CHAPTER 1

INTRODUCTION

1.1 GENERAL

E-learning represents the employment of information technologies like the Internet, mobile and the parallel computer aided mechanisms in the teaching and learning procedure, either asynchronously or synchronously (Mohamed Jama Madar et al. 2014). The asynchronous E-learning is exclusively used for the content management mechanism where the users have the option of browsing the data during several occasions devoid of concurrent teamwork. E-learning or the pedagogy is mainly intended for the online users who team up concurrently. In both the cases, the content management system for E-learning functions as the treasure house for the learning materials gathered on the web. The E-learning pedagogy merely hands over the set of courses to the learners. In this regard set up the E-learning calls for diverse organizational requisites. However, in all cases, an organization which deserves to employ the E-learning has to guarantee that the system is appropriately put in place and effectively sustained thereafter.

It is disheartening that a lion’s share of the institutions concerned commits the grave mistake of setting up the E-learning mechanisms, without delving deep into various features which have a profound say on the applicability of the system within the framework. In fact, it can be effectively set up by means of gradual phases of the cautious planning of the life modules required to guarantee and set up a preserved mechanism. Further, makeshift setups of the E-learning systems habitually do not reach anywhere near the urgent requirement of the users concerned, and invariably result in turning
the system into an ineffectual or detached mechanism. Several higher education institutions exhibit a tendency to turn a blind eye to the strategic modules during the design of the E-learning mechanism. They habitually commit the mistake of opting out for the outsourcing devoid of appropriate adaption or merely design and set up the E-learning systems without caring for the vital modules required in their strategic implementation. The fundamental backbones of the E-learning are detailed below:

- Technological
- Pedagogical (Materials development and instructional design)
- Managerial.

The effective harmonization between these modules reveals the supreme significance of the system execution. The vital intention of the organization in effectively employing the E-learning system has a telling effect on the modalities of execution. The model of E-learning followed also influence the formation of the relevant techniques to execute or set up the E-learning mechanism, based on the academic functions and policies of the institution concerned. In fact, the E-learning has become the backbone of the current educational system. In the modern age of unprecedented information and communication growth, the extant procedure of face-to-face teaching delivery is fast disappearing to oblivion. The aspirants in pursuit of knowledge the world over invariably resort to the employment of technology to obtain class notes and information, obtain appraisals, and communicate when needed.

Furthermore, the requirements of the university students have literally gone sky-high, with their varied needs and zooming aspirations for the E-learning based courses and the same holds good in respect of the requirements of proficiently functioning E-learning institutions. The
prerequisites for the acceptance and utilization of the E-learning have to be revealed so as to promote the advancement of the system. It is highly essential to concurrently take into consideration several constraints such as the technological, pedagogical and individual factors for the proper execution of the E-learning measures. Nevertheless, the deficiency of the of hypothetical or/and abstract structures for the effective performance of E-learning systems has paved the way for conflicting outcomes, leaving a basic question unanswered is on the essential attributes to have a positive impact on the efficient delivery of the E-learning (Mohamed Jama Madar & Oso Willis 2014).

It is unfortunate that a number of institutions offering the higher education courses commit the mistake of putting in place vague E-learning mechanisms which often run counter to the declared mission and vision of the institution concerned in addition to being out of phase with the student needs. While admitting the imperative necessity for the E-learning system, and also accepting the undeniable fact that a host of universities have initiated instant and immediate measures to meet the requirements, it has to be painfully admitted the implementation of the systems concerned have been far from satisfactory, with the non-availability of the requisite infrastructure across a wide spectrum of the universities, and occasionally among diverse modules within the identical university. As on date, it appears there is the dearth of a standard strategic model for the implementation of the E-learning which broadly illustrates the common status and requisites of the institution concerned. In this regard, it is high time an appropriate model is effectively designed and put in place.

Personalization and adaptation of learning are generally considered as highly important because learning has to be individualized to become more effective and efficient. This is particularly true for the situation in which
learners enter the learning situation with different backgrounds and experiences, as in the case of workplace learning.

Personalized E-learning represents a major step-change from the one-size-fits-all approach of traditional learning platforms to a more customized and interactive provision of learning materials. Adaptive learning can support the learning process by tailoring learning materials to individual needs. However, this requires the initial preparation of content upfront, which is a laborious task and organizations have to target their limited resources effectively. In order to guide the process of creating adaptive learning materials, the criteria for adaptation or adaptation needs have to be known.

For Education, an Adaptive Learning System (ALS) should be based on:

- Requirements of the curriculum
- Learner’s proficiency in different concepts related to the curriculum
- Predominant learning styles of the target group
- Conceptual knowledge required to climb a higher cognitive level with regards to a particular concept

The new paradigm attracted academia is adaptive teaching and learning which provides personalized learning. This novel method of teaching and learning used to enhance the quality of classroom teaching and learning is the requirement of the century. The Internet users are overloaded with the E-learning resources and they are finding it difficult to choose the best material for the specific topic. The adaptive teaching and learning provides a solution for one size doesn’t fit for all.
The rapid development and improvement in the Internet technologies and the decreasing cost of the hardware platforms, most of the educational institutions are using E-learning as an effective tool to provide effective teaching learning process. The main objective of this thesis is to enhance teaching learning process for a larger group. With this teachers should dynamically revise and deliver instructional materials according to the learners’ current progress. The current state-of the art of E-learning system uses the automatic collection of learners’ performance data using explicit test but our method using graphical tool could show the performance of the students graphically. Semantic Web provides concept based information with well-defined meaning, understandable for both humans and machines. Semantic Web technology enhances the E-learning technology using ontology. Ontologies are building blocks of Semantic Web which change the way in which E-learning systems are constructed (Mohammad Mustafa Taye 2010).

The ontology, in quintessence, represents a formal pattern of the conceptualization. It is the easy version of the taxonomy of ideas such as the light weight ontology. In this regard, the domain ontology is one of the categories of the ontology which is employed to illustrate the knowledge for a specific category of the application domain. Conversely, the concept maps are effectively employed to bring out and characterize the knowledge framework like the ideas and suggestions as observed by the individuals concerned. The concept maps are analogous to the ontology in as much as these measures are effectively employed to signify the ideas and the semantic associations among the ideas (Uden & Damiani 2007). Nevertheless, the ontology constitutes a formal knowledge illustration technique to enable the human and computer interfaces and it is represented by means of the formal semantic markup languages like the Resource Description Framework and Ontology Web Language, whereas the concept map represents an informal device for the
human beings to reveal the semantic knowledge configuration (Chang & Guetl 2007).

The ontologies represent the formal frameworks which furnish a collective awareness of a specific domain. They characterize the semantics of a domain overtly, enabling intelligent access to the data. Right from the early nineties, ontologies have continued to be a well-known research subject in the artificial intelligence community. The related research subjects predominantly encompass the knowledge engineering, natural language processing, and the knowledge representation. During the last ten years, thanks to the advent of the Semantic Web, the ontologies have experienced an exponential growth in popularity. Of late, the conception of ontology is more pronounced in the domain of the E-Learning. The ontology is effectively employed in the E-learning in several ways, like the representation of the domain knowledge, furnishing of the metadata for the vital conceptions and entities in the learning domain, facilitating a superior depiction and reclamation of the learning content, enabling the exchange and sharing of the learning content, personalizing and recommending the learning content, designing the curricula, and appraisal of the learning by Mohamed Jama Madar & Oso Willis (2014).

The main objective of adaptive systems is to provide personalized e-learning. The most frequently used definition of adaptive systems is “a system is called adaptive if it is able to change its own characteristics automatically according to the user’s needs” Oppermann (1994).

“E-learning provides well organized, learner-oriented, interactive and facilitated learning environment to anyone, anyplace, anytime by using Internet technology. But E-learning courses experiencing high dropout rates as learners become increasingly dissatisfied with courses that do not engage them (Meister 2002; Frankola 2001). Such high dropout rates and lack of
learner satisfaction are due to the “one size fits all” approach that most current E-learning course developments follow (Stewart et al. 2005), delivering the same static learning experience to all learners, irrespective of their prior knowledge, experience, preferences and/or learning goals.

Adaptive Educational Hypermedia (AEH) (Brusilovsky 2001; De Bra et al. 2004) systems provide possible solutions to this problem by providing a personalized learning experience for the learner by creating personalized learning path to the learner having different knowledge levels. The next generation E-learning systems will use semantic web technologies to provide concept based information retrieval which is having higher accuracy in precision and recall than key based search. Semantic Web technologies use an ontology for the representation of a shared conceptualization of a particular domain. Many researchers proposed the use of ontology in various aspects of E-learning like learner modeling, personalization and adaptive hypermedia educational systems. Ontologies are effectively used by many researchers and application developers to reuse and share knowledge across systems. The main problem to share knowledge across the different system is entity identification; i.e different systems use different concepts and terms for describing domains. By creating a common ontology, the reuse and sharing of knowledge across different systems can be easily achieved. The basic characteristic of ontology is to define explicitly, the concepts, their attributes and their relationships. It can be used in any environments and its potential for contribution to the educational environment is enormous. Ontology gives semantics to the personalized learning system.

The amalgamation of the technology based functionalities goes a long way in facilitating the generation of user-friendly courses, direct access to knowledge, the augmentation in the production of the personalized content and the promotion of the decentralization and collaboration of content
management. In this regard, the ontologies play a significant part in the attainment of the corresponding goals as they can be effectively employed to query and to navigate through the learning material supporting and, thereby the learning process. The pertinent conceptions which are authenticated in the learning objects represent the backbone of the ontology. Therefore, a link is generated between the learning material and its conceptualization which is characterized by means of the ontology thereby facilitating the generation of the individualized learning paths. The ontologies incredibly promote the prospects for designing a further energetic learning scenario with superior access to the specified learning objects by Monachesi et al. (2008).

Several works have been carried out for personalizing the E-learning systems. Till now, most of the current E-learning systems deliver the same content to the learner with different profile. A number of personalized systems have relied on explicit information given by a learner and have applied known methods and techniques of adapting the presentation and navigation. A web based intelligent tutoring system for teaching Java objects to students to overcome the difficulties they face in the programming is described in this thesis. The basic idea of this system is a systematic introduction to the concept of Java objects. The system presents the topic of Java objects and administers automatically generated problems for the students to solve. The system is dynamically adapted at run time to the student’s individual progress. The system provides explicit support for adaptive presentation constructs (Samy et al. 2009).

Most of the E-learning systems provide web-based learning so that students can access the same online courses via the Internet without adaptation. In an E-learning system, one size does not fit all. Therefore, it is a challenge to make E-learning systems that are suitably “adaptive”. The aim of
adaptive E-learning is to provide the students the appropriate content at the right time, means that the system is able to determine the knowledge level, keep track of usage, and arrange content automatically for each student for the best learning result (Esichaikul et al. 2011).

Today, we are in an era where drastic advancements in networking and information technology are in action. The learning process has also taken these advancements, as a result of which E-learning came to the scene. Personalization in E-learning will improve the performance of the system. Recent researches are concentrating on providing adaptability to the learning management systems, depending upon the varying user needs and contexts. Adaptability can be provided at different levels. Providing an adaptive learning path according to the context of the learners’ is an important issue. An optimal adaptive learning path will help the learners in reducing the cognitive overload and disorientation, and thereby improve the efficiency of the Learning Management System (Pushpa 2012). E-learning can be truly effective when it provides a learner centric adaptive learning experience. The success of any E-learning system depends on the retrieval of relevant learning materials according to the requirement of the learner. This leads to the development of the adaptive E-learning system to provide learning materials considering the requirements and understanding capability of the learner (Subrat Roy et al. 2011).

The unprecedented growth in technology has given a ray of hope to the resource-constrained educational institutions, by means of incredible cutback in the overheads of the distance learning, a lion’s share of the resultant saving being siphoned off to the student community as a whole, thereby bringing a large majority of the people under the umbrella of affordable education. Right from the commencement of the year 2000, the smart entrepreneurs began to employ the E-learning to train their employees.
With the result, all the employees, both new and experienced were offered a significant opportunity to enrich their awareness of the industry they are working at, by means of exploiting the corresponding industry knowledge base so as to maximize their skill sets. Even at home, the inhabitants were offered the access to programs which imbibed in them the requisite skills to obtain the online degrees and enhance their style of living by means of enhanced knowledge and skills.

The technologies of communications are generally categorized into two diverse types such as the asynchronous and synchronous technologies. The asynchronous activities include the blogs, wiki and the forums of active debate. The underlying motive is that the participants are capable of engaging in the exchange of concepts and data, without unduly worrying about the implications of other participants concurrently. The e-mail is asynchronous, in which the e-mail is either sent or received, without caring for its impact on the participants instantaneously. The asynchronous learning furnishes to the students the facility to study according to their ability, interest and inclination. This golden feature of the asynchronous learning has emerged as a boon to the students who suffer from ill-health. They are empowered with the requisite skills to effectively conclude their assignment in a stress-free scenario and at an adaptable time-frame. The synchronous tasks reveal the exchange of concepts and data with one or multiple parts simultaneously. An inter-face discussion characterizes an example of the synchronous communication.

The synchronous tasks are made available to all the candidates at an agreed date, as evidenced by an online chat session or a virtual classroom or a meeting. The classrooms and virtual meetings are competent to employ a number of permutations of the techniques of the communications. The participants in a virtual classroom are free to make use of the icons and
emoticons to express their feelings and answer questions or making the questions or declarations. The students are empowered “to write on board” and to dole out their laptops when they are accorded the rights of the tutor. A different technique used for the communication in a virtual classroom involves the text notes, rights to use the microphones and sessions of a breakout. A session of breakout, in essence, enables the candidates to work in unison as a team representing a small workgroup to attain an objective, and it also entails the teachers to have private discussion with their students.

The virtual classroom also bestows upon the student community the facility of inviting direct instructions from an expert tutor in an interactive scenario. The students are permitted direct access for getting instructions from the tutor and also have the facility of the direct feedback. The virtual classroom furnishes a structural program of classes which is beneficial to the students who are offered carte-blanche to learn the asynchronous. Another striking feature of the virtual classroom is that it facilitates a learning social scenario which literally configures the intimately conventional “mortar and stone” class. The most virtual class applications provide a feature of registration. Each class is registered and is stockpiled in a server, which allows instantaneous participation from any classroom during the academic year. This feature is incredibly advantageous for the students to reinvent the materials and ideas for the upcoming tests. The significant advantage to the learners from the virtual class room is the facility of visualizing from any classroom which is missed by it with no possibility of recurrence. Further, it affords the parents the option to have a close watch over any classroom to see to it that the education of their children is progressing satisfactorily.

This thesis illustrates a methodology of automatically constructing concept maps using ontology to measure the learners understanding of a particular topic; thereby teachers can adopt adaptive teaching and learning
based on the learner’s knowledge structures as reflected in the concept maps. In this approach, we provide dynamic content to the learners based on ontology provided by the student. This thesis also focuses on to evaluate the quality of e-Learning content and gives best possible material to the student. This procedure will help the learners by avoiding the information overloading problems. This ontology based tool is effective for tutors to use adaptive teaching methods in providing content and for learners to improve their learning process.

This thesis concentrates on providing personalized learning path to the learner to carry out his learning activities intelligently and effectively. The main objective of the personalized learning path construction is to provide adaptive content to the learners based on their knowledge level by adopting a suitable instructional strategy which is not available in other systems. This research work aims to provide personalized adaptive learning system by providing suitable learning path to individual learners which can dynamically design pedagogical teaching strategy based on learner’s knowledge level and generate suitable learning resources adaptive to different learners and monitor and update learner’s progress.

1.2 STATE OF ART AND MOTIVATION OF THE WORK

The E-learning represents an energetic procedure far different from a stagnant concept. As time progresses, the E-learning gets reinvented and fine-tuned in phase with the modern sophisticated advances. The E-learning is generally described as an effective technique to set up the teaching and learning procedure by means of employing the Internet and information technology gadgets (Bens Pardamean & Teddy Suparyanto 2014).
The educational delivery system traditionally followed in the universities and colleges has predominantly focus on the classroom approach from times immemorial with the tutor offering one-sided lectures to the students who are at the receiving end sandwiched between meek listening and taking notes. In the conservative system, interface between the tutor and students is deemed as a vital learning ingredient. Even innovations in the educational delivery systems like the interactive and reflective schools of thought have, always posed severe challenges to the conservative system of education.

The amazing advancement in the domain of information technology has brought in eye-catching educational delivery systems like the distance learning and e-learning. With the result, several universities and colleges have entered the fray enjoying the advantages of the innovative E-learning world in an incredible manner. Consequently, the paramount need for the pedagogical and technical knowledge for the purpose of teaching by means of the Internet has arisen, with the related knowledge gradually transforming into core competencies a multitude of the tutors. In the backdrop of the explosion of electronic mediated teaching, the crucial question remains concerning the method and the extent to which E-learning and the information technology is changing the dynamics of teaching and learning. E-learning has entered the education as well as the corporate world in a major way and it also complements the traditional delivery methods. It has facilitated the traditionally difficult educational paradigms such as adult learning or distance learning. E-learning can be viewed as an alternative to the face-to-face teaching method or as a complement to it. E-learning usually allows the student a greater choice as well as responsibility for their own learning. E-learning can change the methods of learning and has the promise to overcome the barriers of time, distance, and economics (Anand Tamrakar & Kamal K Mehta 2011). The features of E-learning are listed below:
• The E-learning involves the effective employment of the electronic media and information and communication technologies (ICT) for the purpose of the education/training.

• It can be performed any time with 24x7 accesses.

• E-learning enables a candidate who has joined a course of his choice to learn freely without any interruption from any quarters through the use of computer and enables him to take tests, giving him instructions, steering clear of his doubts and estimating his grade concurrently.

• It is incredibly economical and amazingly proficient. There is no limit to the number of trainers/students who participate in the E-learning.

• It is a boon to the employed people who lack the time-frame to attend an institution in person.

• A candidate can learn according to his needs and his preferred momentum in learning.

• The students are highly motivated in view of their active involvement in subjects endeared to them and also because of the employment of sophisticated technologies.

E-learning may be broadly classified to two categories as synchronous and asynchronous. The ‘Synchronous E-learning’ is having the facility of interface between the trainer and trainee over the net concurrently. The Synchronous techniques, on their part, enable the individuals to have lively and fruitful interface with the peers and professionals. This sophisticated version of the e-learning can be deemed as a virtual classroom which replicates the diverse kinds of skills exhibited in a genuine classroom.
In this regard, a virtual classroom glistens with the sheen of offering the following glittering advantages.

- A place to meet
- Take attendance
- Lecture
- Interaction with Trainee
- Quiz Programs

The trainer and trainee enjoy the freedom to effectively employ the touch screen computers to create a virtual meeting place rather than the boring and restricted classroom scenario. A proper record of the trainee is made, irrespective of the gigantic number of students acquiring learning in this sophisticated scenario. The trainer has the option of short-listing from a host of the synchronous techniques as detailed below.

- The slide presentation
- The audio and video conferencing
- The application sharing (Here, a trainer permits the trainee take control of the application to carry out the performing tasks.)
- The shared whiteboard (Here, a large number of individuals are offered the facility of easy communication by means of offering comments, drawing, highlighting and pointing.

The students are offered the option of expressing their willingness to speak by virtually raising their hand and consequently, the tutors allow them to carry on the discussion by means of the audio and video conferencing. Further, they
also have the facility of employing the instant messaging and chat (Bens Pardamean & Teddy Suparyanto 2014).

The asynchronous e-learning furnishes the student the ease and convenience of completing the Web based training in accordance with his own time-frame and schedule, without the need for an active interface with the tutor. Further, 24x7 learning from any nook and corner of the world is an added attraction of the captioned mode of learning. There is total elasticity in the asynchronous training, which appears in two versions such as the discussion groups and the self-paced courses. In the self-paced courses of the asynchronous training, anybody is competent to acquire the training anywhere any time. Including the just-in-time training in which an individual is offered the precise type of the training he prefers for the purpose of discharging a task. The captioned courses are generated with the help of the e-learning authoring devices by Ekta Srivastava1 & Nisha Agarwal (2013). They can be offered in a number of ways using Internet, employing the local area networks and by utilizing the CD-ROM or DVD

The facilitated asynchronous mode of training, the trainer and a cluster of trainees are involved, though the interface does not take place concurrently. The trainer, on his part, rests assured after posting the assignments on the Web page, which classically involves the online reading or research carried out on several Web sites. The trainees, on the other hand, communicate with one other by means of the threaded discussions which are also called the online bulletin boards, and send their homework to the trainer utilizing the e-mail. This novel brand of learning represents an incredibly effective method to furnish specialized answers to a multitude of trainees, with a single answer to a general question paves the way for great advantages to a larger group of the trainees of a particular subject.
E-learning system, as it exists now, provides the same depth of content to all the learners who are having different knowledge levels. One size does not robust all! Students with different capabilities must get different contents. That is, an e-learning system must be adaptive. Provision of appropriate content at the right time based on the student’s knowledge level is expected of an adaptive learning system. For the best learning result of every student, the content must be dynamically delivered tracking his progress. To offer personalized content to the users, an effective methodology is required to track the progress. However, it is felt that there is a need for research enhancements and development of an adaptive E-learning system that are attuned to a learning environment with unpredictable changes. This research work offers fresh motivation for developing a suitable architecture for adaptive system using ontology to provide personalized E-learning.

1.3 **OBJECTIVES OF THE RESEARCH**

The main aim of this research is to create a Personalized Adaptive Learning Framework for conceptual knowledge representation and retrieval of contents based on conceptual search of individual personnel providing both the personalized learning contents and Adaptive contents using personalized ontologies and appropriate concept maps. The goal this adaptive learning environment is not only to make learning content accessible but to improve learning by adapting navigation, interaction and content. The aim of adaptive e-learning is to provide appropriate information in order to optimize the learning outcome. The main objectives of this research work are:

- Proper assessment of the knowledge level of the learners and quality of the content.
- Generation of Pedagogically suitable learning path to the satisfaction of the learners.
1.4 **SCOPE OF THE THESIS**

The extensive literature which delves deeply into the merits and demerits of the E-learning system casts its vote in favor of its implementation in the domain of the higher education to enable the faculty members, administrators and the students avail the maximum advantage out of its adoption and implementation in the related realms (Benlamri & Zhang 2008). It can be rightly asserted that the E-learning is a god-send gift which has to be deftly harnessed as the amazing step in the direction of efficiently orchestrating the upcoming and challenging educational requirements with the sophisticated teaching gadgets.

The personalization involves the process of adapting the learner content in accordance with the requirements and fondness of the students concerned, which encompass the learning fashion, the improvement achieved in the learning course, individual background awareness and technical necessities and requisites, a classical example being the tool used for accessing the E-learning mechanism. It can be realized by means of a feast of diverse techniques tailor-made to suit the requirements of the learner (Nganji et al. 2011).

The content personalization is habitually realized by means of the user choice, or by the employment of the student profile. The user is offered with the pertinent data to suit his specific requirement. A different brand of
the personalization is popularly known as the link or navigation personalization, which offers the links applicable to the learner in accordance with their navigation history. The presentation personalization effectively discharges its task of offering the data to the student in the style and fashion of learner choice and preference (Maha Al-Yahya et al. 2015). The personalization in the conventional learning content has to invariably meet the requirements of a large majority of the potential learners, whereas in the case of the E-learning content, it can be personalized in accordance with the specific requirements of the student concerned, who is always on the lookout for the learning content of his whims and fancies. Endowed with the additional functionalities devised within E-learning area, the ontology continues to be in the pivotal position as the link between the user requirements and the distinct attributes of the learning content.

The fundamental aim of the E-learning is invested in making available such a system of learning in which the instructors have the ease and convenience of energetically modernizing and handing out instructional materials tailor-made to suit the needs and the current progress of the learners concerned. The modern hi-tech E-learning mechanism invariably employs the habitual compilation of the data regarding the performance and progress of the learners by carrying out unequivocal tests. Still, it is unfortunate that a large majority of the modern E-learning approaches have failed to come out with a regular appraisal of the progress of the learners based on the data frameworks they have achieved.

The E-learning predominantly represents the employment of digital tools for the specific objectives of teaching and learning. It effectively exploits the technological devices to facilitate the learners to carry on studies regardless of time and location. It duly discharges its duty of imparting the training, delivery of vital information and the motivation of students to
interrelate with each other, together with exchange of perspectives, giving due weight to the perspectives of others. It contributes a lot to the ease and convenience of effective communication and fine-tunes the linkages which play a pivotal part in preserving and maintaining the learning task. In spite of the diverse deficiencies discussed elsewhere, the literature has made an earnest effort to elucidate the function of e-Learning, driving home the way in which the E-learning has effected a revolutionary change in the process of delivering and acquiring knowledge. It has literally mesmerized the institutions which have afforded it a red carpet welcome, by abundantly rewarding them with the highly enlightened, skillful and motivated faculty. Moreover, it has offered a carte-blanche to the aspirants for the knowledge by empowering them with the freedom of anytime anywhere learning. In addition, it has effectively created a conducive climate for the collaboration among the students, thereby taking the academic standards to the zenith of excellence.

The main scope of this thesis is to develop an innovative personalized E-learning framework using ontology by creating personalized ontology user models and Adaptive learning system using concept map. This thesis is divided into six chapters including the introduction.

The existing E-learning methods are detailed in **Chapter 2**. This chapter presents a meticulous survey on the existing E-learning algorithms. In the development of E-learning systems, it is necessary to take into account individual needs and requirements, as well as the resources of information technologies. This is particularly important in lifelong E-learning environment. Feedback should be aligned, as much as possible, to the learner's needs. An approach to personalize feedback in these environments based on semantic Web technologies are proposed in existing E-learning techniques. Simulation experiments in static and dynamic environments are discussed to find out the
efficiency of the existing algorithms. Adaptive E-learning has been identified as being an important and challenging issue of computers in education. In the past decades, various methods and systems have been proposed to provide students with a better learning environment by taking personal factors into account. Learning styles have been one of the widely adopted factors in previous studies as a reference for adapting learning content or organizing the content. In most studies, only one or two dimensions of a learning style model are considered while developing the adaptive learning systems. Moreover, in most systems, only a fixed type of user interface is provided.

An E-learning tool is developed in order to help both the learners and the tutors to use the system effectively for teaching learning process. Since the tool needs expert ontology to evaluate the E-learning resources. Subject experts have to develop expert ontology for specific domain and topic. To handle all the above problems, An Adaptive E-learning is proposed in Chapter 3 to make an E-learning system more effective by adapting the presentation of information to individual learners based on their knowledge and needs.

The framework for personalized learning using ontology is introduced in Chapter 4. Personalized learning removes time, location and other constraints of the teaching process and aims to tailor teaching to each learner’s constantly changing needs and skills. The Singular Value Decomposition (SVD) algorithm is used in this chapter. The SVD is a factorization of a real or complex matrix. It has many useful applications in signal processing and statistics. The SVD is a matrix decomposition technique and one of its applications in the dimensionality reduction of a dataset. It simplifies a dataset by removing dependent features which are deemed unnecessary as they might be evaluating the same concept.
In **Chapter 5** the simulation and experiments conducted are explained to show the proposed algorithms’ efficiency in adaptive learning environments. Further, the results obtained through simulation experiments are compared with analytical evaluation.

**Chapter 6** concludes the findings of the study. The research outcomes and future research directions are also provided.