals that M=2.79 shows the uncertainty of UTEs regarding curriculum of teacher education fulfilling digital/e-Learning needs of prospective teachers.

Table 4.24 *Skills to develop Online teaching/Learning Materials*

	N	Mean
I am aware of skills to develop online teaching/learning resources to meet the learning needs of prospective teachers.	354	2.44

In Table 4.24, M=2.44 shows that UTEs disagree that they were aware of the skills to develop online teaching/learning resources.

Table 4.25 *Digital competencies enhancement through e-Training*

Digital Competencies	N	Responded (Yes)	%age
e-Teaching Techniques	354	171	48.3
E-Assessment techniques	354	79	22.3
Digital Lesson Planning	354	88	24.9
Digital Literacy	354	189	53.6
Online teaching/Learning Resources	354	102	28.8
e-Content development	354	132	37.3

Table 4.25 reveals the preferences of UTEs for the objectivity of e-Training courses for them. 48.3% UTEs responded that objective of e-Training might be about seeking e-Teaching techniques; while 22.3% UTEs said that objective might be e-Assessment techniques. Table shows that 24.9% UTEs responded for digital lesson planning, 53.6% for digital literacy, 28.8% for developing online teaching/learning resources while 37.3% UTEs said that objective of e-Training might be e-Content development.

Table 4.26 *e-Training Participation (UTEs Response)*

Statement	N	Yes	No
I have participated in National/International e-Training programs of UTEs.	354	17 4.8%	337 94.9%

From Table 4.26, it is evident that out of 354 UTEs, 17 had already participated in e-Training programs (4.8%) while 94.9% UTEs said that they never participated in any e-Training Program.

Table 4.27 *e-Training reflection through Prospective Teachers*

Statement	N	Mean
E-learning based training programs of University Teacher Educators (UTEs) are necessary to enhance the excellence of prospective teachers.	354	3.76

Table 4.27 depicts that UTEs were tended to agree that their e-Training programs are necessary to enhance the excellence of prospective teachers.

Table 4.28 *e-Training environments*

Statements	N	Mean
In my point of view, training environment is an important element for enhanced learning in a training program.	354	4.13
To facilitate the professional development of University Teacher Educators (UTEs) in novel mode, Online training programs are good option.	354	3.98
UTEs need an exclusive and separate Virtual Training Environment for e-Training.	354	3.78
It is preferred for University Teacher Educators (UTEs) to get e-training in a closed/restricted online environment with complete privacy rather than an open-source environment.	354	2.77

Table 4.28 reveals the opinions of UTEs regarding e-Training environment. In table, M=4.13 shows that UTEs agree that training environment is an important element to enhance learning in training programs. It is obvious from M=3.98 that UTEs agree that online training programs are better option. M=3.78 shows that UTEs tend to agree with the need of an exclusive and separate virtual training environment for their e-Training. Whereas M=2.77 depicts the uncertainty of UTEs regarding preferring e-Training in a closed/restricted online environment rather than open-source environment.

Table 4.29 *Existing Virtual/Online Application for e-Training*

Statement	N	Responses	
		No	%age
Online applications for e-Training of UTEs already exist.	354	289	81.6%

Table 4.29 depicts that 81.6% of the respondents said that no online application was used for their e-Training programs.

Table 4.30 *Online Application/Environment for e-Training of UTEs*

Statement	N	Responses	
		Yes	%age
UTEs need an exclusive separate online application for their e-Training.	354	274	74%

Table 4.30 shows that 74% of UTEs have the opinion regarding need of exclusive and separate online training application particularly for the use of university teacher educators.

b) Students' (Prospective Teachers) Context

Tables below explain the situation of students (prospective teachers) for the familiarity, use, frequency of use and purpose for using digital tools and technologies.

Table 4.31 *Familiarity with digital tools and technologies*

Digital Tools& Technologies	N	<u>Responses</u>	
		Yes	%age
Laptop	1700	1513	89
Smartphone	1700	1054	62
Tablet PC	1700	697	41
iPad	1700	442	26
Desktop Computer	1700	1156	68
Webcams	1700	629	37
Internet/Wifi	1700	1292	76
Email	1700	1207	71
Smart Apps (Whatsapp/viber)	1700	952	56
SMS	1700	1564	92
Search Engines	1700	408	24
Social Networking sites	1700	272	16
E-Books	1700	221	13
Microsoft Office	1700	1003	59

Table 4.31 illustrates the familiarity of students (prospective teachers) with digital tools and technologies. Tables explains that 89% students were familiar of laptops, 62% of students were having familiarity with Smartphone, 41% students were familiar of Tabs while 26% students were familiar with iPads. Table also reveals that 68% students were familiar with desktop computers, 37% students were having familiarity with

webcams.,76% students were familiar with internet/Wifi while 71% students were familiar with email. Table explains that Smart Apps (Whatsapp, Viber etc.) were known by 56% students whereas 92% students were having familiarity with SMS. Search engines were known by 24% of students while 16% students were having familiarity with social networking sites. Table depicts that 13% students were familiar with e-Books while Microsoft Office was known by 59% of students.

Table 4.32 *Availability digital tools and technologies to Students*

Digital Tools	N	Yes	%age
Laptop	1700	1139	67
Smartphone	1700	1275	75
Tablet PC	1700	102	6
iPad	1700	51	3
Desktop Computer	1700	731	43
Webcams	1700	1037	61
Internet/Wifi	1700	1343	79
Email	1700	1207	71
Smart Apps (Whatsapp/viber)	1700	1156	68
SMS	1700	1513	89
Search Engines	1700	391	23
Social Networking sites	1700	272	16
E-Books	1700	136	8
Microsoft Office	1700	1088	64

Table 4.32 shows the availability of digital tools and technologies to the students of teacher education (prospective teachers). It is obvious from the table that laptops were available to 67% of students, Smartphone were available to 75% of students but Tablet PC were available to only 6% students Table also reveals the figures that 3% students were having availability of iPads and 43% students were owning desktop computers while 61% students were having webcams. Table demonstrates that internet/Wifi was available to 79% of students while 71% students were using email facility, 68% students were using smart apps while 89% students were involved in using SMS services. 23% of students were having availability of search engines, 16% were having social networking sites, and only 8% students were having familiarity of e-Books, while Microsoft office was available to 64% students.

Table 4.33 *Frequency of using Digital Technologies by Students (3-point scale)*

Digital Tools& Technologies	N (Students with availability)	Mean
Laptop	1139	2.57
Smartphone	1275	2.85
Tablet PC	102	1.51
iPad	51	1.13
Desktop Computer	731	2.16
Webcams	1037	2.44
Internet/Wifi	1343	2.91
Email	1207	2.02
Smart Apps (Whatsapp/viber)	1156	2.43
SMS	1513	2.1
Search Engines	391	2.38
Social Networking sites	272	2.24
E-Books	136	1.04
Microsoft Office	1088	2.37

Table 4.33 shows the frequency of using digital tools and technologies by the students of Teacher education. On the basis of mean score $M=2.57$ it is clear that students tended to always use laptop and $M=2.85$ shows that student were always using Smartphone like Whereas $M=1.51$ depicts that Tabs were little bit used by the students and $M=1.13$ shows that iPads were rarely used by the students. As represented by $M=2.16$ and $M=2.44$,

desktop computers and webcams were often used by the students while $M=2.91$ reveals that internet/Wifi was always used. In the same way, $M=2.02$ shows that students little bit/sometimes use email, $M=2.43$ reveals that smart apps (Whatsapp or Viber etc.) are more often used, while $M=2.61$ shows that students almost always use SMS. Social networking sites ($M=2.24$) and search engines ($M=2.38$) were more often used by students, but $M=1.04$ reveals that e-Books were never used, while $M=2.37$ shows that Microsoft office was more often used by the students of teacher education.

PURPOSE OF USING DIGITAL TOOLS AND TECHNOLOGIES BY STUDENTS

Tables below show the purposes for which students (prospective teachers) utilize different digital tools and technologies.

Table 4.34 *Purpose of using digital Tools and Technologies by Students*

Digital Tools & Technologies	N	<u>Assignment Preparation</u>		<u>Exams Preparation</u>		<u>Notes Preparation</u>		<u>Research</u>		<u>Communication/ Collaboration</u>		<u>Personal Use</u>	
		N	%age	n	%age	N	%age	n	%age	n	%age	n	%age
Laptop	1139	869	76.3	434	38.1	713	62.6	278	24.4	583	51.2	1022	89.7
Smartphone	1275	481	37.7	393	30.8	374	29.3	154	12.1	1202	94.3	1247	97.8
Desktop Computer	731	549	75.1	385	52.7	498	68.1	134	18.3	157	21.5	585	80.0
Internet/Wifi	1343	1034	77.0	779	58.0	833	62.0	980	73.0	1088	81.0	1255	93.4
Email	1207	82	6.8	54	4.5	60	5.0	28	2.3	677	56.1	954	79.0
Smart Apps	1156	155	13.4	419	36.2	105	9.1	41	3.5	789	68.3	1114	96.4
SMS	1513	76	5.0	62	4.1	97	6.4	39	2.6	858	56.7	1324	87.5
Search Engines	391	244	62.4	67	17.1	219	56.0	295	75.4	13	3.3	173	44.2
Social Networking sites	272	14	5.1	5	1.8	5	1.8	11	4.0	42	15.4	244	89.7
E-Books	136	3	2.2	2	1.5	9	6.6	4	2.9	0	0.0	4	2.9
Microsoft Office	1088	302	27.8	74	6.8	166	15.3	496	45.6	33	3.0	427	39.2

Table 4.34 shows that 76.3% students used laptops for assignments preparation, 38.1% students used laptops for exams preparation, while 62.6% students used laptops for notes preparation. 51.2% of students were of the view that they were using laptops for communication/collaboration purposes whereas 89.7% students said that they used laptops for personal purposes. Findings reveal that 37.7% students responded that they were using Smartphone for assignments preparation while 30.83% students were utilizing Smartphone for exams preparation. Table shows that 97.8% students used Smartphone for personal purposes while 94.3% of students were using Smartphone for communication/collaboration purposes. As illustrated in table 4.34, 75.1% students were using desktop computers for their assignments preparation, 52.7% were using for exams preparation, while 68.1% of students were using desktop computer for notes preparation. It is also clear from table that 80% of students were using desktop computers for their personal purposes. Findings further divulge that 77% of students were using internet/Wifi for assignments preparation, 58% were using it for exams preparation, whereas 62% of students were using internet/Wifi for notes preparation. Table also depicts that 73% of students were using internet/Wifi for research purposes, 81% were using for communication/ collaboration while 93.4% of students were using internet/Wifi for personal purposes. It is revealed from table that email was mostly used for personal purposes (79%) while 56.1% students used email for communication/collaboration purposes. Moreover 36.25% of students were using Smart Apps for exams preparation, 68.3% were using for communication/collaboration, while 96.4% of students were using smart apps for personal means. Findings show that 62.4% students were of the view that they used search engines for their assignments preparation and 56% used it for notes

preparation while 75.4% of students used search engines for their research tasks and 44.2% of students were using search engines for personal purposes. 15.5% of students were using social networking sites for communication/collaboration while 89.7% of students were using social networking sites for their personal intentions. It is also shown that only 2.2% of students used e-Books for their assignments preparation while 6.6% of students were employing e-Books for their notes preparation. It is clear from the findings that 27.8% of students were utilizing Microsoft Office for their assignments preparation, 45.6% students were applying Microsoft Office in their research tasks whereas 39.2% were applying Microsoft Office for personal uses.

Table 4.35 *Provision of e-Learning to Students (5-point scale)*

Statements	N	Mean
My university/institute provides fully-equipped digital lab to students.	1700	1.33
My university/institute provides opportunities to apply e-learning in education.	1700	1.81

In table 4.35, M=1.33 shows that students did not agree that their university/institute was providing them fully-equipped digital labs. Students also disagree (M=1.81) that their universities/institutes were providing them opportunities to apply e-Learning in their education.

Table 4.36 *Awareness of e-Learning to Students (5-point scale)*

Statements	N	Mean
I have sufficient knowledge about e-learning.	1700	1.83
I have sufficient skills to learn in E-learning environment.	1700	1.60
I can easily learn by using e-learning based curriculum/content.	1700	2.91
I feel e-learning very important for me as a future teacher.	1700	4.11

Table 4.36 reveals the awareness level of students regarding e-Learning. M=1.83 explains that students they were not having sufficient knowledge about e-Learning. Also M=1.60 shows that students disagreed that they had sufficient skills to learn in e-Learning environments. M=2.91 represents the neutral/average opinions about using e-Learning based curriculum/content. M=4.11 shows that students were aware of the importance of e-Learning for their future profession.

Table 4.37 *Desirability of Students for utilizing e-Learning (5-point scale)*

Statements	N	Mean
I want to learn efficiently with e-learning tools.	1700	3.76
I want to merge e-learning with face-to-face mode of learning.	1700	3.80
I want to be a digital teacher in future.	1700	4.27

Table 4.37 shows the desirability of students for using e-Learning. M=3.76 reveals that students wanted to apply e-Learning in their education, while M=3.80 shows that

students were likely to merge e-Learning with face to face mode of learning. Table also represents with M=4.27 that students of teacher education were very much interested to be digital teachers in future.

4.1.2 GAP ANALYSIS

For analyzing the gaps, a comparison was made between findings of macro-level context and micro-level context. The differences between both levels were identified as gaps which are described below.

Table 4.38 *Gaps analyzed for e-Learning policies, strategies, and e-Learning vision*

Factors	Current State	Ideal State
Theoretical Focus	Constructivism	Connectivism
e-Learning in Teacher education	ICT is spotlighted to be incorporated in teacher education and teacher training. ICT is emphasized as standard no. 7 in National Professional standards for teachers in Pakistan.	e-Learning (digital learning, online learning, virtual learning, cloud-based learning, open learning) are compulsory mode of learning in many of the countries of world. Rather e-learning is put in action more than traditional learning.
Fund allocation and Infrastructure for e-Learning	In most TEIs, as e-Learning is not a priority, least funding is released to ensure the availability of e-learning resources and developing e-Learning infrastructure. No e-learning labs and digital classrooms are built up to promote e-Learning practices amongst teacher educators and student teachers.	With elevated precedence, Governments allocate and release funds to ensure the provision of e-Learning resources and developing modernized digital infrastructure to promote e-Learning practices in TEIs. Digital and virtual classrooms, digital labs and digital libraries are extensively developed to facilitate the students and teachers.
Digital tools & technologies	Only limited digital resources are provided to teachers and students which include Laptops and free Wifi devices. Also teachers get availability of multimedia projectors only to practice e-Teaching in their classes.	TEIs provide access to Digital Tools; e-Learning technologies to their students. Provision of e-learning resources and services such as Moodle/LMS/web Portals; VLEs; e-Content; Digital Libraries; Online Communities; OERs are major priorities.

e-Learning based teaching	Teachers are limited to use laptops and multimedia projectors during teaching. Only some teachers use web services to communicate with students i.e. email, Whatsapp etc.	In American, European, Australian and many Asian countries' teacher education, the educators are involved in high-tech digital teaching practices. Their teaching emphasize use of digital tools and technologies and utilizing web apps, Social networking sites etc. these countries promote online teaching tools and environment with prominent emphasize.
Digital competencies	Teachers own basic digital skills like laptop, tabs, Smartphone use, handling multimedia projector, browsing and locating online materials etc. They are not sufficiently digitally literate to take part in immense online digital activities. Also they are not capable enough to inline curriculum according to technological patterns. Teachers only concentrate using offline technologies and are found less confident in using online tools and technologies.	Teachers exhibit expertise for Digital literacy; e-Pedagogies; Online teaching; e-Curriculum development; e-Content designing; e-Learning design & development; e-Teaching skills.
Digital curriculum	Teachers have no opportunities to avail or utilize the e-Learning based curriculum in their teaching. Concept of digital curriculum is not prevalent in teacher education and teacher training.	Technology-integrated curriculum is utilized to teach the students which reveals viable compatibility with e-learning and digital setups of TEIs. Teachers have capabilities to design and develop e-curriculum in accordance with the needs of students.

e-Training	<p>Although teachers show high interest in e-Training programs, Govt. doesn't concentrate to organize online or e-Learning based training programs for teachers. Only the use of laptops or computers is kept mandatory in teacher training courses.</p> <p>However, there are indicated some e-Training programs in collaboration with international agencies, Non-Governmental Organizations, or Funded projects.</p>	<p>Online, virtual training programs and MOOCs are continuously conducted for teachers to promote digital literacy; e-Teaching competencies; e-Content design; e-Pedagogies; e-Teaching with technology use; e-Teaching for technology use.</p> <p>Most e-Training programs ponder to enhance the digital competencies, digital literacy and e-content development for augmenting e-Teaching skills of teachers.</p>
Online Training Application	<p>No Virtual/online training applications are ever designed, developed , or even outsourced to conduct online training programs for teachers.</p>	<p>Webinars; Social Networks; TMS; e-Portals; Smart Apps; Websites; Moodle; Online Communities; Blogs etc. are utilized as virtual environments for e-Training of teachers.</p>
e-Training of UTEs	<p>Teachers educators are considered the same teachers followed by same NPS for teachers. Teacher educators at College level, and trainers of teacher educators are trained by DSD in Punjab. But There is no concept of training for University Teacher Educators (UTEs).</p>	<p>In many countries, profession of Teacher Educators is kept separate from teachers. Even teacher educators have their different Professional standards. Different universities of the world focus on training the teacher educators in their TEIs or TE departments to enhance their skills and capabilities as teachers of teachers. Training of the teacher educators' trainers is highly emphasize in many countries.</p>

Table 4.38 explains the gaps identification keeping in view the different aspects and dimensions for comparison of international and national context. Table shows that a major gap exists in the theoretical perspective as constructivism is focused in Pakistan by converging the technological trends towards ICT while in international context, Connectivism is focused. Second dimension used for comparison is e-Learning in teacher education. Table reveals that in Pakistan, ICT is spotlighted but internationally e-

Learning (digital learning, online learning, virtual learning, hybrid learning, cloud-based learning, open learning) is being applied in teacher education, so gap exists here. Table shows that there subsists a gap in fund allocation and infrastructure for e-Learning as in most TEIs in Pakistan, e-Learning is not a priority and least funds are released for e-Learning resources and e-Learning infrastructure development. Whereas in many of the countries of the world, governments allocate and release funds for ensure provision of e-Learning resources and developing modern digital infrastructure to promote e-Learning practices in TEIs. Table identifies more gaps in provision of digital resources, as in Pakistan, limited digital tools and technologies are provided to the teachers and students of TEIs but internationally, teachers and students of TEIs have open access to digital tools and technologies. A gaps also exists in e-Learning based teaching since teachers have limited use of laptops and multimedia projectors, also online teaching is not practiced in teacher education of Pakistan. While in many of the countries of the world, teachers in TEIs are involved in high-tech e-Teaching practices by utilizing digital tools web apps, and social networks etc. Table explains the gap of e-Competencies as in international scenario, teachers in TEIs demonstrate their expertise for digital literacy, e-Pedagogies, online teaching, e-Curriculum development, e-Content design and development and e-Teaching skills. Where as in Pakistan, teachers of TEI own the basic digital skills like using laptops, multimedia projectors, emails, browsing and locating online materials etc. but they are not much capable to integrate e-Learning into curriculum of teacher education. Table shows the identified gaps of e-Curriculum, e-Training, VLEs for e-Training and e-Training of UTEs. One more gap, that is Digital Divide, is found between teacher educators and prospective teachers as there is huge

difference between awareness, potential and utilization of digital tools and technologies of digital natives (prospective teachers) and digital immigrants (teacher educators). It is also identified that professional training of teacher educators is not emphasized by authoritative bodies, for instance, as HEC conducts faculty development programs for university faculty but never organize any training courses for teacher educators of formal universities. Comparison reveals that in many countries of the world, universities possess their own e-Portal specifically developed for e-Trainings of teachers and teacher educators. This phenomenon lacks in Pakistan.

4.1.3 NEED ASSESSMENT

Needs correspond to the state of deficiency of something which is crucially important in current circumstances. In relation to this study, the technological/digital gaps identified during gap analysis phase were translated as technological/digital needs of teacher education of Pakistan. Also by analyzing data collected through survey questionnaires and interviews, the gaps and lacking were explained as needs for promoting and implementing the e-Learning, e-Teaching and e-Training in teacher education of Pakistani universities.

Need no. 1: Incorporation of e-Learning in Teacher Education

In the light of macro and micro level context studies, and data gathered from university teacher educator and prospective teachers, it is the stern need to incorporate e-Learning at every level (learning, teaching, & training) in teacher education. This requisite is more exerted through the collected data about firm awareness of teachers and students about potential, significance and usefulness of e-Learning in teacher education. Following findings of tables support this need.

Table 4.39 *e-Learning Exposure for Students of Teacher Education*

Statement	N	Mean
E-learning exposure is essential for prospective teachers of Pakistan.	324	3.71

In table 4.39, mean score $M=3.41$ shows that UTEs tend to agree that e-Learning is important for prospective teachers of Pakistan.

Table 4.40 *Provision of e-Learning to prospective Teachers*

Statement	N	Mean
Prospective teachers are provided education to use digital tools and technologies for professional teaching.	324	2.34

Table 4.40 reveals that UTEs disagree ($M=2.34$) with statement that prospective teachers are provided with the opportunities and exposure of incorporating e-Learning for their future professional teaching.

Table 4.41 *Significance of e-Learning*

Respondents	Statements	N	Mean
UTEs	E-Learning enables unique forms of education that fit within the existing paradigms of face to face education	324	3.82
	E-learning practices enable the learners to achieve planned learning outcomes.	324	3.67
Prospective Teachers	E-Learning is an essential tool to support Education.	1700	3.69
	E-learning provides an interactive mode of education to students.	1700	3.59
	E-learning improves understanding level of what I learn.	1700	3.56
	E-learning is a potential alternative to face-to-face mode of education.	1700	3.82
	e-Learning experience is important for me as a future teacher.	1700	3.46

Table 4.41 shows the responses of UTEs and students regarding significance of e-Learning. As responded by UTEs, M=3.82 reveals that UTEs agree that e-Learning is significant tools for enabling unique forms of education to fit within existing mode of teacher education, while M=3.67 represents that e-Learning is significant to enabling learners to achieve planned learning outcomes of education. From the responses of prospective teachers , it was uncovered that e-Learning is essential tool for education (M=3.59). Prospective teachers tend to agree with the view that e-Learning provides interactive mode of education, whereas M=3.56 exposes that students were likely to agree that e-Learning improved their understanding level for what they learn. M=3.82 shows that students agree that e-Learning is potential alternative to face-to-face mode of

education. M=3.46 shows that student teachers tend to agree that as future teachers, e-Learning experience is vital for them.

Table 4.42 *Potential of e-Learning (UTEs point of view)*

Statements	N	Mean
E-learning Facilitates the teaching/learning processes	324	4.01
E-learning Stimulates better understanding of knowledge	324	3.56
E-learning Fulfills individual learners' need	324	3.45
E-learning Motivates the learners	324	3.42
E-learning Plans the lessons	324	3.29
E-learning designs teaching/learning resources	324	3.04
E-learning helps to better communicate with students and colleagues	324	3.63

In Table 4.42, M=4.01 reveals that UTEs agree that e-Learning facilitates teaching/learning process, M=3.56 shows that UTEs agree that e-Learning stimulates better understanding of knowledge, while M=3.45 shows that UTEs tend to agree that e-Learning fulfills individual learners' needs. Table depicts that UTEs also tend to agree (M=3.42) that e-Learning motivates the learners whereas M=3.29 shows that UTEs are uncertain for potential of e-Learning in lesson planning. UTEs also seem to uncertain (M=3.04) for the potential of e-Learning for designing teaching/learning resources while M=3.63 depicts that UTEs tend to agree for e-Learning as potential tool for better communication with the students and colleagues.

Table 4.43 *Potential of e-Learning (Students' point of view)*

Statements	N	Mean
It is a versatile mean of learning.	1700	3.67
It is enjoyable platform for learning.	1700	3.71
It is an attractive tool for learning.	1700	3.82
It develops self-efficacy in students.	1700	3.13
It provides more flexibility for learning.	1700	3.69
It provides increased access to learning opportunities.	1700	3.68
It provides enhanced quality of learning.	1700	3.66
It is cost-effective way of learning.	1700	3.17
It leads towards self-managed learning.	1700	3.53
It leads towards self-paced learning.	1700	3.56
It is user-friendly platform for learners.	1700	3.63
It enhances the knowledge of the learners.	1700	3.74

Table 4.43 shows the responses of students (prospective teachers) regarding potential of e-Learning in different aspects. M=3.67 shows that students tend to agree that e-Learning is a versatile means while M=3.71 shows that student agree with the potential of e-Learning as enjoyable platform for e-Learning. M=3.82 depicts that students perceive e-Learning an attractive tool for learning while M=3.13 shows the uncertainty of students for knowing potential of e-Learning to develop self-efficacy in students. Mean score M=69 shows that students perceive e-Learning as flexible mode of learning while M=3.68 notifies that students agree for e-Learning to provide increased access to learning

opportunities. From the table, M=3.66 shows that students agree with the statement that e-Learning provides enhanced quality of learning while M=3.07 depicts the uncertainty of students for e-Learning being cost-effective way of learning. M=3.03 reveals that students were uncertain about potential of e-Learning toward self-managed learning and M=3.16 also shows that students were unsure for e-Learning to lead towards self-paced learning, whereas M=3.63 and M=3.74 show that students perceive e-Learning as user-friendly platform and a potential tool to enhance knowledge of the learners.

Table 4.44 *Usefulness of e-Learning (Students' point of view)*

Statements	N	Mean
Feel interest in their learning activities.	1700	3.64
Collaborate with other students and teachers more effectively.	1700	3.47
Share their knowledge with fellows in more efficient way.	1700	3.54
Relate their knowledge with course and subject.	1700	3.55
Connect their knowledge outside the classroom.	1700	3.65
Feel motivated to learn.	1700	4.15
Engage them in learning.	1700	4.31
Reinforce their knowledge at anytime.	1700	4.30
Participate in varied learning activities.	1700	4.45
Work independently.	1700	4.43
Access online information.	1700	4.31

From Table 4.44, it is evident by $M=3.64$ that students e-Learning is useful to create interest in their learning activities, and $M=3.47$ shows that students tend to agree with the usefulness of e-Learning as collaborative tool to be used with peers and teachers, while $M=3.54$ reveals that students tend to agree that they can share their knowledge with fellows more effectively. Table shows that $M=3.06$ explains the uncertainty of students for relating their knowledge with course and subject whereas $M=3.65$ expresses the perception of students that e-Learning is useful for connecting their knowledge outside the classroom. It is clear from table that by using e-Learning, students agree to feel motivated to learn ($M=4.15$), agree to be engaged with learning ($M=4.31$), agree participate in varied learning activities ($M=4.45$) while agree to work independently ($M=4.43$) and students perceive e-Learning as useful means to access online information ($M=4.31$).

Table 4.45 *Willingness of Prospective Teachers for e-Learning experiences*

Statements	N	Mean
I want to learn efficiently in e-learning mode.	1700	2.77
I want to be ane-Teacher in future.	1700	2.80

Table 4.45 shows that students (prospective teachers) are willing to take education in e-Learning mode ($M=2.77$) and mean score $M=2.80$ shows that students confirm their willingness to be e-Teachers in future.

Need no. 2: Promote e-Teaching Practices

The identified gaps indicate new modes of teaching in the digital era. It stresses that teachers being the key players, for preparation of prospective teachers, need to utilize digital tools and technologies in their teaching practices by promoting e-Learning trends.

It is therefore desirable for teachers to alter traditional teaching with e-Teaching while doing classroom instruction by integrating online applications and innovative technologies. Facts that show the teacher educators least practices for utilization of digital resources in teaching emphasize on more need of e-teaching

Table 4.46 *Use of Digital Tools in Teaching*

Digital Tools and Technologies	N	%age of UTEs using DT&T
Laptops	333	34.5
Smart Phones	350	9
Tabs	131	3.43
iPads	67	1.13
Desktop Computers	223	16.1
Webcams	262	5.1
Interactive Whiteboard	57	10.2
Multimedia Projector	223	69.5

Table 4.46 illustrates the use of digital tools by UTEs in teaching. It is obvious from the table that 34.5% UTEs used laptop in teaching, 9% teachers used Smartphone, 3.43% teacher used tabs while 1.13% teachers used iPad during teaching tasks. It is also shown in table that 16.1% UTEs were involved in teaching through desktop computers, 10.2% teachers used interactive whiteboards whereas 69.5% teachers used multimedia projector in their teaching.

Table 4.47 *Use of Digital Technologies in Teaching*

Digital Technologies	N	%age of UTEs using Digital Technologies
Blogs	120	1.92
You Tube	273	7.16
Twitter	181	9.26
Facebook	333	27.06
Slide Share	145	12.5
Whatsapp	294	17.24
Google Docs	152	12.41
Skype	166	8.02
Discussion Forums	110	3.56
Email	343	14.21
e-Books	117	35.08

Table 4.47 shows the actual use of digital technologies by UTEs in their teaching. Table reveals that 1.92% UTEs used blogs in their teaching, 7.16% teachers used YouTube, 9.26% teacher utilized twitter, while 27.06% teachers were using Facebook in their teaching activities. It is also evident from the table that 12.5% teachers used slide share, Whatsapp was utilized by 17.24% teachers while LMS was utilized by 5.61% UTEs. Table shows that 12.41% teachers were involved in using Google docs, 8.02% UTEs used Skype while 3.56% UTEs used discussion forums in their teaching. Table also provides evidences that 14.21% UTEs used email whereas 35.08% were used to utilize e-Books in their teaching tasks.

Table 4.48 *Use of digital tools and technology in Classroom (Students' point of view)*

Statement	N	Mean
My teachers promote e-learning through their teaching.	1700	2.37

Table 4.48 shows that students disagreed with the statement that their teachers were promoting e-Learning through their teaching.

Table 4.49 *Use of Digital Tools and Technologies by UTEs in Teaching(Students' point of view)*

Digital Tools & Technologies	N	Mean
Laptop	1054	2.33
Desktop Computers	816	2.12
Multimedia Projector	782	2.49
Internet/Wifi	561	1.38
WhatsApp	697	1.66
Smartphone	867	1.37
Interactive whiteboard	170	1.05
Microsoft Office	408	1.87
Facebook	391	1.24
Email	238	1.2

Table 4.49 depicts the opinions of students for the use of digital tools and technologies in teaching by their teachers. In table, M=2.33 shows that UTEs more often used laptops while M=2.12 shows that UTEs sometimes used desktop computer in their teaching.

M=2.49 shows that UTEs more often used multimedia projectors in teaching but M=1.38 illustrates that teachers rarely used internet/Wifi in their teaching activities. M=1.05 explains that UTEs never used interactive whiteboards in teaching while M=1.87 shows that sometimes UTEs were using Microsoft Office in their teaching.

Need no. 3: e-Training

Gaps recognized in gap analysis exceedingly emphasize on e-Learning based teacher training so that teachers may be capable enough not only to integrate but also utilize digital tools and technologies and online applications in teaching. Interviews data collected in this study also emphasized the significance, modes, trends and objectivity of e-Training to be conducted for UTEs. Data collected through interviews was analyzed to know the opinions of UTEs regarding different dimensions of online trainings.

The interviewees were having diverse opinions about technology-based training and learning. Respondents were of the views that technology causes learning to be flexible and collaborative as latest collaborative technologies used in teacher training programs impact on and transform the learning patterns of students. Online training courses of teachers provide the flexibility of hours and change learning mode based on learning activities. As one interviewee said:

" As technology leads towards learner centered and activity-based learning, through online trainings teachers can be prepared to use technology in their teaching by using latest trends."

Respondents perceived that e-Learning is a latest trend in education and university teacher educators must be equipped with skills to utilize and implement e-Learning in their teaching because teaching profession is also banded with innovation and

have been revolutionized due to the growth of educational technologies. It was also conversed by some interviewees that e-Learning on one side transforms teaching and on other hand introduces new patterns of online training. As one of the respondents said:

"having online training, teachers can improve their pedagogy according to e-Learning trends."

e-Training of UTEs is very much helpful in developing the expertise to create and utilized digital curriculum in the field of teacher education. Always up-to-date training content is available online with learners. e-Training enables the teachers to do online communication with colleagues and online tutors too on the time of need as an interview uttered:

"Participants of online training courses share their views, ideas and knowledge with other participants, communicate with instructors of the course and even can provide their feedback as swiftly as they feel a need of it."

Respondents of interview spoke about the technological resources ideally to be used in teacher training courses. Resources included digital and smart devices, digital and smart applications, online communities, websites and Wifi. Digital tools and technologies are best to facilitate the training of teachers as everyone in recent world have the accessibility of Wifi, smart devices and online applications to work with as one interviewee verbalized that:

" The smart devices and apps used these days can best be used for online training of teachers."

Analysis of the interviews also divulged that digital knowledge, skills and e-Learning competencies were most important knacks to seek by university teacher educators as digital era demands these abilities as a part of their profession. Findings show that UTEs regarded online training as time saving, cost saving and anywhere anytime facility for UTEs. UTEs said that objectivity of online training for them should be to enhance their professional digital competence and e-Learning skills.

As mentioned in the gap analysis, only 4.8% UTEs every participated in national/international e-Training programs. This weedy situation arises the need of e-Trainings so that UTEs might pave themselves in accordance with latest trends of times. Also data from questionnaire show that e-Training programs of UTEs enhance the excellence of prospective teachers (referred by table 4.) as students are perceived as reflection of their teachers.

Need no. 4: e-Training Focus

Need was drawn from gap analysis that e-Training should be focused on digital literacy and developing online teaching/learning resources as foremost digital competencies. Besides, e-Teaching skills for use of digital resources and with use of digital tools and technologies. Interviews data shows that e-Training programs should be converge to optimum fulfillment of objectives of the course i.e. e-Training programs must be objective-oriented. Many respondents prioritized to emphasize training goals rather than interface of training application or training environment as an interviewee expressed:

" Possibly the training goals are more important than training environment "

While one more interviewee said that:

"It is very important that trainers must guide to use those components which are highly task-oriented and goal-oriented."

Data from questionnaire also emphasizes the need to determine the focus of e-Training courses of UTEs which is shown in table below.

Table 4.50 *Digital competencies enhancement through e-Training*

Digital Competencies	N	Responded (Yes)	%age
e-Teaching Techniques	354	143	40.40
E-Assessment techniques	354	79	22.32
Digital Lesson Planning	354	88	24.86
Digital Literacy	354	119	33.62
Online teaching/Learning Resources	354	102	28.81
e-Content development	354	132	37.29

Table 4.50 reveals the preferences of UTEs for the objectivity of e-Training courses for them. 40.40% UTEs responded that objective of e-Training might be seeking e-Teaching techniques, while 22.32% UTEs said that objective might be e-Assessment techniques. Table shows that 24.86% UTEs responded for digital lesson planning, 33.62% for digital literacy, 28.81 for developing online teaching/learning resources while 37.29% UTEs said that objective of e-Training might be e-Content development.

Need no. 5: e-Training environment

Gap analysis spotlights the need to get specific and significant online application as virtual environment of e-Training of UTEs. In the light of need of e-Training and its objectivity, it is required to choose (design/develop/customize) enviable online/virtual

environment. Training environment is vital factor to conduct e-Training programs converging on achievement of training objectives. Table (4.26) reveals the elevated importance of online training environments and e-Training programs for UTEs. Table shows that UTEs must have exclusive separate online application for e-Training. Table also spotlights the need of e-Training application with must not be open-sourced but with restricted mode. Moreover, participants put light on the desired functions, features and characteristics of training environments of e-Training. Table below refers that e-Training environment must be active, engaging, motivating, attractive, flexible and self-directed.

Need no. 6: e-Learning content

The crucial need highlighted through identified gaps is to modify the curriculum/content of teacher education/training in accordance with e-Learning/digital patterns and trends. As teachers require e-content/digital resources to practice e-Teaching, therefore it is desired to modify curriculum as digital content. As referred in table 4.51, existing curriculum of teacher education doesn't fulfill the digital needs of prospective teachers. In addition, table 4.21 depicts that teachers were not satisfied with their competencies to develop e-Content for their students. These gaps identify the need of e-content for prospective teachers and also the competencies of UTEs to develop online teaching/learning resources to meet the digital needs of prospective teachers.

Need no. 7: e-Training of UTEs

All the facts and data revealed the dire need to organize e-Training programs for UTEs as online/digital trainings and UTEs, both are least focused areas in teacher education of Pakistan. Also as UTEs professional practices influence the learning of student teachers and prospective teachers are digital natives, they demand to be educated according to

digital trends. It is needed for UTEs to be skillful and competent enough to instruct digital natives by using e-Teaching practices. As illustrated in table 4.50, UTEs of Pakistan are in extreme need to get training to integrate and utilize e-Learning in teacher education. Interview data also endorses the need to e-Training programs for UTEs as they lack the digital competencies of e-Teaching, online resources development and digital literacy.

4.1.4 ANSWERING THE RESEARCH QUESTIONS

RQ-1 What are the major difficulties faced by UTEs for incorporating e-Learning in their teaching?

Table 4.51 *Difficulties faced by UTEs*

Statements	N	Mean
Lack of technological infrastructure	324	2.31
Financial constraints of university/institute	324	2.53
Short of e-Learning trainers/e-Teachers	324	2.22
Inadequate technological skills of UTEs	324	1.96
Lack of familiarity of UTEs with international trends in teacher education	324	1.32
Lack of technical support to UTEs and students	324	1.41
Lack of access to latest digital tools and technologies	324	1.24
No/Least compatibility between curriculum of teacher education and e-Learning	324	2.64
Lack of pedagogical models to implement e-Learning in teacher education programs	324	1.33
Insufficient internet bandwidth	324	1.67
Lack of training programs for UTEs to integrate e-Learning in teaching	324	2.61

Table 4.51 reveals the major difficulties faced by UTEs for incorporating e-Learning in teaching. M=2.31 explains that lack of technological infrastructure was extreme difficulty for UTEs, M=2.53 shows that UTEs financial constraints of university/institute to fund for e-Learning was extreme level difficulty, where as short of e-Learning experts/e-Teachers was a medium difficulty for UTEs to incorporate e-Learning in their teaching. From table, M=1.96 represents the short/lack of technological skills of UTEs as moderate difficulty, and M=1.32 reveals that lack of familiarity with international trends of teacher education was not a difficulty for UTEs, while M=1.41 shows that lack of technical support to UTEs and students was minor level of intricacy. Also M=1.24 shows that lack of access to digital tools and technologies was not difficulty for UTEs, but no/least compatibility between teacher education curriculum and e-Learning was an extreme difficulty (M=2.64) faced by UTEs, while lack of e-Learning based pedagogical models was very minor level difficulty to incorporate e-Learning in teaching by UTEs. Table also reveals that insufficient internet bandwidth was a moderate difficulty (M=1.67) whereas lack of training programs for UTEs to incorporate e-learning in teaching was extreme difficulty (M=2.61) faced by the UTEs.

RQ-2 What are the problems faced by prospective teachers for using e-Learning technologies and resources in university/institute?

Table 4.52 *Problems faced by students (Prospective Teachers)*

Type	Statements	N	Mean
<i>Digital Labs</i>	Availability of digitally-equipped labs	1700	1.93
	Least/no access to digital labs	1700	2.76
<i>Attitude towards e-Learning</i>	Lack of motivation	1700	1.97
	Unwillingness of teachers to promote e-Learning	1700	2.28
	Fear of technology use	1700	2.21
	English Language difficulty	1700	2.02
<i>Technical Resources</i>	Bad/weak internet connections	1700	2.47
	Excessive failure of electricity	1700	2.18
<i>e-Learning opportunities</i>	Irrelevance between e-learning and courses of study	1700	2.67
	Lack of technology-based courses offered in every semester	1700	2.4
	Less time consumed for learning using digital tools and technologies	1700	2.75
	Lack of training to work in e-learning environments	1700	2.29

Table 4.52 reveals the barriers faced by students of teacher education to utilize e-Learning in their education. Table shows the barriers regarding digital as M=1.93 represents that availability of digitally equipped labs was a moderate barrier while M=2.73 shows that lack of access to digital labs was also an extreme barrier faced by the students. Students revealed their attitude towards e-Learning, as in table, M=1.97 shows that lack of motivation of students was a moderate barrier while teachers unwillingness to promote e-Learning (M=2.28) was a major barrier. M=2.21 shows that students were

having fear of technology use while $M=1.12$ shows that English language was not a barrier for them to use e-Learning. $M=2.47$ interprets that insufficient bandwidth of internet was extreme barrier while $M=2.18$ reveals that electricity was also a moderate barrier faced by the students. In the table, $M=2.67$ shows that irrelevance between curriculum and e-Learning was extreme barrier while $M=2.4$ shows that lack of technology-based courses offered in each semester was also a major barrier for the students. $M=2.75$ interprets that one more extreme barrier faced by the students was less time consumption for utilizing digital tools and technologies in learning activities, whereas $M=2.29$ shows that lack of training to work in e-Learning environments was also a major barrier faced by the students.

RQ-3 Which digital tools and technologies are utilized by UTEs for the development of online teaching/learning resources?

Table 4.53 *Digital tools and technologies used by UTEs for teaching-learning resources development*

Online Resources	N	Frequency	%age
Research Journals	354	116	32.8
Search engines	354	138	38.9
Digital Libraries	354	70	19.8
e-Books	354	41	11.6
E-Databases	354	23	6.5

In table 4.53, it is obvious that 32.76% UTEs were using research journals, 38.98% UTEs were using search engines, whereas 19.77% UTEs were using digital libraries for the

development of online teaching/learning resources. Table also provide evidences that 11.58% UTEs were using e-Books while e-Databases were used by 6.49% UTEs.

RQ-4 For e-Learning resources sharing, which applications do the UTEs use?

Table 4.54 *Online Resources Sharing by UTEs*

Tools & Technologies	N	Frequency	%age
Wikis	354	16	4.5
Google Drive	354	45	12.7
Google Docs	354	19	5.3
Smart Apps (<i>Whatsapp, Viber etc.</i>)	354	59	16.6
Social Networking Sites	354	121	34.1
Email	354	164	46.3
Blogs	354	24	6.7

Table 4.54 reveals the tools and technologies used by UTEs for online resources sharing with their students. Table shows that 16 out of 354 UTEs (4.52%) used Wikis for resources sharing, 45 out of 354 UTEs (12.71%) used Google drive for resources sharing while Google docs were used by 19 out of 354 UTEs (5.37%). Smart Apps were using by 16.67% of UTEs and 34.18% UTEs used social networking sites for resources sharing with their students. It is shown in the table that 46.33% of UTEs utilized emails while 6.78% UTEs used blogs for online resources sharing.

RQ-5 What are success factors for an e-Training program?Table 4.55 *Success factors of an e-Training Program*

Factors	N	Mean
Technology literacy	354	2.62
Online Training Environment	354	2.35
UTEs acceptance level of digital/online environments for e-Training	354	1.93
Ease of using digital tools and technologies	354	2.31
Quality of e-Training course material	354	1.33
Knowledge and competencies of e-Trainers	354	2.12
Theme of e-training program	354	2.29
Reusability of e-learning resources and e-Content	354	1.13
Cost of enrolling the e-training course	354	2.51
Reputation of organization/agency/institution offering e-Training	354	2.33
Continuous mentoring and guidance provided by tutor throughout the e-training course	354	1.37
Extensive e-Learning activities planned to be carried out by UTEs	354	2.32

In Table 4.55, M=2.62 reveals that UTEs consider technology literacy a major success factor of e-Training and M=2.35 shows that UTEs believe that online environment is prominent success factor for e-Training, while M=1.93 depicts that UTEs consider technology acceptance a success factor to some extent. M=2.31 reveals that ease of using

digital tools and technologies is a success factor while M=1.33 shows that UTEs did not consider the quality of e-Training material (M=1.33) as a success factor for e-Training. Knowledge and competencies are slightly regarded (M=2.12) as success factor whereas M=2.29 shows that theme of e-Training is regarded as considerable success factor for e-Training program. M=1.13 depicts that UTEs did not consider the reusability of training e-Content as factor of success whereas M=2.51 shows that cost of enrolling in the e-Training program was a prominent success factor for e-Training. Reputation of organization/institute offering e-Training course was also regarded as success factor (M=2.33) by UTEs, while continuous mentoring and guidance of trainer throughout the e-Training course was not considered a success factor for e-Training. Also M=2.32 reveals that UTEs considered e-Training activities as major success factor for any online training program for UTEs.

RQ-6 What is importance of Training environment for e-Training programs?

Table 4.56 *e-Training environments*

Statements	N	Mean
In my point of view, training environment is an important element for enhanced learning in a training program.	354	4.13
Training environment is vital for the success of any Training program.	354	2.35
To facilitate the professional development of University Teacher Educators (UTEs) in novel mode, Online training programs are good option.	354	3.98

Table 4.56 reveals the opinions of UTEs about training environments. M=4.13 suggests that UTEs agree that training environments are significant element for enhance learning in training programs. M=2.35 suggest that training environments are regarded vital for the success of training programs. Whereas M=3.98 show that UTEs agree with online mode of training most suitable for their professional training.

RQ-7 Do the online system/Application for e-Training of UTEs already exist?

Table 4.57 *Existing Virtual/Online Application for e-Training*

Statement	N	Responses	
		No	%age
Online applications for e-Training of UTEs already exist.	354	289	81.6%

Table 4.57 depicts that 81.6% of the respondents said that no online application was used for their e-Training programs.

Table 4.58 *Online Application/Environment for e-Training of UTEs*

Statement	N	Responses	
		Yes	%age
UTEs need an exclusive separate online application for their e-Training.	354	274	74%

Table 4.58 illustrated that 74% of UTEs explored the need of an exclusive separate online application for their e-Training.

RQ-8 Which online training applications are preferred by UTEs for e-Training?

Table 4.59 *Online Applications for e-Training Preferred by UTEs*

Applications	%age of Preference
LMS	47.08%
Blogs	23.49%
e-Portals	29.57%
Social Networking sites	31.21%
Online Communities	15.65%
Personal Websites	54.33%
MOOCs	9.34%

Table 4.59 depicts the preferences of UTEs for different virtual environments for e-Training. It is obvious from the table that 47.08% UTEs gave preference to LMS, 23.49% UTEs preferred blogs, while 29.57% UTEs chose e-Portals as virtual environment for e-Training. Table also reveals that 31.21% UTEs preferred social networking sites, 15.65% UTEs chose online communities, 54.33% of UTEs were in favor of personal websites whereas 9.34% UTEs preferred MOOCs as online environment for e-Training of UTEs.

RQ-9 Why development of e-Portal is preferred choice than outsourcing an open-source e-Portal?

Table 4.60 *Mode of e-Training Application preferred by UTEs*

Statement	N	Mean
It is preferred for University Teacher Educators (UTEs) to get e-training in a closed/restricted online application with complete privacy rather than an open-source e-Training application..	354	3.77

In table 4.60, Mean=3.77 shows that UTEs tend to prefer an online application which provides them closed environment with full privacy.

Interview responses indicated preferences for in-house development of training application rather than outsourcing from open sources. Interview data specified many advantages of development of online application where ownership was the foremost. According to the interviewees, development of e-Portal enables the universities/TEIs to have ownership of their own e-Training application whereas outsourcing although operates the system but in that case organizations cannot claim for the ownership of application and data. Second reason for developing e-Portal is security of data and maintaining privacy of users. In case of ownership of own e-Portal, legal and ethical issues and risks are controlled by the organization itself. Furthermore in-house developed application are compatibility with organizational and training needs and users interests. One interviewee stated that:

"Teacher educators at university level must have equipped with their own training environment particularly made according to their professional and training needs."

One more respondent said :

"It is the best solution to build our own training e-Portal or LMS so that beneficial components and features may be included in it according to the needs of university teacher educators."

Cost effectiveness is another advantage to develop an online application rather than outsourcing as evidenced by the opinion of a respondent that:

" it saves money for borrowing open-source portals for training purposes."

Almost all respondents were of the views to have separate, distinct, independent, purpose-built and economical online training application which may be able to fulfill the professional training needs of university teacher educators.

RQ-10 Are UTEs willing to participate in e-Training course?

Table 4.61 *Willingness of UTEs for participation in e-Training Course*

Statement	N	Responses	
		Mean	%age
<i>I am interested in taking e-Training course</i>	354	315	89%

Table 4.61 shows that 89% UTEs were interested to participate in e-Training course.

Willingness to Participate in e-Training programs (from interview)

Findings of data collected through interviews revealed that all the UTEs were enthusiastically interested for attending any e-Training program if offered as all the interviewees responded positively as 'Yes' regarding participation in professional e-Training course. One interviewee presented his interest by saying:

"It will possibly a great experience for me to attend online training course "

While one more interviewee said that:

"I will like to take offered course as we are also working to promote the same in our own professional practices."

These result shows the elevated need to organize e-Training programs for University Teacher Educators in Pakistan.

4.2 OBJECTIVE : 2 (Phase-II)

To propose a developmental framework (DFW) of e-Portal for online training of UTEs

The proposed framework for the development of e-Portal for online training of University Teacher Educators (UTEs) has uniqueness in a way that development framework (DFW) provides both the dimensions of theory and practice of e-Portal. Theoretical and application sides of DFW are carried out in detail which mainly comprises conceptual foundations, methodological paradigm, Critical Success Factors (CSF) of e-Learning systems and Software development blueprint. Constituents of a training process are undertaken as base process for DFW which are significant for any training program. These elements are context & needs, objectives, trainees, environment, resources and assessment. UTEs are focus of whole process which encompasses the digital needs of teacher education, UTEs are prospective teachers. Specified needs are taken as input for proposing DFW of e-Portal for e-Training of UTEs.

4.2.1 DEVELOPMENTAL FRAMEWORK (DFW) FOR E-PORTAL :UTeT

The proposed development framework (DFW) was titled as "UTeT" framework abbreviated from "University Teacher Educators' e-Training". As followed by methodology illustrated in third chapter, developmental framework has four major constituents which cover theoretical and application perspectives of DFW. Those are i) Conceptual Foundation, ii) Methodological paradigm, iii) Critical Success Factors (CSF) of e-Learning systems, and iv) Software development blueprint. The proposal of UTeT framework was characterized by a combination of literature, empirical evidences from situation analysis (phase-I of this study) and document analysis to address the respective

phenomena of all four constituents of UTeT framework. The main idea behind proposing DFW was therefore providing a conceptual model in which these elements of DFW were studied thoroughly and respective findings were utilized to develop e-Portal and conduct e-Training course for UTEs.

4.2.1.1 Conceptual Foundation

Conceptual prototype of DFW was expounded in term of which objectivity and processes to develop e-Portal were understood. It included the context, needs and ideas which were justified by DFW of e-Portal making it possible to plan distinctive functionalities, features and characteristics of e-Portal in a novel way. Conceptual foundations of DFW were amassed from four dimensions.

1. Contextual Phenomena:

While doing situation analysis, the study was proceeded in international and national contexts. Then both were compared to identify the gaps (e-Learning, e-Training, and e-Teaching) which are contextual to Pakistani teacher education. On the basis of results of situation analysis, it was revealed that e-Training was needed in order to drive teacher education of Pakistan according to the technological trends in digital era. During situation analysis, it was revealed that e-Training in most of the countries are held with objectivity of enhancing e-Teaching skills and digital competencies in teachers with two distinguished modes, which are 'what' and 'how'. 'What' leads to the training for integration of digital technologies and resources in the teaching practice whereas, 'How' leads to manage training with digital tools and technologies in virtual/online environments. Results of situation analysis (as referred by Table 4.28) show that UTEs were agreed upon the importance of e-Training environments, and preferred separate and

exclusive online training application to meet training needs of UTEs. Situation analysis also revealed the need to develop an e-Portal for UTEs' training.

2. Audiences : User Analysis

Findings of situation analysis and literature review drew the characteristics, learning styles and learning principles of UTEs. It was corroborated that UTEs are owners of content and pedagogical knowledge and have familiarity with learning needs and contexts of their students. UTEs endeavor to create learner-centered learning environments which are conducive, productive and innovative. They also plan, implement and assess effective teaching and strive to enhance their professional competencies and learn new trends in the profession. UTEs own upright skills to collaborate with students, colleagues and organization at well. In the modern world, UTEs learn and practice new technologies, utilize digital tools and resources to promote e-Teaching and participate in e-Training programs which ultimately impact on students who are future teachers and reflect in their profession what they learn from their teachers. Learning principles of digital immigrants and adult learners were employed to refer the learning of University Teacher Educators (UTEs).

i) Learning principles of UTEs being Adult Learners:

Considering UTEs as adult learners, literature was reviewed to identify the learning principles of UTEs. It was found that adults are self-directed and their learning must be autonomous based on learning activities and projects of their interest to reach their goals. Adults learning must be experiential, relevant to profession, connecting knowledge and experience and providing respect and motivation. It was also found that

adult learners own varying learning styles so the proposed application must be capable enough to coop with learning styles of UTEs.

ii) Learning principles of UTEs being Digital Immigrants

UTEs being the digital immigrants have specific digital needs which can be satisfied by creating an approachable, virtual, digital and easily accessible learning environment. For learning of digital immigrants, their basis level of technology familiarity and utilization must be kept focus. A digestible format of content and learning activities, being simple and time saving, keeps them motivated and connected with training. So it was found that UTEs' training should be in professional capacity; training must be authentic and coop problem-based multiple learning styles. UTEs learn technology in collaborative and sequential mode.

iii) Technology Learning Principles for In-Service and Pre-Service Teachers:

As established in empirical and grounded literature of technology professional development of in-service teachers, following learning principles were drawn. a) technology learning is connected to the professional knowledge; b) technology learning should pedagogical content knowledge and subject matter connections; c) Teachers learn technology for challenging their current knowledge relating profession; and d) Teachers must be taught too many innovative technologies rather than focusing a few.

iv) Attitude of UTEs towards Technology integration

Findings of situation analysis revealed that UTEs have positive attitude towards training through e-Portal as they have familiarity with and availability of digital tools and technologies of digital era. They are also aware of significance of e-Training courses for

UTES. Furthermore they have shown their interest and willingness to participate in online professional training to be conducted by employing proposed e-Portal.

v) *Digital Literacy and Digital Competencies of UTEs*

From situation analysis findings, it was lucid that e-Training programs for UTEs were meant to enhance the abilities to develop digital competencies.

Table 4.2.1 *Digital competencies of UTEs*

From table 4.25 (phase-I), it is clear that UTEs consider e-Training programs helpful for developing the competencies of digital literacy, e-Teaching and developing online teaching/learning resources and e-Content.

3. Thought Experiment

Thought experiment was the source to construct a speculative model for e-Portal development in which different concepts were merged together to come up with sagacity of creativity. It involved the profound analysis of goals, requirements, tasks which appeared to influence the processes of e-Portal development and instructional design for e-Training of UTE. Moreover, thought experiment analyzed the direct and indirect impact of developmental and utilization processes of e-Portal on UTEs and on teacher education & training in long term.

i) *Goal Analysis*

On the basis of goal analysis, decisions were taken about the whole objectivity of endeavor of employing an e-Portal as online application for e-Training of UTEs. Goal analysis was deemed to be performed to elucidate performance goals, process goals and outcomes i.e. either identified gaps would be filled or not by meeting performance and

process goals. Findings from situation analysis and literature were employed to determine the goals.

Performance Goals:

Goals were believed to be determined for the individual and organizational performances of teacher education departments/institutes and UTEs. Organizational goals addressed the project goals and organizational growth in the light of situation analysis. Findings of situation analysis depicted the e-Portal was selected as desired online application for e-Training of UTEs whereas development of e-Portal was preferred option given by the respondents. Findings also asserted that training of UTEs through e-Portal influences the performance of UTEs, prospective teachers and instigates organizational growth.

Performance goals at individual level were ascertained by job goals, training goals and behavioral goals. Job goals were supposed to enhance functions, working and digital competencies of UTEs. Training goals were meant to bridge the gaps of e-Training of UTEs, e-Teaching, digital competencies of digital immigrants (UTEs) and digital natives (prospective teachers), and non-utilization of virtual environments of online applications for e-Training of UTEs. Behavioral goals were measured by means of awareness of UTEs about latest technological trends in profession, their willingness to utilize digital resources in their teaching and to enhance digital literacy and skills. It was proposed to measure the e-Readiness before commencing e-Training course and engagement level during e-Training course of UTEs.

Process Goals:

Process goals were written in terms of proposed technologies and strategies to be utilized to develop e-Portal and conduct e-Training through e-Portal. Digital tools, mobile apps, and smart apps were the technologies considered to carry out process whereas collaborative, authentic and connective process of learning was ascertained for proposed UTeT framework. On other hand, different tasks including processes of design and development of e-Portal, instructional design for training modules development, employing e-Portal to training of UTEs and assessing e-Portal were also made the part of goal analysis and ultimately DFW.

ii) Requirement Analysis

Requirements were meant to be inscribed to carry out the performances and processes identified in goal analysis. This step involved determining the functional and non-functional requirements for the development of e-Portal and conduction of online training for UTEs.

Functional requirements of e-Portal comprised of the decisions to be taken about the features, characteristics and functions to meet the online training needs of UTEs. Foremost requirement was experts of software design and develop who might possess the abilities to plan and develop e-Portal according to identified features and functionalities. Non-functional requirements consisted of determining criteria of a successful and efficient e-Portal. It was identified that reliability, usability and security of proposed system must be ensured. Customization-based user interface and quality-based system was required which might be assessed under the criteria of quality assurance of online application software.

Requirement analysis also found the need of trainers who were digitally trained and expert to work in online environments. Moreover content experts cum instructional designers were required to develop training modules compatible with e-Portal and objectives of training of UTEs. Evaluators were also required to assess flawless execution of e-Portal and online training, content of training and successful completion of e-Training course. Training requirements of UTEs were also identified in requirement analysis process. Findings from situation analysis and literature found that prime need of UTEs was enhancement of digital literacy and digital competencies whereas same were identified during goal analysis as goals of an e-Training program. It was also required to make the digital resources available to UTEs so that objectives of training could be achieved. It was decided that a prototype of e-Portal would be developed according the derived concepts and identified functions, characteristics and features of proposed e-Portal.

iii) Task Analysis

Task analysis determined the decisions and ways to carry out performance and process goals being identified in goal analysis followed by requirement analysis. A prototype was proposed to be developed first to integrate the concept and identified functions, features and characteristics of e-Portal which was meant to check the viability of idea and utilization of proposed application for preset goals. An incomplete version of one module of software (prototype) was to be developed according to the design and rest of the modules were to be developed after testing the functions of working module (prototype). Testing of this first and incomplete version escorted to evaluate the potential,

usability and complexity of whole application. Requirement analysis and software design were used as inputs to develop prototype of proposed application.

Task of development of e-Training modules was also identified in task analysis which described the tasks to be carried out to design and develop training modules followed by suitable model of instructional design. It also included the ways to select the content and activities derived from different aspects and theoretical basis of DFW having compatibility with features, interface and functions of proposed e-Portal. The approaches were also identified to implement and assesses the success and acceptance of proposed e-Portal to be employed for the training of UTEs.

iv) Impact Analysis

This step involved analyzing the direct and indirect impact of utilizing e-portals and conducting an online training course for UTEs. The impact was to be determined on the basis of requirements, design and architecture of e-Portal and structure of training modules. It was also to be determined that how the features of proposed e-Portal and structure of training modules would influence the objectives attainment and system performance. Impact of e-Training was assumed to cover how online training through proposed e-Portal could influence UTEs, teacher education departments/institutes and ultimately to teacher education of Pakistan.

4.2.1.2 Methodological Paradigm

Methodological paradigm was derived to study the philosophical and theoretical assumptions about the development of e-Portal.

i- Philosophical Beliefs : Pragmatic Approach (Development focused)

Philosophical viewpoint has lead towards engineering the system or product according to the pragmatic principles which emphasize the practical applications of knowledge in realistic scenarios by merging theory and practice. This study has explored the ways how UTeT framework could be implemented for e-Training practices of UTEs by using pragmatic modes of digitization, collaboration, online learning principles etc. The aspects focused in this pragmatic approach are development process, trainees and training content which is being expressed in terms of compatibility with e-Portal followed by ontology and epistemology.

a. Ontological Belies (Learner-centeredness)

Ontology focused the reality and veracity about the proposed product. The structure and sequencing of components of e-Portal was supposed to support the knowledge base of the content and context of the learners/trainees. It comprised the aspects of trainees transactions demanded by nature, i.e. natural language, learning styles, natural settings for learning.

b. Epistemological Beliefs (Content-Centered and Pedagogy-centered)

e-Portal was meant to support the whole process of knowledge and skills acquisition. Keeping the objectivity of knowledge and skills focused, Content-centeredness brought into account determining course characteristics and course construction processes. Whereas pedagogy-centeredness focused the aspects of learning process, learning principles and teaching methods to impart that content.

ii- Theoretical Beliefs (Components focused)

The components of e-Portal were considered to be designed followed by the theories focusing the objectivity, features, functionality and users of e-Portal. Theory of Connectivism and learning principles of UTEs as digital immigrants were applied as theoretical base for e-Portal development where Connectivism was focusing networked, online collaborative and social learning. Moreover theories of Digital Micro-learning adult learning, and authentic learning were employed to design and develop the content/modules for e-Training of UTEs by utilizing proposed e-Portal.

Connectivism, being the theory of learning age seeking to explain the complex learning in rapidly changing social and digital world, clustered the dimensions of connectivity, social learning, communication & collaboration, virtual environment for e-Training and networked knowledge. Online collaborative learning theory provided a model of learning where learners were supposed to be encouraged and supported to work together to create knowledge, to invent, to explore ways to innovate, and learning by doing to seek the conceptual knowledge needed for problem solving. Adult learning took into account experiential, self-directed, active and transformational learning. Authentic learning theory contributed to explore meaningful knowledge and concepts which involved real world problems and projects meant to facilitate multi-disciplinary leaning environment, virtual communities of practice and multiple learning styles. Digital Micro-Learning (DML) was utilized as strategy of training through brief, digestible and well-planned units of information which were to be consumed by the trainees. Major elements of DML focused for UTeT framework were micro-content, micro-activities and digital/online training environment.

4.2.1.3 Critical Success Factors (CSF) of e-Learning Systems

In this research study, e-Learning CSFs were identified by reviewing different studies which were imperative to the design and development of e-Portal. Eight studies were reviewed to identify CSFs for e-Portal development as an e-Learning system. Findings revealed that factors imperative to be included in an e-Learning application were technological/digital infrastructure, online management, instructional design, organizational needs, trainers and their competencies, trainees needs, and online pedagogy.

4.2.1.4 Software Design and Development Blueprint

This element of DFW focused the design of proposed e-Portal to be employed for online training of UTEs. It comprised two JAD (Joint Application Development) approach and Water Fall model of SDLC was applied for e-Portal design and development of e-Portal. JAD accentuates design and development of e-Learning systems assisted with system requirements and continuous acquaintance of developers and clients of software applications. Water Fall model was identified best keeping as project gets divided into transparent and short developmental phases. Each phase separately just after development was deployed on server and was tested for suitable working. Feasibility and requirement studies were to be conducted as major ingredients of system design. Also context diagrams, data flow diagrams (DFDs), flowcharts, E-R (Entity-Relationship) diagrams were designed as inputs to pave the development of e-Portal.

4.2.1.5 Concept Map of Development Framework (DFW) of e-Portal



Figure 4.1: Integrated Diagram (Concept Map) of Developmental Framework (DFW) for e-Portal

4.2.2 *Answering Research Questions*

RQ-11 **How Development Framework (DFW) of e-Portal is validated?**

The proposed DFW was developed on the basis of data collected during situation analysis and extensive literature review. The developmental framework was validated through experts. Four experts assessed the proposed DFW in different dimensions i.e. contextual dimension; analyses dimension; technical/developmental dimensions; conceptual dimension. suggested changes/modifications were made in the proposed DFW according to the opinions of experts.

4.3 **OBJECTIVE: 3 (Phase-III)**

To identify the components, interface and features of e-portal for training of UTEs

Data analyzed for phase-III of research study yielded following findings.

4.3.1 **Components of e-Portal**

Table 4.62 : Preferred components for e-Portal development

Components	N	Responses	
		Yes	%age
Secured Registration	354	298	84.2
Profile Management	354	246	69.5
Course Management	354	315	89.0
Interactive Modules/Lessons	354	151	42.7
Dashboard	354	68	19.2
Users' security	354	232	65.5
Record Keeping	354	162	45.8
Users tracking	354	209	59.0
Assessments	354	256	72.3
FAQs	354	163	46.1
Feedback	354	231	65.3
Help Desk	354	289	81.6
Test Designing	354	241	68.1
Multiple types of content	354	263	74.3
Attractive user interface	354	167	47.2
e-Surveys	354	168	47.5
Calendar	354	123	34.8
Event/Activity alerts	354	44	12.4
Discussion forums	354	187	52.8
Chat	354	216	61.0
Email	354	319	90.1

Table 4.62 shows the preferences of UTEs to identify the components to be incorporated during e-Portal development. Percentages represent the preferences of UTEs in quantitative form.

ANSWERING THE RESEARCH QUESTIONS

RQ-12 Why e-Portal is preferred online training application to be developed?

Reasons for selecting e-Portal as e-Training environment for UTEs are:

- 1- UTEs have positive opinions about choosing e-Portal as online training application.
- 2- There is no e-Portal ever developed specifically for online training of UTEs in Pakistan.
- 3- Features of objectivity and specificity make the e-Portals desirable online training application.
- 4- e-Portals normally don't contain irrelevant, unnecessary and needless features, but only those relevant to the objectives of training.
- 5- e-Portals are developed keeping in view the needs of trainees and needs of training programs.
- 6- Like all other online apps, e-Portals are very attractive and easy to use.
- 7- e-Portals include such features, functionalities and interface which converge on achieving the training objectives, as those don't cause to deviate the focus of trainees. So e-Portals provide shield to the trainees by saving them from distractions or wasting time.

RQ-13 What are preferred features of e-Portal?

Table 4.63 *Preferred Features of e-Portal*

Features	N	%age
Striking interface	354	89.2%
Meaningful and relevant content	354	93.4%
Learning Resources	354	85.0%
Activities	354	91.1%
Multiple learning styles	354	84.4%
Assessment	354	81.3%

Table 4.63 illustrates the preferred features of e-Portal by UTEs. It is clear from table that 89.2% UTEs preferred striking interface, 93.4% respondents preferred meaningful and relevant content, 85% UTEs chose learning resources, 91.1% UTEs preferred activities, 84.4% UTEs chose multiple learning styles while 81.3% UTEs desired to include assessment as preferred features.

4.3.3 Preferences of UTEs regarding components and features of e-Portal

Data collected from ten respondents through interview revealed the opinions and preferences of UTEs towards features of e-Portal. Eight out of ten respondents were of the view that e-Portal must contain common and familiar components in comparison with existing online training applications. As one of those respondents said:

" I focus on the components with which I am very much familiar and which are easy to use for me."

One more respondent in this regard assumed that:

" unfamiliar or exotic web elements effect the efficiency of doing task."

Interview findings show that seven out of ten UTEs did not prefer to include unnecessary features and components in e-Portal as those don't lead to the trainees to be inclined towards seeking training but cause deviation and create difficulty in the use e-Portal. As one UTE responded that:

"I think unnecessary components of training applications deviate the trainees from the actual goal of training."

4.3.4 Preference for Subjectivity of e-Portal

Respondents were asked about their preferences to focus ae-Portal while they were provided with the two options, one was e-Training goals and other was interface of online training application. Seven out of ten respondents preferred training goals rather than as main focus while working with online applications as one of the UTEs said:

" Certainly focusing the objectives of online training is primary consideration."

One more respondent said:

"My inclination will positively be towards adding only specific features in e-Portal which may be aligned with training needs."

RQ-14 What are the preferences of UTEs for Features, functionalities and characteristics of e-Portals to experience with?

Table 4.64 *Characteristics of e-Portal*

e-Portal Characteristics	N	%age
Active	354	95.3%
Engaging	354	91.7%
Motivating	354	96.0%
Attractive	354	79.3%
Flexible	354	70.8%
Self-directed	354	74.1%

Table 4.64 shows the characteristics of e-Portal by UTEs. It is clear from table that 95.3% UTEs preferred active environment, 91.7% UTEs preferred engaging environment, 96% UTEs suggested that training environment must be motivating, 79.3% UTEs desired for attractive environment, 70.8% UTEs preferred Flexible whereas 74.1% UTEs desired for training environment to be self-directed.

Table 4.65 *Features of e-Portal*

Features of e-Portal	N	%age
Striking interface	354	89.4%
Meaningful and relevant content	354	93.6%
Learning Resources	354	85.0%
Activities	354	91.2%
Assessment	354	81.7%

Table 4.65 depicts the features of e-Portal, as 89.4% UTEs preferred striking interface, 93.6% UTEs said that content should be relevant and meaningful, 85% UTEs desired for

Learning resources, 91.2% UTEs preferred extensive activities whereas 81.7% UTEs said that e-Training environment must contain the feature of assessment.

Table 4.66 Functionalities of e-Portal

Functionalities	N	%age
Collaboration	354	83.3%
Communication s	354	92.8%
Multiple learning styles	354	81.4%
Discussions	354	76.1%
Social Interactivity	354	84.5%

From table 4.66 it is evident that 83.3% UTEs said that e-Portal must have the function of collaboration, 92.8% UTEs preferred communication, 81.4% UTEs desired for the function of multiple learning styles, 76.1% UTEs preferred discussions while 84.5% UTEs preferred social interactivity to be important functionality of e-Portal.

RQ-15 What is preferred user interface for e-Portal?

Preferred User Interface of e-Portal

Responses of interview of UTEs explicated the preferred user interface of e-Portal. While analyzing the interviews, two themes Characteristics and Focus were extracted. It was evident from findings that UTEs preferred characteristics of e-Portal interface as attractive, eye-catching, esthetically strong, easy to use, interactive, graceful, straightforward, engaging, attentions seeker and attractive dashboard. It was also found in the light of UTEs' opinions that e-Portal must be purpose oriented and it should emphasize on fulfillment of training goals by meeting training and trainees' needs.

4.4 OBJECTIVE- 4 (Phase IV)

To develop an e-Portal for the training of University Teacher Educators (UTEs)

The e-Portal development life Cycle was begun with needs identification and extended through the conceptual design (requirement analysis; feasibility study) and preliminary design (ERDs, DFDs, Context diagrams), detailed design and development, production and/or construction, product utilization, phase-out and disposal.

4.4.1 Feasibility Study

Selecting a type of e-learning course that meets the requirements of prospective students is not enough to justify the investment that would need to be made in an e-Learning project. The administrators want to carry out a detailed study of the costs and benefits of an e-Learning endeavor. They also want to know what aspects of their existing capabilities can be leveraged in the e-Learning project.

Stakeholders of the Application:

As overall need for an e-Learning application depends on the specific requirements of the various stakeholder groups that would be associated with the e-Learning endeavor. These stakeholder groups include:

1. Students (Prospective Teachers)
2. University Teacher Educators (UTEs)
3. Teacher education department/institutes in universities

Infrastructure:

For a new entrant, the costs involved in purchasing or hiring infrastructure, such as computer hardware and office space, would represent a significant percentage of the overall cost of an e-Learning program.

Benefits:

High on the list of benefits of e-Learning delivery was the revenue that teacher education organization could earn from the program. The feasibility report needed to take into account all such tangible and intangible benefits. The following benefits were determined:

- a) Extending the existing portfolio of programs
- b) Reaching students who otherwise would not enroll
- c) Optimizing the use of existing resources
- d) Enhancing the image of the institution
- e) Saving on some costs such as classroom facilities

4.4.2 Requirement Specification

This system could be used for any required teacher education institute and it could be utilized within the same interface. Any teacher education department/interface was able to acquire an online training application like e-Portal and all administrative processes could be managed with the designed system.

Assumptions/Constraints:

- Customer is well aware of his/her requirements in start of project.
- Any change/new requirement only shall be added after detail discussion and negotiation
- All Material which shall be uploaded via E-LMS, would be only downloadable. No video playing or audio playing functionality be the part of this system.
- User/web surfer should have basic knowledge of web.

Scope Management

Following is the scope of this system.

- An admin shall have predefined credentials. Whereas admin can change password/user name.
- An Admin shall create Teacher/Student account manually.
- An teacher can get login using his/her university name, email and name
- An email shot shall be generated to teacher email with code to login
- A teacher/Student can maintain their profile.
- Teacher can create course with start date and end date, along with category of course.
- Teacher can assign/enroll student on specific course. A course can have multiple students.
- Teacher can upload course material(video, pdf, docx, xls, text, image)
- Teacher can add lesson feedback (limited to Teacher powers)
- An Email shall be generated when new course is created to admin.
- An Email shall be generated to course subscribed students for any new upload.
- Log in and log out of students shall be generated with respect to course.
- Teacher can create quiz for any course.
- Student can take quiz for his course.
- Automated Marking is generated on submission of quiz.
- Teacher can upload/assignment against any course.
- Assignment does have calendar to start/stop

- Student can upload his assignments against any course assignments.
- Student can give feed back
- Teacher can launch surveys.(survey question could be limited to teacher powers)
- Teacher can initiate any discussion/topic
- Students can add comments to any discussion.
- Students/teacher can chat with each other directly. But offline chat.
- DFDs, ERDs, Flowcharts, Context Diagrams, Test cases
- User Manual

4.4.3 Work Breakdown Structure

The system can divided into four phases.

Phase 1:

1. Project Plan Document
2. Project plan phase one Screen/Flow of phase 2
3. ERD of System phase 2.

Phase 2:

1. Login page functional page
2. Register/Add user/students page
3. Teacher/Student profile management
4. Manual of Phase 2 with Test cases.

Phase 3:

1. Course Management/Adding/Editing
2. Course Setting

3. Students Enrollment.
4. Course content uploading
5. Students course quiz
6. Course quiz
7. Course assignment adding
8. Course quiz automated marking
9. Manual of Phase 3 with test cases

Phase 4:

1. Reporting of student enrollment wise
2. Reporting of students login/log out wise as attendance
3. Topic discussion initiating from teacher
4. Students participating in discussion
5. Chat (offline) with teacher/students
6. Survey can be initiated
7. Student feed back
8. Manual of phase 4 with test cases.

4.4.4 Deployment Plan

As one phase was completed, it was deployed to server in order to get feedback while code was deployed on client server/machine. Likewise as all the phases were completed, those were one by one deployed to the server to assess either the phases altogether were working or not.

Dependencies

Team coordination was necessary.

PHP 5.2 or higher server was essential

Mysql 5.0 or higher server was needed .

4.4.5 Quality Management

For e-Portal system, controlling the consistency of screen layouts was include reviewing all screens to make sure they match the standards. Quality measures may be no bugs or defects for certain critical requirements, consistent screen layouts, or correctly calculating variables. Quality was ensured through inspections, audits, formal testing and documentation of defects in a defect tracking system to ensure defects are fixed, retested and closed.

4.4.6 SDLC (SOFTWARE DEVELOPMENT LIFE CYCLE)

Following two SDLC models were used in this application development.

- Water Fall
- JAD(Joint Application Development)

Reason to use JAD:

The JAD approach, in comparison with the more traditional practice, is thought to lead to faster development times and greater client satisfaction, because the client is involved throughout the development process. In comparison, in the traditional approach to systems development, the developer investigates the system requirements and develops an application, with client input consisting of a series of interviews.

Reason to use Water Fall:

Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate phases. In Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially.

Following phases were involved in water fall.

- *Requirement Gathering and analysis*
- *System Design*
- *Implementation*
- *Integration and Testing*
- *Deployment of system*
- *Maintenance*

4.4.7 E-PORTAL DESIGN

i) *DFDs (Data Flow Diagrams)*

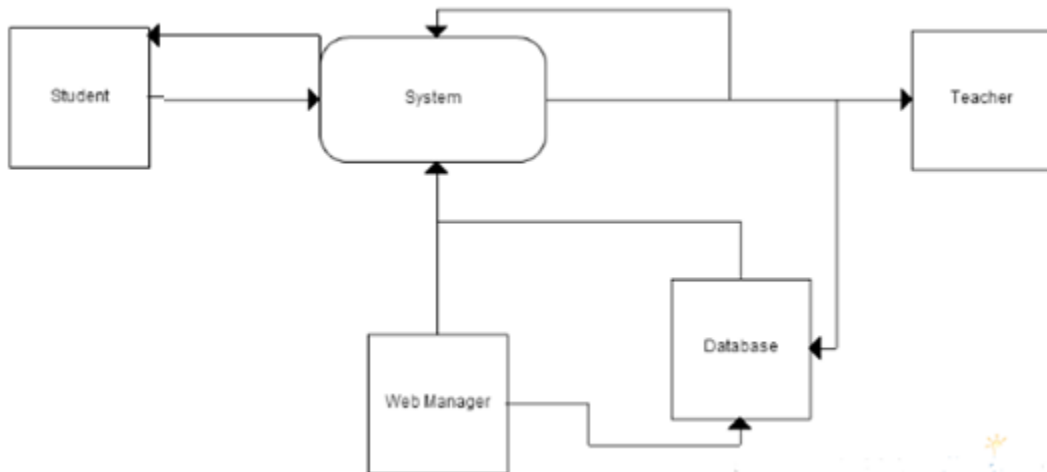


Figure 4.2(a) : 0-Level Data Flow Diagram

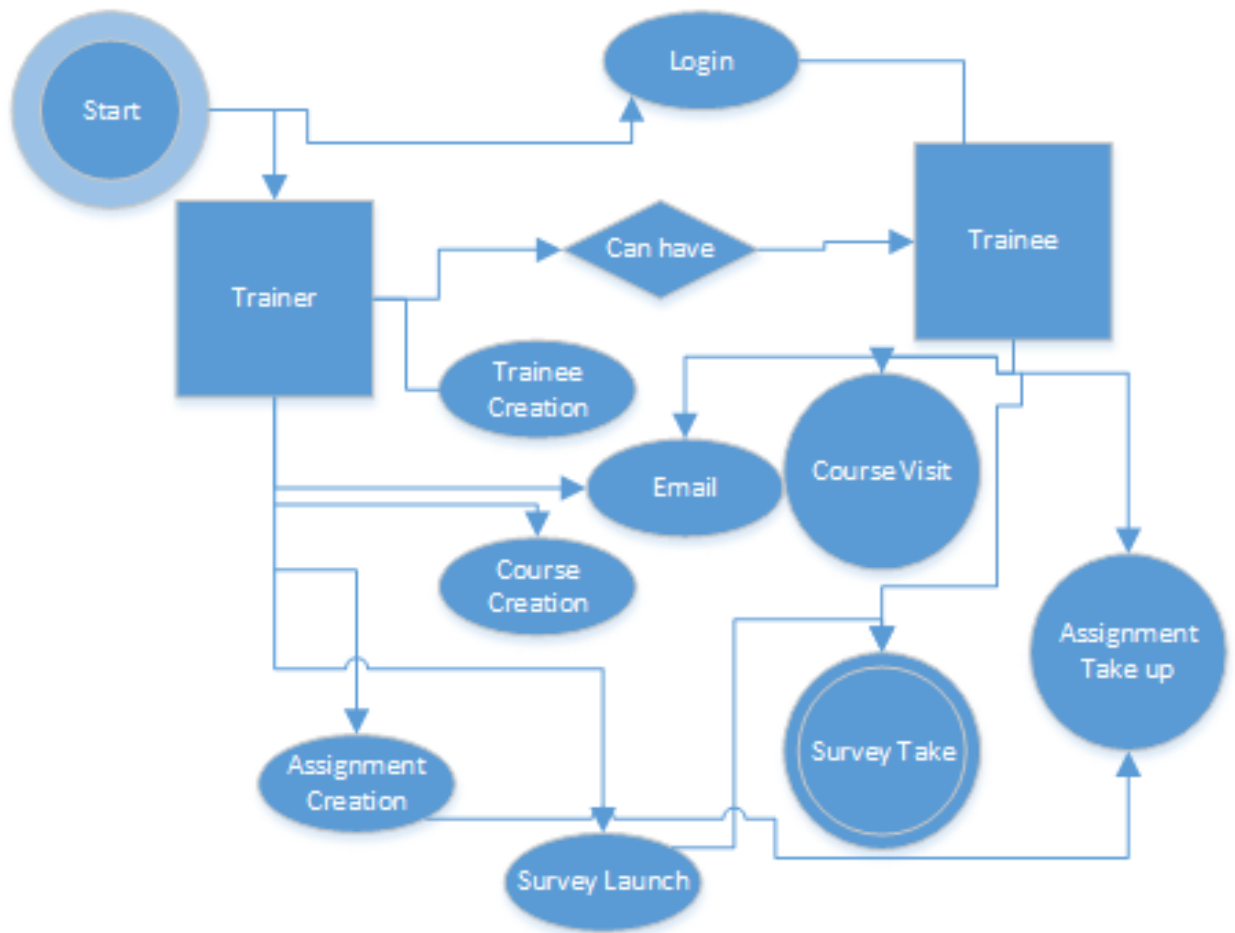


Figure 4.2(b) :1-Level Data Flow Diagram

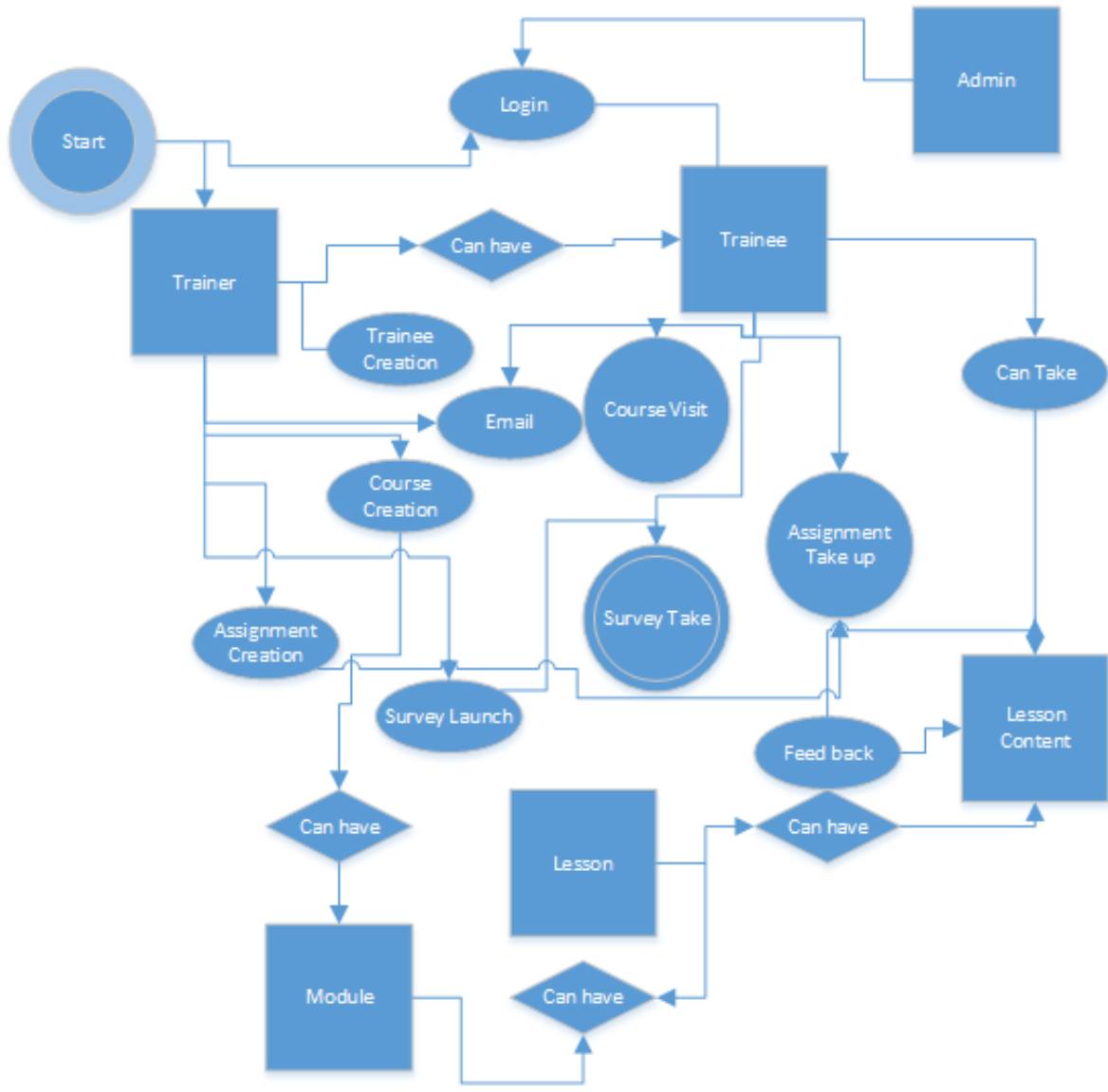


Figure 4.2(c) :2-Level Data Flow Diagram

ii) ERD (Entity Relation Diagram)

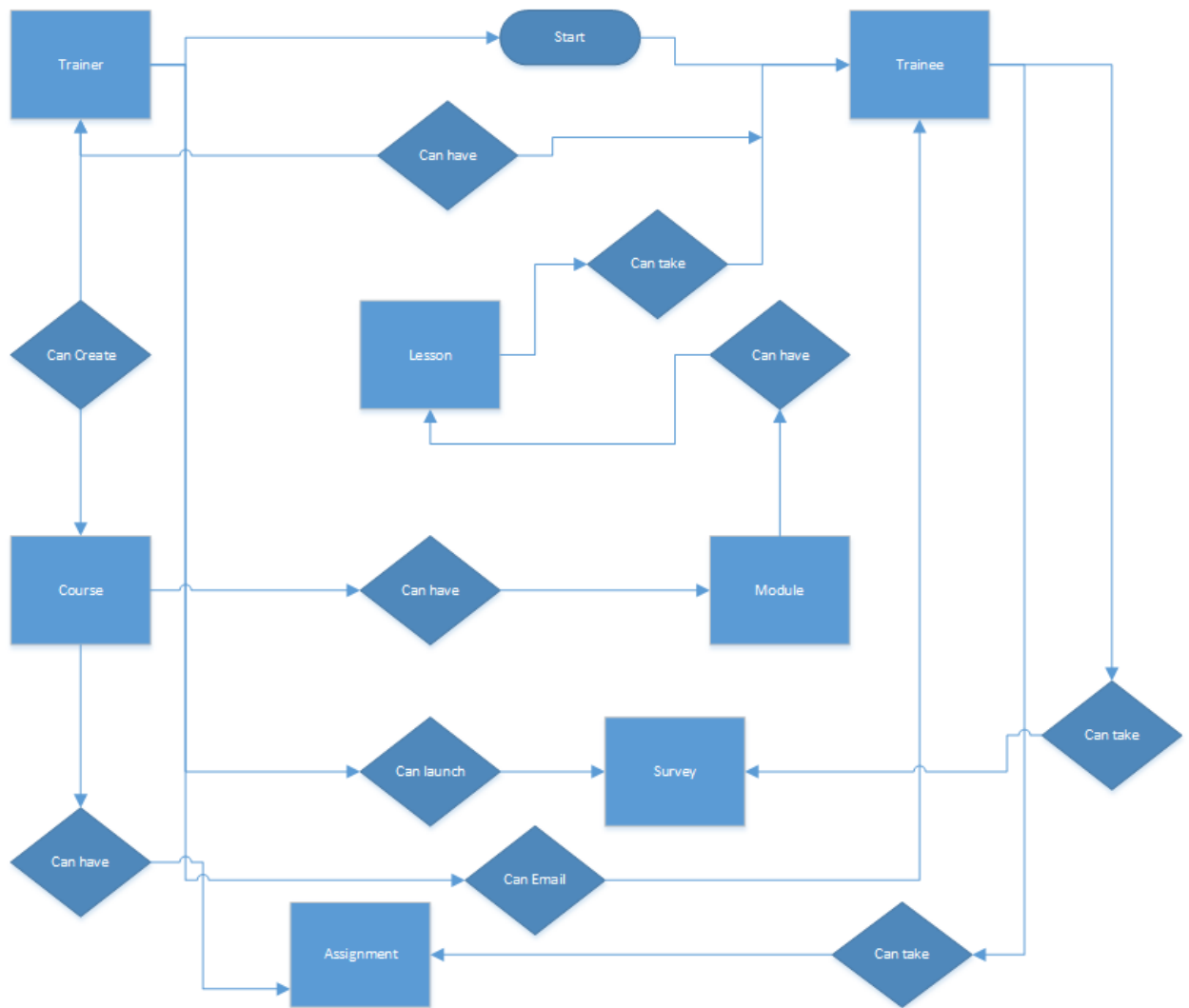


Figure 4.3 :E-R Diagram of e-Portal

iii) Flow Charts:

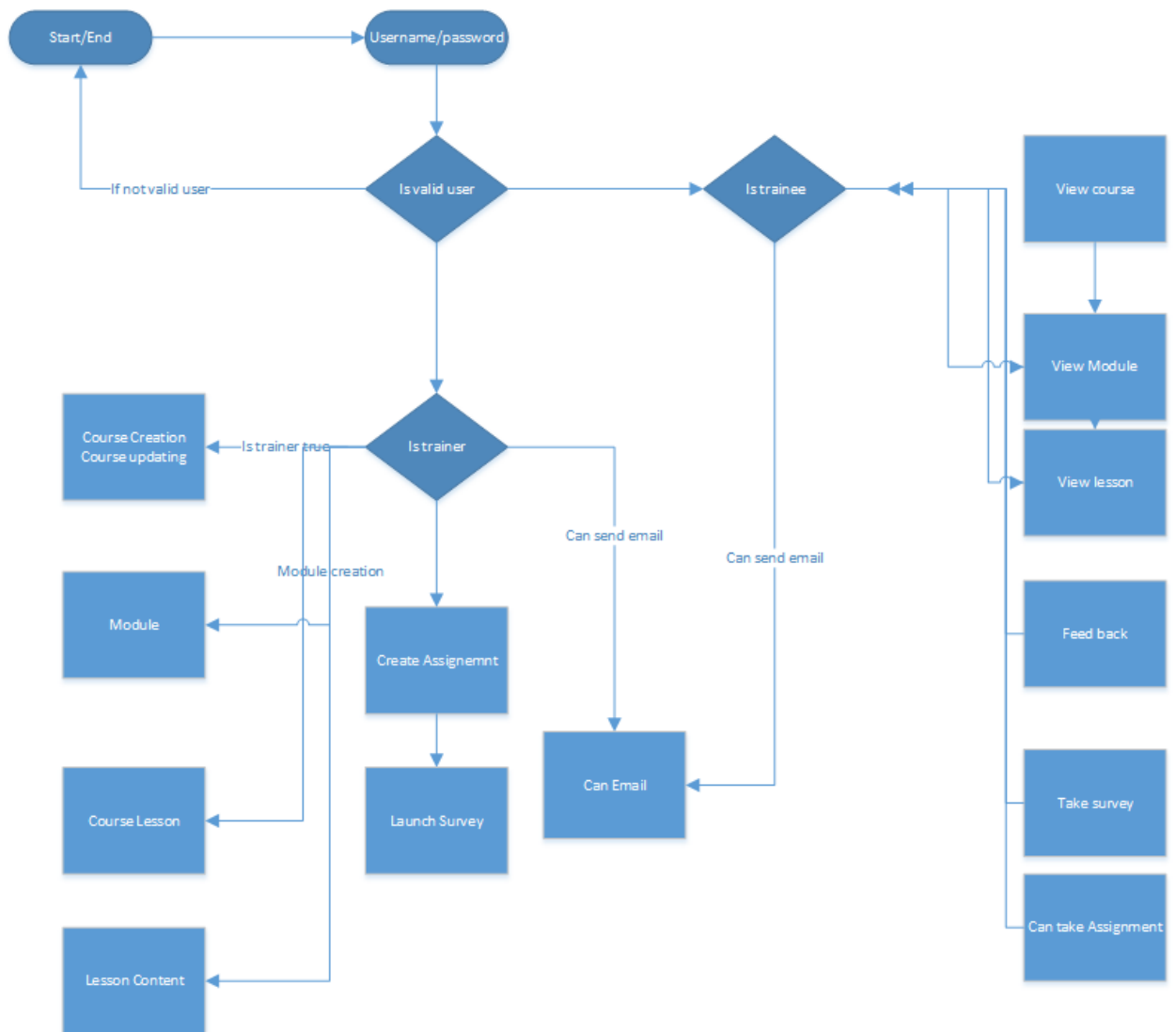


Figure 4.4 :Flowchart illustrating data flow

iv) *Context Diagram*

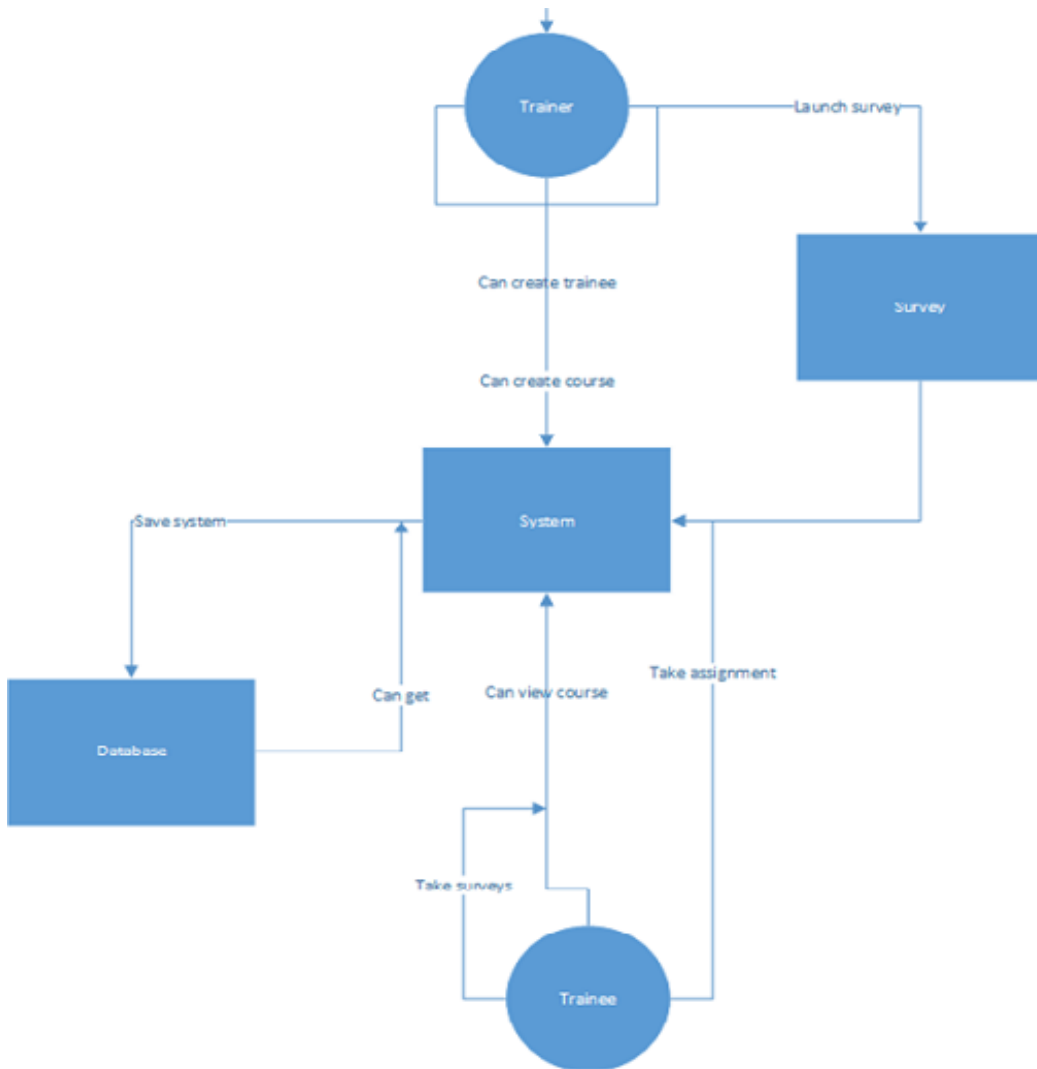


Figure 4.5 :Context Diagram of e-Portal

v) *User Interface*

User interface of system is very responsive. Its user friendly. It can be viewed on desktop and on mobile equally. Bootstrap css is being used in this theme.

Information Handling:

Information handling in the system is being done using mysql server database. Data base is relational data base. Smooth data handling is done in system.

Control Hierarchy

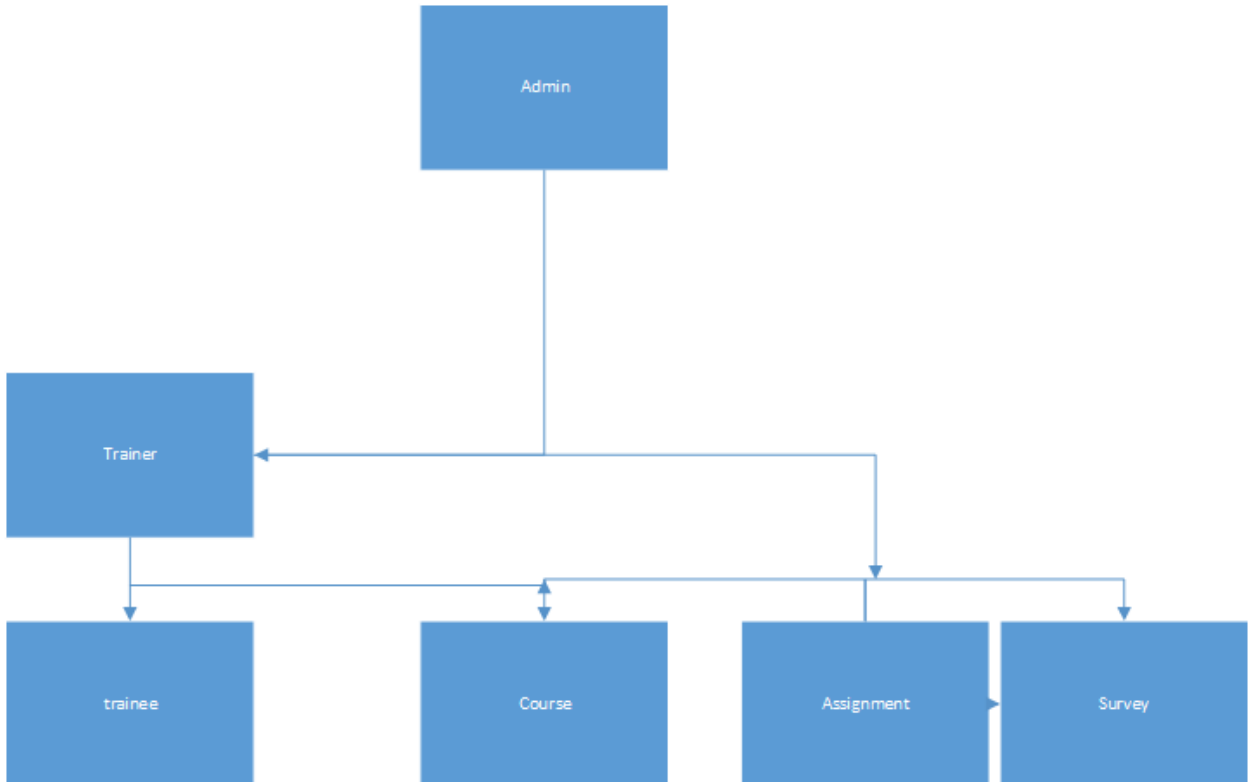


Figure 4.6 :Control hierarchy of user interface

4.4.8 Database Design

Database is totally relational database system. Proper entity relation is being made in system.



Figure 4.7 :Database design of e-Portal

4.4.9 Server Interface and Requirements

Following Server interface and configurations are made.

- i. Apache 2.2x
- ii. Mysql 5.5x
- iii. PHP 5.2X
- iv. Code igniter
- v. Bootstrap html

4.4.10 Design Consideration and Specification

Responsive Web design has been evolving rapidly ever since Ethan Marcotte coined the term years ago. Since then, techniques have emerged, become best practices and formed part of our ever-changing methodology. A few obvious examples are the multitude of responsive image techniques, conditional loading, and responsive design and server-side components (RESS), among many other existing and emerging strands stemming from the core concept of responsive Web design. System is fully web 2.0 based design. Responsive design is used for it. You can view the system on mobile and as well as on web equally.

Deployment / Implementation

Complete code is deployed on apache 2.2x and mysql with php 5.2x version.

4.4.11 Testing

Testing of modules are done against different input values. Tested on apache server. Testing is done by different parties as well. Following testing method were made.

- Black Box testing
- White Box Testing
- Smoke testing
- Sanity Testing

4.4.12 Maintenance & Quality Assurance

Only developer could do any kind of change in code is needed. As JAD and Water fall model is used for development so QA is done by directly client. Other than client QA is performed by external QA expert too. Review is been made. Peer reviews is taken. Due to SDLC model QA is ensured on every step of software development phase.

4.4.13 e-Portal (UTeT) Interface:

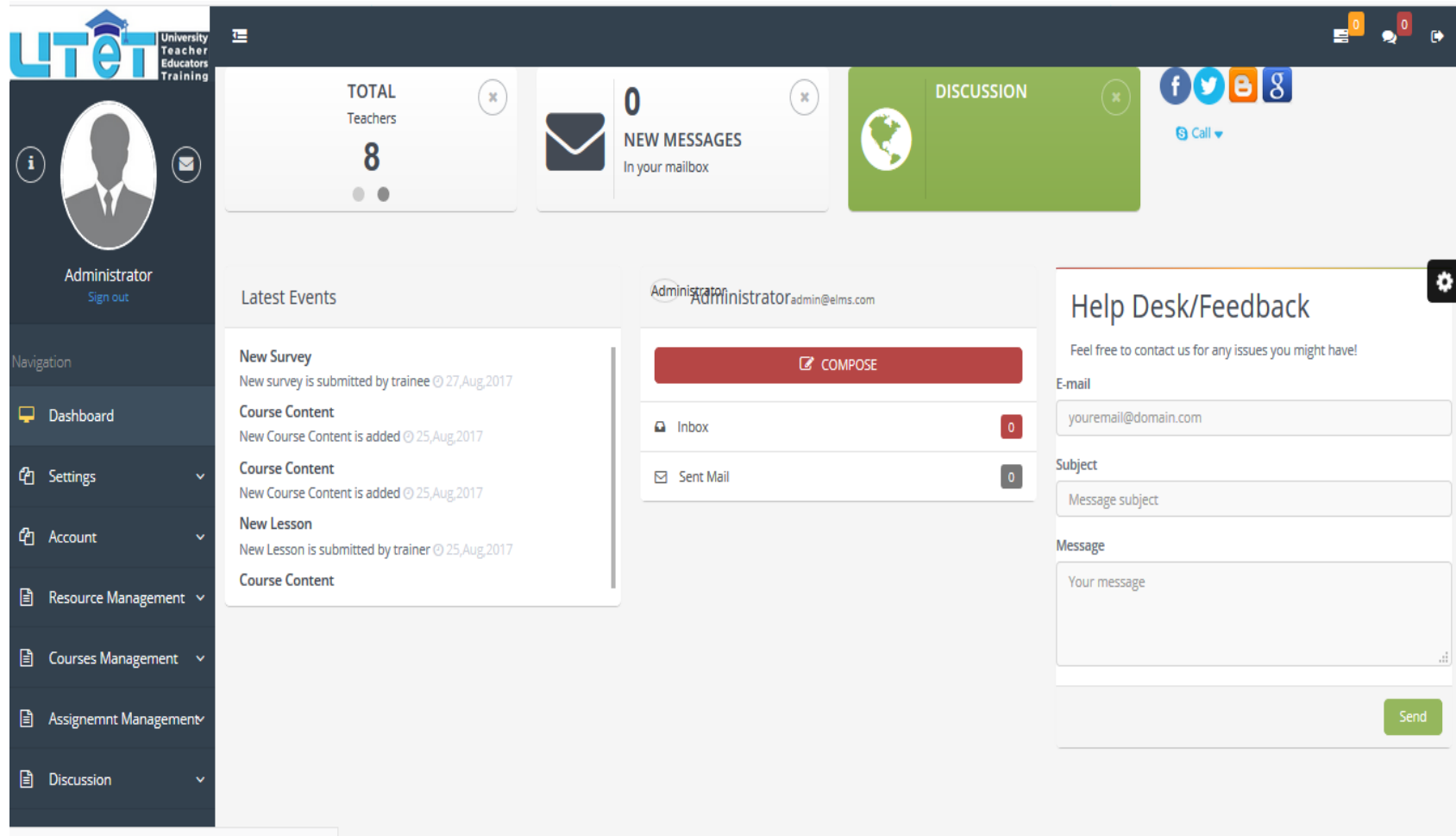


Figure 4.8: e-Portal interface

4.5 OBJECTIVE: 5 (Phase-V)

To develop training modules for e-Portal for the Training of University Teacher Educators (UTES).

ADDIE model of instructional design was utilized to develop e-Training modules having compatibility with the features and functions of e-Portal.

4.5.1 ADDIE Model

ADDIE consists of five phases which are analysis, design, development, implementation and evaluation of training modules. Phases of ADDIE were accomplished as following.

1- ANALYSIS:

The data for ANALYSIS was taken from the findings of Situation analysis already being done in Phase-1 and Phase-2 of this study.

- i- Need Assessment : PHASE-1
- ii- User Analysis : PHASE-2 (DFW)
- iii- Goals and Objectives Analysis : PHASE-1
- iv- Task Analysis : PHASE-2 (DFW)
- v- Resources Availability : PHASE-1

2- DESIGN:

The information obtained from first stage of analysis was used to prepare a blueprint in combination with learning principles and learning theories used in the CFW of e-Training. This step also determined the strategies to create this online training program. Design was started with establishing the learning objectives and tasks identification was carried out. The entire course design was systematic and logical in

which each segment was linked and built on the previous segment. After tasks were segmented, the strategies regarding e-training course delivery methods, the digital tools and technologies, the content material were decided and then e-activities were designed for the participants of course. Also the assessment strategies were planned.

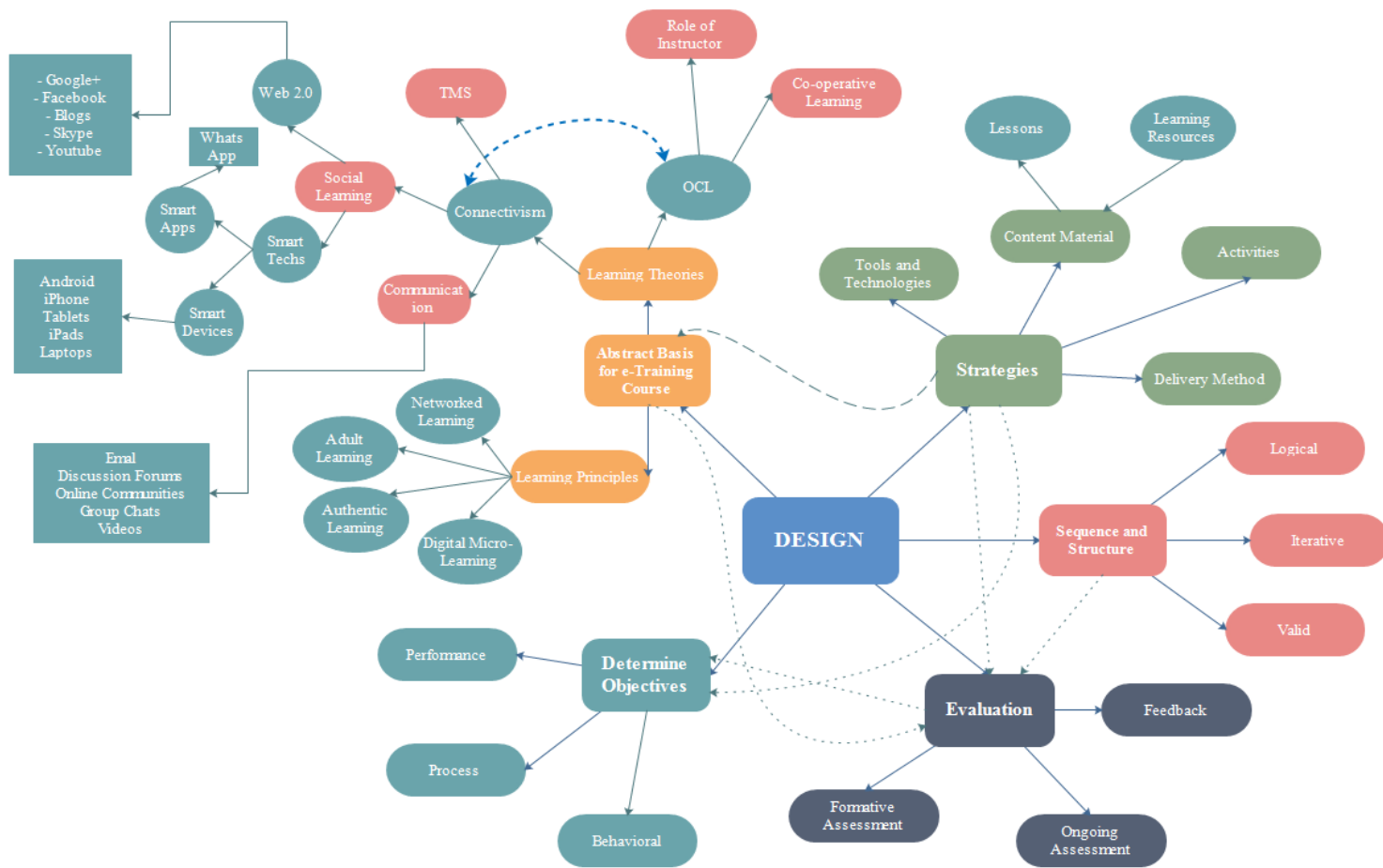


Figure 4.9: ADDIE Map for e-Modules Design & Development

3- DEVELOPMENT

This stage involved the creation of content material and activities to be utilized in the e-Training course. All those strategies which were selected during design stage were developed and assembled here. It included the development of training modules, lessons, activities, learning resources as well as integration of digital materials such as presentations, videos etc. Also the manuals of course guides and content material were prepared. This first draft was reviewed and revised until it was shaped in ready form for implementation.

4- IMPLEMENTATION:

After the development, the content was implemented to ensure that all developed entities were ready for e-Training. It included deployment of the course modules and testing the equipments, e-Portal, compatibility of content with e-Portal, and all the functions of course. The course material was tested on a group of participants to check that if there exist any weaknesses or problems before actually starting the training. So the validity of course and content was ensured during this phase.

5- EVALUATION:

Evaluation was the last step in ADDIE. The validation results of testing were analyzed by using evaluation rubrics and evaluation criteria. The process was revised and modifications were made on the basis of rubric outcomes. Three types of evaluation took place during this step, those were ongoing assessments, reporting and feedback. After this step, the e-Training modules were ready to be utilized for University Teacher Educators (UTEs) using e-Portal.

4.5.2 Answering Research Questions

RQ-16 In what ways are Connectivism, ADDIE, and e-Portal are associated?

The e-Modules were designed and developed using ADDIE model but the e-Training rationale was taken from DFW developed in the second phase of this research study. As DFW was based on the Connectivist approach and in ADDIE process data was also taken from contextual analysis and DFW. That is why ADDIE, e-Portal and Connectivism were considered to be associated.

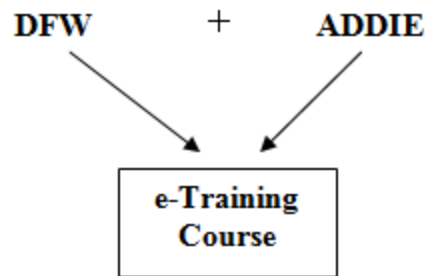


Figure 4.10 : compatibility between ADDIE, DFW& e-Portal

RQ-17 How the theoretical compendium of DFW is followed by ADDIE?

As ADDIE was utilized to develop the modules for e-Training course for UTEs, ADDIE was associated with DFW already proposed in phase-2 of the study. In DFW a theoretical compendium was proposed from where the postulates of different theories were used in different dimensions in DFW. When modules were in development process, theory of Connectivism was used to ensure the online learning activities based on social learning concept i.e. communication and connectivity. Authentic Learning theory was used to align the modules with problem-based activities and content. Adult learning theory was followed to develop active and experiential learning activities according to the learning principles and learning styles of UTEs. Online Collaborative Theory was

followed to design the collaborative activities through e-Portal and social networks. Digital Micro-Learning was followed to design the modules with quick, short, small and very relevant nuggets of content to be taught by the UTEs during e-Training course.

4.6 OBJECTIVE : 6 (Phase-VI)

To apply e-Portal for pilot testing and practical orientation course for University Teacher Educators (UTEs)

4.6.1 Pilot Testing and Practical Orientation Course

This phase of research was experimental which was held to fulfill two purposes, those were, i) Pilot testing of e-Portal, and ii) practical orientation of e-Training course with UTEs. For this, certain steps were taken:

- viii) The UTEs included in sample were sent course invitations via emails. In the invitation letter, the process of registration in the course on e-Portal were outlined.
- ix) Interested UTEs were registered and were provided with trainee logins to enter the e-Portal and take the course. A course calendar including course sessions and events was also provided to the participants.
- x) Participants were provided a survey questionnaire to analyze their e-Readiness to take this course.
- xi) Participants were guided towards course modules where lesson with content were imparted according to the course calendar.
- xii) In the mid of the course, another survey was administered with participant to analyzed their e-Engagement with course and digital environment.

- xiii) During course a number of activities were provided to the trainees to show their participation with content and course. Assessments were also taken in the form of descriptions and quizzes.
- xiv) At end of the course, another survey was launched to analyzed the acceptance level of participants for e-Portal to be used in e-Training programs.

4.6.2 Answering Research Questions

RQ-18 **What is the readiness level of participants to attend e-Training Course?**

Table 4.67 *e-Readiness of Participants (3-point scale)*

Statements	N	Mean
Access my laptop/Android/iPhone	51	1.80
Reliable internet/Wi-Fi connection.	51	1.84
Knowledge of digital tools and technologies	51	2.82
Skills to use digital tools and technologies.	51	2.56
Web literacy	51	3.24
Web search skills	51	3.21
Digital literacy	51	2.61
e-Teaching skills	51	2.42
Skills for developing e-Content.	51	2.23
Confidence to use UTeT e-Portal	51	1.75
Goals setting	51	2.31
Task accomplishment	51	2.29
Familiarity of DML	51	1.17
Motivation to attend e-Training course	51	1.86
Motivation to complete this e-Training course	51	1.82

Table 4.67 reveals the readiness level of UTEs to participate in practical orientation course through e-Portal. M=1.81 shows that 81% participants said that they were used to access their laptop/Smartphone many times a day, M=1.84 responded that they had reliable internet/Wifi connection. M=2.82 showed that UTEs had intermediate level of knowledge of digital tools and technologies whereas M=2.62 depicts that UTEs had basic level of knowledge to use digital tools and technologies. M=3.24 depicts that most of UTEs rated their web literacy as of intermediate level, M=3.21 shows that UTEs had basic intermediate level of web search skills, while M=2.61 reveals that UTEs had basic level of digital literacy. M=2.42 shows that UTEs were having basic e-Teaching skills, and M=2.23 showed that UTEs were having basic skills of e-Content development. M=1.75 shows that 75% UTEs were confident to utilize e-Portal for their online training. M=2.31 and M=2.29 depict that UTEs were good in goals setting and tasks accomplishment. M=1.17 depicts that UTEs were not aware of digital micro-learning concept of online courses. 86% participants were motivated to attend while 82% were motivated to complete this practical orientation course.

RQ-19 What is the engagement level of participant during practical orientation course?

An online survey conducted during practical orientation course to assess the engagement level of participants yielded the following facts.

Table 4.68 *e-Engagement of Participants (3-point scale)*

Statements	N	Mean
I am an active participant of this e-training course.	39	2.11
I am giving due required time to the e-training course.	39	2.00
I interact with trainers and other participants when I need.	39	2.62
I am learning according to my own learning style.	39	2.53
I can relate this course with my professional activities.	39	2.36
I am able to access course content anytime.	39	2.62
I am confident in doing course activities	39	2.15
I am doing good in this training course.	39	2.58
The content is instantly understandable.	39	2.53
Lessons are time saving and to-the-point.	39	2.55
Course content and activities are very interesting.	39	2.38
I am intended to complete this training course.	39	2.49

In Table 4.68, M=2.11 reveals that participants were having moderating active participation in e-Training course. M=2.62 shows that participants were interacting with trainers and other participants of course. M=2.00 illustrates that participants were moderately sparing time for e-Training course whereas trainees were of the opinion that they were learning according to their learning styles (M=2.53). Table shows that trainees were able to access course anytime (M=2.62) while M=2.53 shows that content was easily understandable by trainees. M=2.49 shows that trainees were intended to complete e-Training course.

4.7 OBJECTIVE: 7 (Phase-VII)

Objective:

To explore the acceptance level of participants after taking practical orientation course through e-Portal

4.7.1 Hypotheses Testing

To find the acceptance level of participants, Technology acceptance model (TAM) was applied. TAM has predefined hypothetical framework for which model was tested.

H1: Perceived ease of use of e-Portal has a significant effect on the perceived usefulness of e-Portal.

H2: Perceived ease of use of e-Portal has a significant effect on attitude towards using e-Portal.

H3: Perceived usefulness of e-Portal has a significant effect on attitude towards using e-Portal.

H4: Perceived usefulness of e-Portal has a significant effect on intention to use e-Portal.

H5: Attitude towards using e-Portal has a significant effect on intention to use e-Portal.

HYPOTHESES TESTING

All Hypotheses were tested by applying regression analysis. Results of hypotheses testing were as follows:

Table 4.69 (a) *H₁ testing – [Predictors: PEOU → Dependent variable: PU]*

Model	Unstandardized Coefficients		R ²	T	Sig.	
	B	Standard Error of β				
1	(Constant) PEOU	1.092	.024	.686	44.90	.00

In table 4.69(a), the value $R^2 = .686$ indicates that predictor perceived ease of use (PEOU) explained 68.6% of the variation in perceived usefulness (PU). It shows that H_1 is significant at $\beta = 1.092$ and $t = 44.9$ while $p < .05$, so H_1 was accepted.

Table 4.69 (b) *H₂ testing – [Predictors: PEOU → Dependent variable: ATU]*

Model	Unstandardized Coefficients		R ²	T	Sig.	
	B	Standard Error of β				
2	(Constant) PEOU	-.982	.026	.887	42.56	.02

In table 4.69(b), the value $R^2 = .887$ indicates that predictor perceived ease of use (PEOU) explained 88.7% of the variation in attitude towards use (ATU). It shows that H_2 is significant at $\beta = -.982$ and $t = 42.56$ while $p < .05$, so H_2 was accepted. so

Table 4.69 (c) *H₃ testing - [Predictors: PU → Dependent variable: ATU]*

Model	Unstandardized Coefficients		R ²	T	Sig.	
	B	Standard Error of β				
3	(Constant) PU	1.007	.025	.273	41.07	.00

In table 4.69(c), the value $R^2 = .273$ indicates that predictor perceived usefulness (PU) explained 27.3% of the variation in attitude towards use (ATU). It shows that H_3 is significant at $\beta = 1.007$ and $t = 41.07$ while $p < .05$, so H_3 was accepted.

Table 4.69 (d) *H₄ testing – [Predictors: PU → Dependent variable: ITU]*

Model	Unstandardized Coefficients		R ²	T	Sig.	
	B	Standard Error of β				
4	(Constant) PU	-1.008	.027	.979	37.22	.07

In table 4.69(d), the value $R^2 = .979$ indicates that predictor perceived usefulness (PU) explained 97.9% of the variation in intentions towards use (ITU). It shows that H_4 is non-significant at $\beta = -1.008$ and $t = 37.22$ while $p > .05$, so H_2 was rejected.

Table 4.69 (e) *H₅ testing – [Predictors: ATU → Dependent variable: ITU]*

Model	Unstandardized Coefficients		R ²	T	Sig.	
	B	Standard Error of β				
5	(Constant) ATU	.989	.025	.442	39.41	.00

In table 4.69(e), the value $R^2 = .442$ indicates that predictor attitude towards use (ATU) explained 44.2% of the variation in intentions towards use (ITU). It shows that H_5 is significant at $\beta = .989$ and $t = 39.41$ while $p < .05$, so H_5 was accepted.

Table 4.70 *Summary of Hypotheses Testing*

Hypotheses	Relationship Tested	Results	
H1	PEOU <--> PU	$\rho < .05$	<i>Accepted</i>
H2	PEOU <--> ATU	$\rho < .05$	<i>Accepted</i>
H3	PU <--> ATU	$\rho < .05$	<i>Accepted</i>
H4	PU <--> ITU	$\rho > .05$	<i>Rejected</i>
H5	ATU <--> ITU	$\rho < .05$	<i>Accepted</i>

4.7.2 Testing Results of TAM Model

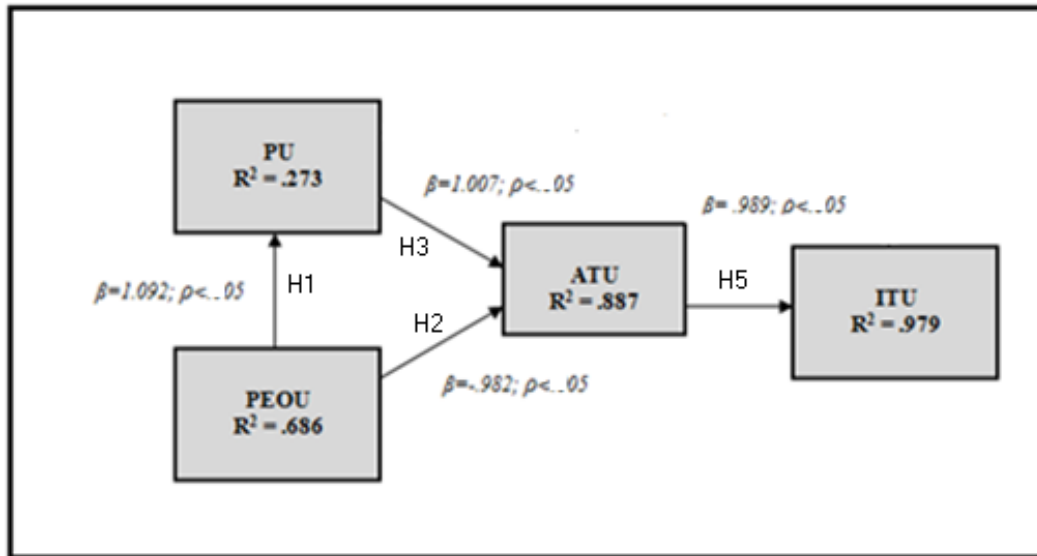


Figure 4.11 : TAM Model (Testing Results)

Findings reveal that participants of the course were positive towards acceptance of e-Portal for their e-Training as four out of five hypotheses were accepted to be true for acceptability.

CHAPTER 5

SUMMARY, FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

This chapter intends to state major findings from analyzed data and their interpretations with researcher's point of view. It also includes the explanations of inferences of findings of study and making suggestions for the researches to be held in future. The key function is answering the questions being posed in the introduction, explicating how the results are meant to defend the answers, and how answers to be fit in with available knowledge on the theme of study. The discussion is deemed the core of any research study. The major findings regarding research questions are summed up/summarized and conclusions established on the basis of findings presented in this thesis are described. Furthermore, the limitations and potential strengths of this research study are considered, and suggestions for the further researches with related theme in teacher education are provided. This chapter ends with recommendations for the stakeholders of teacher education, policy makers, teachers, students and formal education system.

5.1 SUMMARY

This research study is followed by sequential mix-method sequential transformative design comprising of quantitative and qualitative research methods followed by pragmatic paradigm. The study was conducted phase-wise and each phase of study was led by specific methodological framework, objective, research questions and hypotheses.

First phase of study was proceeded to find the need of e-Training and for University Teacher Educators (UTEs) and then emphasizing the need of desired training platform for conducting online training of UTEs. Results of situation analysis revealed that as e-Learning and digital technologies are least focused in teacher education of Pakistan, so UTEs lack e-Teaching and e-Training practices. Findings uncovered the fact that UTEs are in dire need of taking e-Training courses for enhancing their digital literacy, e-Teaching skills and digital competencies.

Online training applications are emphasized as important element and one of the key success factors of any training program. Findings illustrate that UTEs preferred flexible, self-directed and interactive e-Training applications incorporated with specific characteristics and digital features and functionalities. Amongst many online training applications, Findings suggested e-Portal as a desirable training application.

In Phase-II of study, a comprehensive Developmental Framework (DFW) for training of UTEs with e-Portal was proposed followed by philosophical support and theoretical compendium.

In Phase-III, according to digital and online characteristics, features and functionalities proposed by DFW, interface and components for e-Portal were identified. In Phase-IV of this study, e-Portal was developed in-house while dominating the characteristics of software over its features in accordance with the preferences of the results. Development of e-Portal was followed by Water Fall Model of SDLC and JAD approach. In Phase-V, Training modules compatible with e-Portal were developed. Results showed that ADDIE Model was best to be adjusted for the development of training modules compatible with e-Portal.

Phase-VI was experimentation phase in which e-Portal was applied for piloting and Practical Orientation Course (POC). In Phase-VII facts proclaimed that UTEs had significant acceptance for e-Portal as training application for online training of UTEs. According to participants responses, e-Portal was an appropriate TMS for e-Training of UTEs.

5.2 FINDINGS

The main findings revealed through data analysis results described phase wise are shown below.

5.2.1 Context Analysis

a) International Context:

e-Learning in Educational policies and Digital Progress Reports

- 1- It was found that teachers in Finland own advanced digital skills and e-Teaching practices are observed while online applications (software) are utilized in teaching and teacher training. Teachers are digitally literate and have positive attitude towards digital technologies uses whereas less use of digital technologies by students is evidenced.
- 2- It is found that teachers in European countries are digital champions and owe faster digital progress with basic level of digital skills. These countries allocate funds for digitized teacher training and e-Teaching practices to promote digitized learning. Virtual environments for learning and training are lacking while less training programs are conducted using VLEs.

- 3- Findings of review of EDPR-2017 and Technology Partnership Report-2016 reveal that UK provides digital skills development training to the teachers while online teaching and learning are done by utilizing e-Curriculum.
- 4- In Digital Education Plan – 2015, EDPR-2017, DSJC-2016, and DESI-2016 of France, it is found that high investments are made on digitization of education. Essential digital skills are provided to teachers through digital training courses while high internet usage for learning is being evidenced. Training programs for teachers are conducted as teachers own insufficient digital competencies of e-Teaching and e-Content development.

e-Learning Strategic Plans and Digital Progress Reports

- 5- It was found that e-Teaching, e-Learning and online training are practiced in universities of USA, Croatia and Norway. These universities are provided with digital infrastructure as students and teachers are having availability of latest digital tools and technologies, and e-Resources are easy to access.
- 6- It is Digital skills are found as mandatory in universities of USA with familiarity and use of e-Curriculum. VLEs and LMS utilization practices are established.
Web portals

Digital Policies for Teacher Education and Teachers Training

- 7- In USA, teacher trainings are organized and conducted through webinars, MOOCs while digital tools and technologies are utilized for training purposes. The some of the major objectives of most of teacher training programs are developing digital literacy, e-Pedagogical skills and e-Curriculum development skills in teacher education of these universities.

- 8- It was found Teacher education in Canada, focuses the use of LMS, web portals and smart devices and hybrid designs to promote and enhance digital literacy, virtual pedagogical skills, and e-Courses designing.
- 9- Australian universities are evidenced to conduct teacher training courses mainly focused on e-Teaching competencies, learning analytics and digital learning resources while utilizing social network, video conferencing, teleconferencing VLEs, mobile apps, CMS and tablet-enabled classrooms.
- 10- It was divulged from results that Digital policies of Asian countries emphasize on the need of teacher training with the focus of MOOCs, x-spaces, web portal, virtual classrooms to enhance the competencies of e-Teaching and e-Content designing.

E-Learning Strategies for Teacher Education and Teachers Training

- 11- Many countries have developed their e-Learning strategies for teacher education and teacher training. These countries include USA, UK, Norway, Croatia, Scotland, Australia, Taiwan, China, Thailand, Japan, France and Vietnam. Teacher education and teacher training in these countries focus on the latest patterns in e-Learning, e-Teaching and online training of prospective teachers and teacher educators.
- 12- Table 4.1 illustrated that e-Portals are widely used in teacher education of different countries in the world to conduct and promote online professional training programs of teachers and teacher educators as well.

b) National Context

- 13- It was found that National Education Policy (NEP) -2009 of Pakistan spotlights technology integration and utilization on basic/surface level in teacher education and teacher education of Pakistan. It was also found that NEP-2009 does not emphasize integration of information and communication technologies and e-Learning in teaching pedagogy and teacher training content. Also ICT and e-Learning knowledge and skills are not considered as compulsory criteria for recruitment and promotion processes of teacher educators in TEIs whereas policy doesn't recommend the allocate funds for establishing ICT and e-Learning based infrastructure in TEIs.
- 14- National Education Policy – 2017, it is found that teacher educators in TEIs and universities are not properly skilled according to professional standards, also teacher educators' training is not customary phenomenon. Continuous professional trainings are not introduced for teacher educators however policy recommends to establish training academy for continuous professional trainings of teacher educators to help them acquire up-to-date knowledge and adopt modernized innovative teacher-learning strategies in classroom.
- 15- It was found that while latest technological trends are not made a part of curriculum of teacher education by Higher Education Commission (HEC) of Pakistan and practical application of novel trends of e-Learning and digital learning are not recommended in curriculum of teacher education at any level.
- 16- It was obvious from results that National Professional Standards for Teachers in Pakistan (NPSTP) being focus the knowledge and skills of Information and

communication technologies obligatory for teachers of Pakistan as 7th standard of NPSTP emphasizes proficient use of ICT by teachers.

- 17- Findings of Pakistan Vision – 2025 report reveals the priorities of opening technology colleges and highlights the importance of training and education. Review of the report reveals the new policy initiatives meant for improving quality and delivery of education which may comprise on establishing trendy and innovative ways to develop standardized curriculum, national standards for education and teachers training to use modern teaching-learning methods.
- 18- Findings of National ICT (NICT) Strategy for Teacher Education/Training in Pakistan – 2008 divulge that online teachers training courses were also offered with the collaboration of UNESCO and INTEL. Findings show that Pakistan has laid stress on incorporating digital technologies in learning, teaching, training and curriculum of teacher education and also utilizing online environments for ICT-based trainings of teacher is highlighted.

c. Organizational Context

- 19- Table 4.2 depicts data taken from teacher education departments/institutes of 10 formal public universities of Punjab maintains a lucid representation of prevailing situation of ICT in strategic plans, vision and mission of these organizations. Table shows that none of the departments/institutes gives importance to incorporate ICT in teacher education. No department/institute has precedence of utilize ICT in teachers training.
- 20- Table 4.3 shows the responses of HOD/Chairperson/Deans of teacher education departments/institutes. For e-Learning strategy/plan, 46.7% respondents said that

they have not developed any e-Learning strategy/Plan while 33.3% respondents said that e-Learning plan for their departments/institutes are under process. For national-level measures to support e-Learning, 80% respondents countered that there are no national-level measures to support e-Learning for teacher education for their institutes/departments.

- 21- In Table 4.4, Mean=1.37 shows that most of the respondents disagreed that universities prioritize the skills and knowledge of e-Learning/ICTas criteria for the recruitment of UTEs. While mean=3.80 portrays that respondents were likely to agree that pre-service teacher training certifications are somewhat given priority in recruitment process of UTEs.
- 22- Table 4.5 shows that universities/institutes of teacher education are not inclined towards funds allocation for maintaining and promoting e-Learning in teacher education. 20% of the respondents said that their university allocates and releases funds for establishing e-Learning based teaching/learning environments. 13.3% UTEs responded that their university allocates funds for e-Learning based training programs for UTEs. While 43.3% respondents said that their university allocates funds for the provision of digital tools and technologies to UTEs.
- 23- From findings of Table 4.6, Mean=3.20 depicts that UTEs have assorted opinions of agreement and disagreement about the priority of university/institute for demanding digitally competent teachers.

d. User Context

UTEs (University Teacher Educators) Context:

- 24- Table 4.7 shows the availability of digital tools to UTEs. Findings describe that 94% of UTEs have the availability of laptops and 99% of UTEs have availability of Smartphone, whereas 37% UTEs own tablet PCs and 19% have iPads with them. It is also obvious from the findings that 74% of UTEs have webcams, 16% UTEs have availability of interactive Whiteboard while 63% of UTEs are provided with multimedia projectors.
- 25- In Table 4.8, Mean values illustrate that digital tools frequently used by UTEs are laptops (mean=4.77), Smartphone (mean=4.62) and Desktop Computer (mean=4.16). while interactive whiteboards (mean=1.61) are rarely used by UTEs. Findings show that sometimes UTEs also use Tablet PCs (mean=3.25) and Multimedia Projector (mean=3.53).
- 26- Table 4.9 shows the findings of use of digital tools by UTEs under six purposes. As elicited by table, 34.5% of UTEs utilize laptops for teaching, 9.1% UTEs utilize smartphone in teaching, tabs utilization is 4% while only 1% UTEs responded that they have ever utilized iPads for teaching purposes. Desktop computers are evidenced to be used in teaching by 36% of UTEs, Webcams are used by 13% of UTEs, interactive whiteboard is used by 6% of UTEs whereas 69.5% of respondents said that they use multimedia projector in their teaching. For training purposes, 6.9% respondents claimed to use laptops, 9.1% of UTEs used smartphone, 1.5% of UTEs used tabs and 1.5% of UTEs used iPads. Moreover only 1.9% respondents asserted the use of desktop computers while 38.1% of UTEs said

that they have used multimedia projector in their trainings. Table 4.9 clearly provides findings that only Laptops are comparatively more frequently used by UTEs in their profession while Multimedia projectors are evidenced to be used in teaching frequently. In addition, as table depicts, digital tools are utilized by most of UTEs for personal use.

27- Table 4.10 illustrates the familiarity of UTEs with digital technologies. It is obvious from table that 33.90% UTEs were familiar of blogs, 12.99% UTEs have the familiarity of teacher tube while 77.12% UTEs were familiar of you tube. Findings further represent that 7.9% respondents were having know-how of Dropbox while 51.13% of UTEs were familiar of twitter. Facebook was known by 94.07% of respondents while 40.96% UTEs were familiar with Slideshare. Familiarity of Whatsapp was 83.05%, LMS was known by 9.04% UTEs while 1.98% of respondents had intimacy of MOOCs. It was also evident from table that 42.94% of respondents were familiar with Google Docs, 46.89% of respondents were familiar with Skype while 31.07% of UTEs were familiar with discussion forums. Awareness of UTEs for Google Hangouts was 12.99% while for email 96.89% of UTEs were familiar with. Table also depicts the figures for the familiarity of UTEs for Chat forums, LinkedIn, e-Portfolios and e-Books as 1.98%, 74.01%, 3.95% and 33.05% respectively.

28- Table 4.11 illustrates the frequency of using digital technologies by UTEs. The mean values in the table are decisive for the results. In the table, $M=2.11$ explains that UTEs rarely use blogs, while $M=1.17$ depicts that Teacher tube was never used by UTEs. $M=4.19$ reveal that You tube was often used by UTEs while Dropbox

was never used by them (M=1.13). Mean value M=4.61 depicts that UTEs were using Facebook all the times but M=1.74 show that Slide share was rarely used by UTEs. For Whatsapp, M=4.36 highlights that UTEs had often use of it while M=1.32 depicts that LMS was never used by UTEs. M=1.03 shows that MOOCs were never used, and M=2.16 shows that Google docs were rarely used by UTEs. M=3.78 explains that Skype was often used by UTEs, M=1.81 depicts that Google hangouts were rarely used while M=4.76 represents that UTEs were always using email. As illustrated in the table 4.11, chat forums were rarely in the use of UTEs (M=2.35) but UTEs sometimes used LinkedIn (M=3.21). It is also clear from table that e-Portfolios were never used (M=1.26) but e-Books were sometimes used (M=3.33) by the UTEs.

- 29- Table 4.12 showed that actual representation of digital technologies utilized by the UTEs on the basis of frequency of using these technologies.
- 30- Findings of Table 4.13 illustrated that most of the UTEs were involved in using blogs for research purposes (54.36%) while only two out of 120 UTEs (1.92%) said that they were using blogs in their teaching while 0.8% shows null use of blogs for training purposes. It is also shown that that you tube was mostly used for research purposes (68.1%) by UTEs. Only 7.3% UTEs responded that they used you tube in their teaching while 2.9% responded as for their training. It is also clear from findings that that UTEs utilized twitter mostly for personal purposes (51.9%) while only 9.4% UTEs said that they were using twitter in their teaching activities. It is illustrated in the table that Facebook was mostly used by UTEs for personal intentions (81%) while 27.0% UTEs responded that they used Facebook in their

teaching while 6.9% UTEs were evidently using Facebook for training purposes. Findings also present that Whatsapp was mostly used (93.2%) for personal intentions while 17.3% UTEs utilized Whatsapp for their teaching tasks and 2% for training purposes. 36.2% UTEs were of the view that they were using Google Docs for personal purposes. Moreover 12.5% of UTEs were evident to use Google docs in their teaching while 2.09% were using in their training. Findings depict that Skype was mostly used by UTEs for their personal intentions (56%). 13 out of 166 UTEs (7.8%) responded that they used Skype in their teaching while 9 out of 166 (5.4%) UTEs said that they used Skype in their trainings. It is obvious from findings that UTEs were mostly using discussion forums for research purposes (30%). Besides 4 out of 110 UTEs (3.6%) said that they used discussion forums in their teaching tasks, while 1.8% UTEs were of the view for using discussion forums in training. Email was used by UTEs for many purposes, i.e. for 14.3% for teaching, 78.4% for professional communication & collaboration and 48.4% for their training purposes while 61.2% UTEs were using email for their personal purposes. Table shows that LinkedIn was utilized by 78.2% UTEs for professional communication/collaboration purposes whereas 81.2% UTEs were utilizing e-Books for research purposes.

- 31- Table 4.14 illustrates the students'(Prospective teachers) point of view about their teachers (UTEs) for using digital tools and technologies. Findings show that UTEs were inclined towards using laptops (62%), Smartphone (51%), and desktop computers (48%). Whereas use of multimedia projector (46%), internet/Wifi (33%) and Microsoft Office (24%) was evidenced from findings. Opinions of respondents

portray the UTEs' use of Facebook (23%), Whatsapp (41%), email (14%) and e-Books (2%).

- 32- Table 4.15 depicted the actual number and percentage of UTEs using digital tools and technologies
- 33- Findings of Table 4.16 shows the frequency of using digital tools and technologies by UTEs are responded by students. $M=2.33$ describes that Laptops were frequently used by the teachers, $M=2.12$ shows that UTEs had average use of desktop computers while $M=2.49$ depicts that multimedia projector was frequently used by the teachers in classroom. Mean value $M=1.66$ show that UTEs sometimes use Whatsapp with students whereas $M=1.87$ gives evidence of frequent use of Microsoft Office by the UTEs as responded by prospective teachers.
- 34- From Table 4.17, findings show that 58.1% teachers use laptop in their teaching and 39% teachers use laptops for research tasks whereas desktop computers are utilized by 49.3% teachers in teaching. It is clear from the findings that 49.2% teachers utilize Whatsapp for communication and collaborations purposes while Smartphone are also used for communication and collaboration with students. It is shown in the table that 34.8% UTEs use Microsoft Office in teaching while 31.6% teachers use the same for classroom activities. Moreover email is also utilized (37.2%) for communication and collaboration purposes with students.
- 35- According to the findings of Table 4.18, 30.0% HODs disagree that digital knowledge and competencies of UTEs are demanded by the university, while

43.3% HODs were agreed that digital knowledge and competencies of UTEs were required by the universities.

- 36- It is obvious from the table 4.19 that 46.7% HODs told that they were not at all familiar with the skills to developing digital teaching/learning resources while 41% UTEs responded as they were not at all familiar with these skills. 23.3% HODs while 21.3% UTEs were moderately familiar with these skills. Table also represents that 6.6% of HODs while 9.9% of UTEs were extremely familiar with the skills to develop online teaching/learning materials/resources for their students.
- 37- It was found in Table 4.20 that $M=2.07$ shows that UTEs were not aware of skills to develop online teaching/learning resources to meet the need of prospective teachers. Also $M=2.44$ represents that UTEs were also not well aware of online resources development for teaching and learning.
- 38- Findings of Table 4.21 showed that UTEs were not at all satisfied with the e-Learning infrastructure established by their university/institute. $M=2.14$ depicts that UTEs were not satisfied with the opportunities provided to them for e-Learning incorporation in teaching and learning. $M=2.37$ shows the neutrality for the provision of technical assistance regarding e-Learning. $M=3.06$ explains the neutral level of satisfaction for the provision of digital tools and technologies to UTEs. $M=1.27$ shows that UTEs were completely dissatisfied with the e-Learning based professional training programs provided by university/institute.
- 39- In table 4.22, $M=1.83$ explained that lack of technological infrastructure is moderate barrier for e-Learning incorporation. Regarding resources availability, table shows the barriers as $Mean=1.37$ depicts that financial constraints are extreme

barrier, $M=1.83$ explains deficiency of technical support to UTEs as moderate barrier while $M=2.34$ shows that access to latest digital tools and technologies was not a barrier for e-Learning incorporation in their teaching. Regarding digital literacy and competencies, $M=1.46$ shows that insufficient/lacking digital skills of UTEs was extreme barrier while $M=1.33$ represents less familiarity of UTEs with global digital patterns of teacher education was also an extreme barrier for e-Learning incorporation in teaching. $M=1.26$ depicts that unsatisfactory e-Training programs for UTEs are extreme barrier whereas $M=1.48$ proves the short of e-Learning trainers as an extreme barrier to incorporate e-Learning in teaching. Regarding curriculum of teacher education, $M=1.32$ shows that no/least compatibility between teacher education curriculum and e-Learning was an extreme barrier while $M=1.75$ explains that lack of e-Learning based pedagogical models was moderate barrier. $M=1.41$ shows that insufficient bandwidth of internet was also an extreme barrier for incorporating e-Learning in teaching by UTEs.

- 40- In Table 4.23, $M=2.79$ shows the uncertainty of UTEs regarding curriculum of teacher education fulfilling digital/e-Learning needs of prospective teachers.
- 41- In Table 4.24, $M=2.44$ showed that UTEs disagree that they were aware of the skills to develop online teaching/learning resources.
- 42- Findings of Table 4.25 revealed that 48.3% UTEs responded that objective of e-Training might be about seeking e-Teaching techniques, while 22.3% UTEs said that objective might be e-Assessment techniques. Table shows that 24.9% UTEs responded for digital lesson planning, 53.6% for digital literacy, 28.8% for

developing online teaching/learning resources while 37.3% UTEs said that objective of e-Training might be e-Content development.

- 43- From Table 4.26, it was evident that out of 354 UTEs, 17 had already participated in e-Training programs (4.8%) while 94.9% UTEs said that they never participated in any e-Training Program.
- 44- Table 4.27 depicted that UTEs were tended to agree that their e-Training programs are necessary to enhance the excellence of prospective teachers.
- 45- In table 4.28, $M=4.13$ showed that UTEs agree that training environment is an important element to enhance learning in training programs. It is obvious from $M=3.98$ that UTEs agree that online training programs are better option. $M=3.78$ shows that UTEs tend to agree with the need of an exclusive and separate virtual training environment for their e-Training. Whereas $M=2.77$ depicts the uncertainty of UTEs regarding preferring e-Training in a closed/restricted online environment rather than open-source environment.
- 46- Table 4.29 depicted that 81.6% of the respondents said that no online application was used for their e-Training programs.
- 47- Table 4.30 showed that 74% of UTEs have the opinion regarding need of exclusive and separate online training application particularly for the use of university teacher educators.

Students' (Prospective Teachers) Context

- 48- It was found in table 4.31 that 89% students were familiar of laptops, 62% of students were having familiarity with Smartphone, 41% students were familiar of Tabs while 26% students were familiar with iPads. Table also reveals that 68% students were familiar with desktop computers, 37% students were having familiarity with webcams., 76% students were familiar with internet/Wifi while 71% students were familiar with email. Table explains that Smart Apps (Whatsapp, Viber etc.) were known by 56% students whereas 92% students were having familiarity with SMS. Search engines were known by 24% of students while 16% students were having familiarity with social networking sites. Table depicts that 13% students were familiar with e-Books while Microsoft Office was known by 59% of students.
- 49- It is obvious from the findings of table 4.32 that laptops were available to 67% of students, Smartphone were available to 75% of students but Tablet PC were available to only 6% students Table also reveals the figures that 3% students were having availability of iPads and 43% students were owning desktop computers while 61% students were having webcams. Table demonstrates that internet/Wifi was available to 79% of students while 71% students were using email facility, 68% students were using smart apps while 89% students were involved in using SMS services. 23% of students were having availability of search engines, 16% were having social networking sites, and only 8% students were having familiarity of e-Books, while Microsoft office was available to 64% students.

- 50- It was found from table 4.33 that mean score $M=2.57$ clarifies that students tended to always use laptop and $M=2.85$ shows that student were always using Smartphone like Whereas $M=1.51$ depicts that Tabs were little bit used by the students and $M=1.13$ shows that iPads were rarely used by the students. As represented by $M=2.16$ and $M=2.44$, desktop computers and webcams were often used by the students while $M=2.91$ reveals that internet/Wifi was always used. In the same way, $M=2.02$ shows that students little bit/sometimes use email, $M=2.43$ reveals that smart apps (Whatsapp or Viber etc.) are more often used, while $M=2.61$ shows that students almost always use SMS. Social networking sites ($M=2.24$) and search engines ($M=2.38$) were more often used by students, but $M=1.04$ reveals that e-Books were never used, while $M=2.37$ shows that Microsoft office was more often used by the students of teacher education.
- 51- Table 4.34 showed that 76.3% students used laptops for assignments preparation, 38.1% students used laptops for exams preparation, while 62.6% students used laptops for notes preparation. 51.2% of students were of the view that they were using laptops for communication/collaboration purposes whereas 89.7% students said that they used laptops for personal purposes. Findings reveal that 37.7% students responded that they were using Smartphone for assignments preparation while 30.83% students were utilizing Smartphone for exams preparation. Table shows that 97.8% students used Smartphone for personal purposes while 94.3% of students were using Smartphone for communication/collaboration purposes. As illustrated in table 4.34, 75.1% students were using desktop computers for their assignments preparation, 52.7% were using for exams preparation, while 68.1% of

students were using desktop computer for notes preparation. It is also clear from table that 80% of students were using desktop computers for their personal purposes. Findings further divulge that 77% of students were using internet/Wifi for assignments preparation, 58% were using it for exams preparation, whereas 62% of students were using internet/Wifi for notes preparation. Table also depicts that 73% of students were using internet/Wifi for research purposes, 81% were using for communication/ collaboration while 93.4% of students were using internet/Wifi for personal purposes. It is revealed from table that email was mostly used for personal purposes (79%) while 56.1% students used email for communication/collaboration purposes. Moreover 36.25% of students were using Smart Apps for exams preparation, 68.3% were using for communication/collaboration, while 96.4% of students were using smart apps for personal means. Findings show that 62.4% students were of the view that they used search engines for their assignments preparation and 56% used it for notes preparation while 75.4% of students used search engines for their research tasks and 44.2% of students were using search engines for personal purposes. 15.5% of students were using social networking sites for communication/collaboration while 89.7% of students were using social networking sites for their personal intentions. It is also shown that only 2.2% of students used e-Books for their assignments preparation while 6.6% of students were employing e-Books for their notes preparation. It is clear from the findings that 27.8% of students were utilizing Microsoft Office for their assignments preparation, 45.6% students were applying Microsoft Office in their research tasks whereas 39.2% were applying Microsoft Office for personal uses.

- 52- Table 4.1.1.42 shows that e-Portfolios were used by 10.14% UTEs for assessment purposes.
- 53- In table 4.35, M=1.33 shows that students did not agree that their university/institute was providing them fully-equipped digital labs. Students also disagree (M=1.81) that their universities/institutes were providing them opportunities to apply e-Learning in their education.
- 54- From the findings of table 4.36, M=1.83 explained that students they were not having sufficient knowledge about e-Learning. Also M=1.60 shows that students disagreed that they had sufficient skills to learn in e-Learning environments. M=2.91 represents the neutral/average opinions about using e-Learning based curriculum/content. M=4.11 shows that students were aware of the importance of e-Learning for their future profession.
- 55- Table 4.37 shows the desirability of students for using e-Learning. M=3.76 reveals that students wanted to apply e-Learning in their education, while M=3.80 shows that students were likely to merge e-Learning with face to face mode of learning. Table also represents with M=4.27 that students of teacher education were very much interested to be digital teachers in future.

5.2.2 Gap Analysis

Findings of table 4.38 identified gaps keeping in view the different aspects and dimensions for comparison of international and national context. Table shows that a major gap exists in the theoretical perspective as constructivism is focused in Pakistan by converging the technological trends towards ICT while in international context, Connectivism is focused. Second dimension used for comparison is e-Learning in teacher

education. Table reveals that in Pakistan, ICT is spotlighted but internationally e-Learning (digital learning, online learning, virtual learning, hybrid learning, cloud-based learning, open learning) is being applied in teacher education, so gap exists here. Table shows that there subsists a gap in fund allocation and infrastructure for e-Learning as in most TEIs in Pakistan, e-Learning is not a priority and least funds are released for e-Learning resources and e-Learning infrastructure development. Whereas in many of the countries of the world, governments allocate and release funds for ensure provision of e-Learning resources and developing modern digital infrastructure to promote e-Learning practices in TEIs. Table identifies more gaps in provision of digital resources, as in Pakistan, limited digital tools and technologies are provided to the teachers and students of TEIs but internationally, teachers and students of TEIs have open access to digital tools and technologies. A gaps also exists in e-Learning based teaching since teachers have limited use of laptops and multimedia projectors, also online teaching is not practiced in teacher education of Pakistan. While in many of the countries of the world, teachers in TEIs are involved in high-tech e-Teaching practices by utilizing digital tools web apps, and social networks etc. Table explains the gap of e-Competencies as in international scenario, teachers in TEIs demonstrate their expertise for digital literacy, e-Pedagogies, online teaching, e-Curriculum development, e-Content design and development and e-Teaching skills. Where as in Pakistan, teachers of TEI own the basic digital skills like using laptops, multimedia projectors, emails, browsing and locating online materials etc. but they are not much capable to integrate e-Learning into curriculum of teacher education. Table shows the identified gaps of e-Curriculum, e-Training, VLEs for e-Training and e-Training of UTEs. One more gap, that is Digital

Divide, is found between teacher educators and prospective teachers as there is huge difference between awareness, potential and utilization of digital tools and technologies of digital natives (prospective teachers) and digital immigrants (teacher educators). It is also identified that professional training of teacher educators is not emphasized by authoritative bodies, for instance, as HEC conducts faculty development programs for university faculty but never organize any training courses for teacher educators of formal universities.

5.2.3 Need Assessment

- 56- In table 4.39, mean score $M=3.41$ showed that UTEs tend to agree that e-Learning is important for prospective teachers of Pakistan.
- 57- Table 4.40 revealed that UTEs disagree ($M=2.34$) with statement that prospective teachers are provided with the opportunities and exposure of incorporating e-Learning for their future professional teaching.
- 58- In table 4.41, $M=3.82$ revealed that UTEs agree that e-Learning is significant tools for enabling unique forms of education to fit within existing mode of teacher education, while $M=3.67$ represented that e-Learning is significant to enabling learners to achieve planned learning outcomes of education. From the responses of prospective teachers, it was uncovered that e-Learning is essential tool for education ($M=3.59$). Prospective teachers tended to agree with the view that e-Learning provides interactive mode of education, whereas $M=3.56$ exposed that students were likely to agree that e-Learning improved their understanding level for what they learn. $M=3.82$ shows that students agree that e-Learning is potential

alternative to face-to-face mode of education. $M=3.46$ shows that student teachers tend to agree that as future teachers, e-Learning experience is vital for them.

- 59- In Table 4.42, $M=4.01$ revealed that UTEs agree that e-Learning facilitates teaching/learning process, $M=3.56$ shows that UTEs agree that e-Learning stimulates better understanding of knowledge, while $M=3.45$ shows that UTEs tend to agree that e-Learning fulfills individual learners' needs. Table depicts that UTEs also tend to agree ($M=3.42$) that e-Learning motivates the learners whereas $M=3.29$ shows that UTEs are uncertain for potential of e-Learning in lesson planning. UTEs also seem to uncertain ($M=3.04$) for the potential of e-Learning for designing teaching/learning resources while $M=3.63$ depicts that UTEs tend to agree for e-Learning as potential tool for better communication with the students and colleagues.
- 60- Findings of Table 4.45 showed that students (prospective teachers) are willing to take education in e-Learning mode ($M=2.77$) and mean score $M=2.80$ shows that students confirm their willingness to be e-Teachers in future.
- 61- It was found in Table 4.48 that students disagreed with the statement that their teachers were promoting e-Learning through their teaching.
- 62- It was found from interview analysis that respondents perceived that e-Learning is a latest trend in education and university teacher educators must be equipped with skills to utilize and implement e-Learning in their teaching because teaching profession is also banded with innovation and have been revolutionized due to the growth of educational technologies. It was also conversed by some interviewees

that e-Learning on one side transforms teaching and on other hand introduces new patterns of online training.

63- It was also found from interview analysis that e-Training of UTEs is very much helpful in developing the expertise to create and utilized digital curriculum in the field of teacher education.

64- Need was drawn from gap analysis that e-Training should be focused on digital literacy and developing online teaching/learning resources as foremost digital competencies.

5.2.4 Situation Analysis

65- Table 4.51 revealed the major difficulties faced by UTEs for incorporating e-Learning in teaching. M=2.31 explains that lack of technological infrastructure was extreme difficulty for UTEs, M=2.53 shows that UTEs financial constraints of university/institute to fund for e-Learning was extreme level difficulty, where as short of e-Learning experts/e-Teachers was a medium difficulty for UTEs to incorporate e-Learning in their teaching. From table, M=1.96 represents the short/lack of technological skills of UTEs as moderate difficulty, and M=1.32 reveals that lack of familiarity with international trends of teacher education was not a difficulty for UTEs, while M=1.41 shows that lack of technical support to UTEs and students was minor level of intricacy. Also M=1.24 shows that lack of access to digital tools and technologies was not difficulty for UTEs, but no/least compatibility between teacher education curriculum and e-Learning was an extreme difficulty (M=2.64) faced by UTEs, while lack of e-Learning based pedagogical models was very minor level difficulty to incorporate e-Learning in teaching by

UTEs. Table also reveals that insufficient internet bandwidth was a moderate difficulty (M=1.67) whereas lack of training programs for UTEs to incorporate e-learning in teaching was extreme difficulty (M=2.61) faced by the UTEs.

66- Findings of table 4.52 revealed the barriers faced by students of teacher education to utilize e-Learning in their education. Table shows the barriers regarding digital as M=1.93 represents that availability of digitally equipped labs was a moderate barrier while M=2.73 shows that lack of access to digital labs was also an extreme barrier faced by the students. Students revealed their attitude towards e-Learning, as in table, M=1.97 shows that lack of motivation of students was a moderate barrier while teachers unwillingness to promote e-Learning (M=2.28) was a major barrier. M=2.21 shows that students were having fear of technology use while M=1.12 shows that English language was not a barrier for them to use e-Learning. M=2.47 interprets that insufficient bandwidth of internet was extreme barrier while M=2.18 reveals that electricity was also a moderate barrier faced by the students. In the table, M=2.67 shows that irrelevance between curriculum and e-Learning was extreme barrier while M=2.4 shows that lack of technology-based courses offered in each semester was also a major barrier for the students. M=2.75 interprets that one more extreme barrier faced by the students was less time consumption for utilizing digital tools and technologies in learning activities, whereas M=2.29 shows that lack of training to work in e-Learning environments was also a major barrier faced by the students.

67- In table 4.53, it was obvious that 32.76% UTEs were using research journals, 38.98% UTEs were using search engines, whereas 19.77% UTEs were using digital

libraries for the development of online teaching/learning resources. Table also provide evidences that 11.58% UTEs were using e-Books while e-Databases were used by 6.49% UTEs.

- 68- Findings of table 4.54 revealed the tools and technologies used by UTEs for online resources sharing with their students. Table shows that 16 out of 354 UTEs (4.52%) used Wikis for resources sharing, 45 out of 354 UTEs (12.71%) used Google drive for resources sharing while Google docs were used by 19 out of 354 UTEs (5.37%). Smart Apps were using by 16.67% of UTEs and 34.18% UTEs used social networking sites for resources sharing with their students. It is shown in the table that 46.33% of UTEs utilized emails while 6.78% UTEs used blogs for online resources sharing.
- 69- Table 4.56 reveals the opinions of UTEs about training environments. $M=4.13$ suggests that UTEs agree that training environments are significant element for enhance learning in training programs. $M=2.35$ suggest that training environments are regarded vital for the success of training programs. Whereas $M=3.98$ show that UTEs agree with online mode of training most suitable for their professional training.
- 70- In table 4.57, it was found that 81.6% of the respondents said that no online application was used for their e-Training programs.
- 71- Table 4.58 illustrated that 74% of UTEs explored the need of an exclusive separate online application for their e-Training.
- 72- Table 4.59 depicted the preferences of UTEs for different virtual environments for e-Training. It is obvious from the table that 47.08% UTEs gave preference to LMS,

23.49% UTEs preferred blogs, while 29.57% UTEs chose e-Portals as virtual environment for e-Training. Table also reveals that 31.21% UTEs preferred social networking sites, 15.65% UTEs chose online communities, 54.33% of UTEs were in favor of personal websites whereas 9.34% UTEs preferred MOOCs as online environment for e-Training of UTEs.

73- In table 4.60, Mean=3.77 showed that UTEs tend to prefer an online application which provides them closed environment with full privacy.

74- Table 4.61 showed that 89% UTEs were interested to participate in e-Training course.

75- Findings of data collected through interviews revealed that all the UTEs were enthusiastically interested for attending any e-Training program if offered as all the interviewees responded positively.

5.2.5 Proposing Developmental Framework for Training of UTEs through e-Portal

76- DFW showed multi-Dimensional approach for developing e-Portal for online training of UTEs. Findings of contextual phenomena focus on the significance of e-Training as suitable approach to bridge the identified gaps. Data analyzed during contextual situation analysis revealed two modes of e-Training explaining what and how through e-Training. Results of situation analysis show the importance of virtual learning environment for e-Training of UTEs.

77- Findings of the methodological paradigm explained the philosophical beliefs of DFW where pragmatic approach was followed. Ontological beliefs explained the practical effects of the concept with learner-centered approach whereas epistemological beliefs elucidated ways of doing/applying the concept with content

and pedagogy-centeredness approach. In this paradigm, theoretical beliefs were followed for the components and content related decisions. The components of e-Portal were considered to be designed followed by the theories focusing the objectivity, features, functionality and users of e-Portal. Theories were: Connectivism; Authentic Learning Theory; Adult Learning Theory; Online Collaborative Learning (OCL) Theory; & Digital Micro-Learning Theory. All the activities, content, delivery methods, learning principles and learning styles of participants were designed followed by these five theories.

- 78- Findings of questionnaire data revealed that UTEs have positive attitude towards training through e-Portal as they have sufficient awareness, interest, and availability of digital tools and technologies and they were willing to participate in e-Training programs.
- 79- Findings illustrated that UTEs possessed basic level competencies of e-Teaching, digital literacy, while UTEs possessed basic level of competencies for online teaching/learning resources development.
- 80- In Goal analysis, Performance goals were defined. Performance goals included organizational and individual goals. Organizational goals were attributed to teacher education departments/institutes which comprised of project goals and organizational growth. Individual goals included job goals, training goals, and behavioral goals.
- 81- Process goals were comprised of techniques & strategies, Tasks, and actions to be taken. While outcomes were explained as either the gaps were filled by meeting performance and process goals.

- 82- Requirement analysis was conducted for organizational, system, e-Training and trainees' requirements. Organizational requirements were headed by quality assurance, acceptance and success of e-Portal. System requirements were divided into functional and non-functional requirements while e-Training requirements were divided into experts and plan. Trainees' requirements were regarded as digital knowledge and skills, resources availability, and their willingness to attend the e-Training through e-Portal.
- 83- Task analysis was carried out for applying e-Portal to fulfill the identified gaps through e-Training. The sub-tasks involved were deciding TMS, developing training modules, implementation of e-Training, and assessment of e-Training.
- 84- Impact analysis was carried out to assess the outcomes of the whole process. It was divided into direct and indirect impact. Direct impacts were regarded as Trainees' digital knowledge, digital skills, and attitude towards technology. Whereas indirect impact highlights the effects of training through e-Portal on UTEs training system, education of Prospective teachers, teacher education, and ultimately formal education system.

5.2.6 e-Portal Components Identification

- 85- Table 4.62 showed the preferences of UTEs to identify the components to be incorporated during e-Portal development.
- 86- Table 4.63 illustrated the preferred features of e-Portal by UTEs. It is clear from table that 89.2% UTEs preferred striking interface, 93.4% respondents preferred meaningful and relevant content, 85% UTEs chose learning resources, 91.1% UTEs

preferred activities, 84.4% UTEs chose multiple learning styles while 81.3% UTEs desired to include assessment as preferred features.

- 87- Interview analysis revealed that opinions and preferences of UTEs towards features of e-Portal.
- 88- Interview findings showed that seven out of ten UTEs did not prefer to include unnecessary features and components in e-Portal as those don't lead to the trainees to be inclined towards seeking training but cause deviation and create difficulty in the use e-Portal.
- 89- It was found from interview analysis that respondents preferred training goals rather than as main focus while working with online applications.
- 90- Table 4.64 showed the characteristics of e-Portal by UTEs. It is clear from table that 95.3% UTEs preferred active environment, 91.7% UTEs preferred engaging environment, 96% UTEs suggested that training environment must be motivating, 79.3% UTEs desired for attractive environment, 70.8% UTEs preferred Flexible whereas 74.1% UTEs desired for training environment to be self-directed.
- 91- Findings of table 4.65 depicted the features of e-Portal, as 89.4% UTEs preferred striking interface, 93.6% UTEs said that content should be relevant and meaningful, 85% UTEs desired for Learning resources, 91.2% UTEs preferred extensive activities whereas 81.7% UTEs said that e-Training environment must contain the feature of assessment.
- 92- From table 4.66 it was found that 83.3% UTEs said that e-Portal must have the function of collaboration, 92.8% UTEs preferred communication, 81.4% UTEs desired for the function of multiple learning styles, 76.1% UTEs preferred

discussions while 84.5% UTEs preferred social interactivity to be important functionality of e-Portal.

5.2.7 e-Portal Development

93- It was obvious from preliminary and developmental design that a blueprint for the development of e-Portal was ready to be implemented which consisted of context diagrams, ERDs, DFDs, interface diagrams, V-model of SDLC and testing strategy design.

94- It was found that after accomplishing the preliminary analysis and design phases and practical developmental process of e-Portal followed by models of SDLC, an interactive, novel, goal-oriented e-Portal with multi-dimensional features and functionalities and attractive user interface was developed as product. So e-Portal was ready to be utilized for online training of UTEs.

5.2.8 e-Training Modules Development

95- It was found that training modules were developed followed by ADDIE model and proposed DFW. e-Training modules in product form were having compatibility with the features and functions of e-Portal.

5.2.9 Pilot Testing and Practical Orientation Course

96- Table 4.67 revealed the readiness level of UTEs to participate in practical orientation course through e-Portal. $M=1.81$ shows that 81% participants said that they were used to access their laptop/Smartphone many times a day, $M=1.84$ responded that they had reliable internet/Wifi connection. $M=2.82$ showed that UTEs had intermediate level of knowledge of digital tools and technologies whereas $M=2.62$ depicts that UTEs had basic level of knowledge to use digital tools

and technologies. $M=3.24$ depicts that most of UTEs rated their web literacy as of intermediate level, $M=3.21$ shows that UTEs had basic intermediate level of web search skills, while $M=2.61$ reveals that UTEs had basic level of digital literacy. $M=2.42$ shows that UTEs were having basic e-Teaching skills, and $M=2.23$ showed that UTEs were having basic skills of e-Content development. $M=1.75$ shows that 75% UTEs were confident to utilize e-Portal for their online training. $M=2.31$ and $M=2.29$ depict that UTEs were good in goals setting and tasks accomplishment. $M=1.17$ depicts that UTEs were not aware of digital micro-learning concept of online courses. 86% participants were motivated to attend while 82% were motivated to complete this practical orientation course.

- 97- In Table 4.68, $M=2.11$ revealed that participants were having moderating active participation in e-Training course. $M=2.62$ shows that participants were interacting with trainers and other participants of course. $M=2.00$ illustrated that participants were moderately sparing time for e-Training course whereas trainees were of the opinion that they were learning according to their learning styles ($M=2.53$). Table illustrated that trainees were able to access course anytime ($M=2.62$) while $M=2.53$ showed that content was easily understandable by trainees. $M=2.49$ showed that trainees were intended to complete e-Training course.

5.2.10 Acceptance of e-Portal

- 98- It was found that In table 4.69(a), the value $R^2 = .686$ indicated that predictor perceived ease of use (PEOU) explained 68.6% of the variation in perceived usefulness (PU). It showed that H_1 is significant at $\beta=1.092$ and $t=44.9$ while $\rho < .05$, so H_1 was accepted.

- 99- In table 4.69(b), the value $R^2 = .887$ indicated that predictor perceived ease of use (PEOU) explained 88.7% of the variation in attitude towards use (ATU). It showed that H_2 is significant at $\beta = -.982$ and $t = 42.56$ while $\rho < .05$, so H_2 was accepted.
- 100- In table 4.69(c), the value $R^2 = .273$ indicated that predictor perceived usefulness (PU) explained 27.3% of the variation in attitude towards use (ATU). It showed that H_3 is significant at $\beta = 1.007$ and $t = 41.07$ while $\rho < .05$, so H_3 was accepted.
- 101- In table 4.69(d), the value $R^2 = .979$ indicated that predictor perceived usefulness (PU) explained 97.9% of the variation in intentions towards use (ITU). It showed that H_4 is non-significant at $\beta = -1.008$ and $t = 37.22$ while $\rho > .05$, so H_2 was rejected.
- 102- It was found in table 4.69(e) that value $R^2 = .442$ indicated that predictor attitude towards use (ATU) explained 44.2% of the variation in intentions towards use (ITU). It showed that H_5 is significant at $\beta = -.989$ and $t = 39.41$ while $\rho < .05$, so H_5 was accepted.
- 103- Findings reveal that participants of the course were positive towards acceptance of e-Portal for their e-Training as four out of five hypotheses were accepted to be true for acceptability.

5.3 DISCUSSION

The discussion on major findings illustrates the basis, approaches, and requisite to develop e-Portal for the training of university teacher educators of Pakistan. Discussion is expounded in the context of findings of objectives, research hypotheses and research questions.

The study explored the existing state of utilization of digital and online technologies in teacher education and teacher training in national and international scenarios. At national level, the policies regarding e-Learning; the organizational situation; the practices, attitudes and provision of e-Learning to teachers and students of teacher education were studied in detail. After reviewing loads of research studies, education policies, e-Learning strategies, project reports, and vision reports, it has come into notice that many of the countries of world are being successful for adopting latest technological patterns in their education. In education policies of several countries, digital learning, online learning and e-Learning are main focus. It is emphasized in education policies of these countries that teachers must be proficient in technology utilization rather teachers must be e-Learning experts to use e-Learning in their professional teaching and to transform their curriculum in accordance with e-Learning patterns. In many countries, teacher trainings are conducted to enhance digital competencies, online pedagogical skills and digital literacy of teachers and these trainings are conducted in online environments. The educational organizations in the world establish their own e-Learning or digital policies regarding teaching and learning and ascertain the technological infrastructure and practices in these organizations. Besides, many of the countries like USA, UK, Norway, Australia, Japan, Finland, & China have established the e-Learning strategies for teacher education and teacher training so that to maximize the technological quintessence in the practices of present and future teacher through digital tools, e-Learning technologies, LMS/Moodle/e-Portals, online/digital learning resources etc.

it is evident that Pakistan is far behind from many other countries where e-Learning is established practice in universities or institutions of teacher education. As in case of Pakistan, technology in teacher education is focused on the level of ICT, the concept of twentieth century. Very small evidences are there to prove the utilization of latest digital and online trends in teacher education and teacher training. The “ICT in Education Master Plan- 2007” describe the approaches to use ICT for enhancing student learning, increasing educational opportunities, and mounting facilities for all levels (HEC, 2015). The initiatives of e-Learning in Pakistan comprise; The Virtual University of Pakistan (Toor 2005; Sherazi & Ikram, 2002), COMSAT Virtual Campuses (VCOMSAT, 2015) and e-Learning tributary of Allama Iqbal Open University (Shah & Saman, 2016). Findings of the study indicate a grey picture of non-availability of e-Learning in teacher education of formal public universities of Pakistan as none of the universities are practicing e-Learning in learning, teaching and training domains. Teacher education institutions/departments in formal public universities are lacking e-Learning strategies/plans/vision, technological infrastructures, fund allocation for e-Learning, e-Teaching (digital & Online) practices. Even ICT competencies are not considered significant as induction criteria of teacher educators in most of the TEIs.

Findings reveal that students (prospective teachers) have sufficient availability of digital tools and technologies but are mostly utilized for personal purposes rather than learning as students are not aware of the ways to implement these gadgets and apps for their learning purposes. But students are well aware of importance and potential and usefulness of e-Learning and they are willing to experience of e-Learning but opportunities are not provided to them and their digital needs are negated or ignored.

Availability of digital resources to Teacher educators is not even matter of subject but the utilization of digital/web tools and technologies in their teaching and curriculum is main issue. Teacher educators do not use online and digital tools and technologies in their teaching for two major reasons. Firstly they don't have enough organizational support for it, and secondly they do not possess sufficient digital competencies and e-Teaching (digital & online) skills to implement e-Learning in their professional teaching. Literature highlights that digital competencies embrace, i) knowledge of significance of digital/web tools and technologies (digital literacy), ii) knowledge of utilization of these digital resources in teaching (e-Teaching) and in curriculum (online/e-Content). Teacher educators of Pakistan, according to the indication of findings, are lacking digital literacy, e-Teaching skills, and developing online teaching/learning content/material.

This situation leads towards training of teacher educators in accordance with the needs of digital era and digital students. Evidences reveal that many countries emphasize the need of e-Training programs in teacher education and that's why those countries have shifted the formal training systems into online with digital tools and technologies utilization so that to maximize the facilitation of teacher educators. Many studies provide evidences for e-Training (digital & online) concept followed by Connectivism that is the learning theory of digital age based on networked learning with socialization and latest online and digital technologies. In Pakistan, teacher educators' training is limited to gaining proficiency in using computers but not online or other digital gadgets and apps. Findings of this study lead towards the dire need of e-Training programs for university teacher educators of Pakistan as findings show the high willingness for such training courses which might contribute in their professional expertise through enhancing their

digital competencies and e-Teaching skills and by utilizing all the available digital and online technologies in their profession.

Connectivist e-Training highly emphasize the training environments to be networked with social learning tools and integration of highly collaborative and interactive approaches of learning. There are many types of online training application used for the purposes of e-Training in the world like LMS, blogs, websites, e-Portals, social networking apps, MOOCs, and online communities. But as in Pakistan, there are no evidences of establishing any particular training management system for university teacher educators. Findings highlight the ominous need for developing a training management system for e-Training of university teacher educators.

e-Portal was one of the TMS chosen by university teacher educators for their e-Training. Findings of the study are silent on the choice of open-source or closed/secured TMS but Results of the study provide rationale for the selection of e-Portal to be developed as there is no e-Portal ever developed specifically for UTEs. All the features, functionalities and interface preferred by UTEs, and objective-oriented and need-based approach of e-Portals make them the most desirable training management system for the e-Training of UTEs. So it is necessary to root out a sound framework to implement this innovative concept.

Developmental frameworks are theoretical structures based on the assumptions, rules, principles, and means that put together the thoughts and ideas encompassing a broader concept. The concept of e-Training through e-Portal is somehow a contemporary phenomenon. Findings of the study illustrate a proposed Developmental framework for e-Portal development to be utilized for online training of university teacher educators of

Pakistan. The constituents of training systems are the first ingredient of Developmental framework. These ingredients are the background (context, needs), goals (objectives, learning outcomes), the users (trainees, trainers), methods of training (environment, delivery), training resources (content, activities) and training assessment are brought under consideration.

Procedure for DFW development provided by Jabreen, 2009 is followed in this study. In The findings of the first phase are used as background input for the DFW on the basis of which e-Training is meant to lead in two dimensions i.e. How e-Training, and why e-Training. This highlights the objectivity and mode of e-Training. Pragmatic approach is merged in DFW in ontological (learner-centeredness) and epistemological (content & pedagogy centered) modes. For highlighting the components, a theoretical compendium of five learning theories is utilized. Connectivism is followed for deciding networked and interactive social learning based virtual training environment of e-Portal. Authentic Learning theory is followed for determining multi-disciplinary learning environment, problem-based activities and virtual communities of practice. Whereas adult learning theory is utilized to draw learning principles and learning styles of UTEs. Online collaborative learning theory is focused for collaborative activities, communication and knowledge communities in online training environment. Concept of Digital micro-Learning is taken from micro-learning theory which emphasizes to organize the content of training in piece-meals or small chunks directly having relevance with the objectives and profession for avoiding the unnecessary length of information by save time of UTEs.

Already existing systems of teachers training are also studied. Performance and process goals are identified for organizations, individuals and tasks. DFW also contains the requirements of organizations, system, e-Training and trainees to be fulfilled by e-Portal followed by bulk of tasks to be accomplished for e-Portal development. Findings of the study emphasize the impact of training of UTEs through e-Portal, which include direct impacts (digital literacy and digital competencies enhancement, acceptability towards e-Portal usage) and indirect impacts (training system of UTEs; e-Learning practices of prospective teachers; digital trends in teacher education; e-Learning integration in formal education system of Pakistan). The proposed DFW is not only simple framework but it comprises the context, constructs, ideas behind the development of e-Portal as Miles & Huberman (1994) state that DFW lays out major factors, variable, constructs, and deduces the relationships among them.

Findings of the research study provide the evidences of procedures and techniques being followed for designing and developing an e-Portal. Design converges the application to the solution domain from problem domain and tells how the system should meet the identified needs. Design process including Developmental and preliminary designs, and start from system requirement specifications and deciding the interface, features and functionalities of e-Portal shown by context, interface, ER and DF diagrams, whereas ending at modularization. Freeman, Peter, & David (2004) regard the design as engineering process which ends at programming as software programming cannot be started without a detailed design. During the design phase, the contextual and need based facts are taken from situations analysis results and DFW.

To fulfill the objective of the study, many models of SDLC are considered for e-Portal development but in this study V-Model is being followed. As V-Model establishes relationships between each phase of SDLC and carries on testing of each phase during the development process before actual software testing starts as Cockburn (2006) also describes the role of water fall model followed by JAD approach in developing association phase of testing. Being the latest tools and databases for software development. PHP and Mysql programs are used for writing code for e-Portal development. After testing and retesting and rectification of errors/problems according to predefined test strategy, e-Portals are then deployed on online domain for practical usage. Following study has followed the DFW, design and V-Model as the structural basis for e-Portal development.

For utilization of e-Portal for the training of UTEs, ADDIE model is followed to design and develop training modules for online course. ADDIE model comprises of five stages and is utilized for its distinctive features of being flexible and systematic. Rather Vejvodova (2009) states that despite of flexibility and being systematic, ADDIE is allowed to easily turn back to the previous phases. For the analysis phase of ADDIE, inputs (context, theoretical background, gaps ,training and trainees' needs) are taken from situation analysis results and proposed DFW on the basis of which, in design phase, the objectives of the course modules are decided. Design is always proceeded keeping in view the training plan, resources availability, training platform and potential challenges to the training. Deciding the training delivery methods and modes are also considered key input of design phase. Design is then put into the development in which content and activities are created and organized of the online course are developed and formative

assessment strategies are formed. For this study, compatibility of training modules with features and interface of e-Portal is valuably considered. The findings of this study reveal that some survey tools like questionnaires and assessment tools like tests and assignments are also developed. After development the modules are piloted and validated. Strachota, Schmidt, & Conceição (2006) describe the importance of piloting and validation of instructional modules for assessing the appropriateness and relevance of content and activities with context and needs of trainees and training.

After thoughtful processes of analyzing, designing and developing the training modules with an amalgam of DFW, e-Portal, and ADDIE, modules are then put for implementation. Teo, Lee & Chai (2008) explains that thriving implementation of e-Learning is dependent on the perceptions, knowledge and skills of the users. As to fulfill the objective of this study, implementation of training modules with a group of UTEs for piloting and beta testing of e-Portal and e-Modules is evident as beta testing is supported by the arguments of Piskurich (2015). Findings reveal the high level of readiness and engagement of UTEs before and during practical orientation course. Moradmand & Datta (2014) express that a strong knot between Developmental framework, theoretical framework, developmental framework and implementation plan shorten the challenges and limitations of any online platform and online course content.

There is a prevailed thought that success of any innovation depends on its acceptability. e-Portal for training of UTEs also needs the acceptability for its successful and suitable utilization. Dillon & Morris (1996) regard acceptance as demonstrable and verifiable willingness of users to employ emerging technologies for the situation/tasks it is designed/developed to support. Several technology acceptance models are utilized to

explore the acceptability of technological innovations. This research has followed TAM Model developed by Davis which represents the adoption of e-Portal as how UTEs perceive to accept and use it. TAM has a predefined hypothetical framework which tests a compendium of five hypotheses of acceptance of e-Portal. The findings show the acceptability of e-Portal by UTEs for their online training as by accepting four out of five hypotheses.

The application of e-Portal emerges to hold the sizeable potential for the training of university teacher educators of Pakistan by applying Connectivist approach to interactive, collaborative, networked, social, digital and online modes of training.

5.4 CONCLUSIONS

Conclusions are made based on the findings of the study.

- i) Findings of the study refer that existing state of e-Learning integration in teacher education and teacher training in Pakistan was lagging behind the required echelon.
- ii) As digital resources availability was not ensured by the organizations, teacher educators in formal universities were not in practice of utilizing digital tools and technologies in their teaching.
- iii) Teachers educators lacked digital competencies and digital literacy required to coop with the novel e-Learning trends and practices in teacher education.
- iv) No e-Learning strategy was developed for UTEs to practice to apply e-Learning in their profession. No authority suggested the professional development programs to enhance the digital competencies of UTEs.

- v) Findings of the study also conclude that there was no training application subjected for UTEs to get training in online environments to enhance their professional competencies in line with emerging technological patterns.
- vi) UTEs were of the view that they must have an e-Training application which may be adequate to meet their digital needs.
- vii) Study also concludes that development of e-Portal was chosen option so that this application might be utilized in long term with full ownership of teacher education of Pakistan.
- viii) Findings lead to the conclusion that proposing a developmental framework (DFW) was paramount preference because e-Portal developed according to DFW was accomplishing the criteria of theoretical, philosophical and application consideration in the given context.
- ix) The proposed DFW is not only simple framework but it comprises the context, constructs, ideas behind the development of e-Portal
- x) Connectivism as the basis of e-Portal made the application and content of the training more interactive and collaborative.
- xi) e-Portal was successfully deployed for online training of UTEs as UTEs were willing and ready to participate in e-Training course as they intended to experience the novel mode of training.
- xii) e-Portal was consummated as a urged application as UTEs exhibited high acceptability towards ease of use, intentions to use and attitude towards using e-Portal for their e-Training courses.

The conclusions of the study are in accordance with the findings of existing research studies in which digital, online and e-Training has been recommended as enviable mode for professional development courses of UTEs. It is worthy to articulate that e-Portal is an eminent choice to pave the UTEs of formal universities of Pakistan with the emerging trends of utilization of digital tools and technologies in teaching and provide them with evenhanded digital literacy and e-Learning based pedagogy. It is also concluded that e-Portal possesses the capability to bridge the digital divide between UTE (digital immigrants) and digital natives (prospective teachers). It is necessary to facilitate the UTEs with such online training applications for the digital competencies and e-Teaching skills of UTEs.

5.5 RECOMMENDATIONS

- National Strategy for e-learning: It is sturdily recommended that the Government should device e-learning strategy at national level, which must be inseparably associated with teacher education policy and education policy of Pakistan.
- In "VisionPakistan 2025", the e-education policy is recommended to be suitably exhibited.
- Digital Divide: The ICT revolution of Pakistan should be fully utilized in teacher education byfostering e-learning for deeper invasion in teachers and teacher educators' training and teaching process in order to bridge the digital lapse between students and teachers of teacher education.
- Embracing e-Training: In view of the exponential growth in the online and digital technologies and resources, and ever availability of digital and smart devices and online applications, it is recommended to commence the training of teacher

educators in formal universities to make them familiar with and enhance their digital literacy and competencies to adopt emerging technologies in teacher education.

- It is recommended that for e-Training of University Teacher Educators, government should provide exclusive, secured, objective-based online applications i.e. virtual online training application to teacher education departments in formal universities.
- It is highly recommended to provide training to the instructional designers to design and develop online courses for e-Training in line with the format, features and functionalities of online training applications.
- There is high recommendation for the training of trainers of online training courses in teachers education.