Ontology based design for M- learning system

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Abstract: Information and communication Technology is a gateway through which large population of students has been addressed. Mobile learning technology the latest arrival highly changing the way the students learn, interact, access up to data information. It mainly satisfies the current and future generation which needs information at the earliest rather than later few touches. The World Wide Web acts as an interface in E- learning as well as in mobile learning (M-learning) environments. It supports and facilitates the delivery of teaching and learning materials. M - l e a r n i n g provides quality educational content with the help of semantic web technologies like Ontology. This study presents Mobile Learning framework for making efficient learning with a case study on cyber security.

Keywords: Information and Communication Technology; Ontology; M-learning; E-learning; cyber security.

1. INTRODUCTION

Education is a process which enables a person's holistic development of personality through knowledge acquisition. Learning environment has the influence on knowledge improvement or knowledge enhancement [8]. Teaching learning processes delivered through mobile devices are based on wired and wireless communication technologies. Mobile learning creates a new learning environment using handheld devices by interfacing world wide web and the learner [10].

Mobile learning, recent form of distant learning is an extension of E-learning application is shown in Figure 1, which also has the use of audio, visual, cognitive, cooperative and interactive contents delivered via smart digital electronic devices in an attempt to create a direct, dynamic, ongoing learning environment. Such form of learning enables the individual learner to move freely in the learning material, at the same time can access to knowledge sources wherever and whenever the learner desires.

In the world of education and training there exist many definitions for mobilE-learning. Among them ADL defines mobile learning or "M- Learning" as the use of handheld computing devices to provide access to learning content and information resources.

Thus M-learning overcomes the time and distance barriers of traditional learning and cost barrier of E-learning.
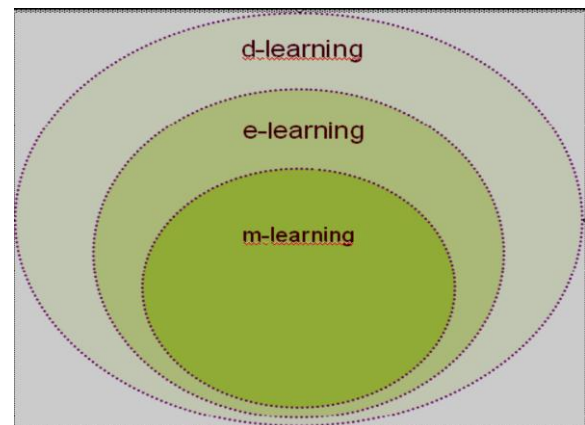

Figure 1. Various Dimensions of latest learning/ Evolution of distant learning

Ontology is a conceptual system a semantic account, which expresses a meta-level specification [5], and it owns the features like expressiveness, extensibility, interoperability, sharing and re-usability.

The various directions of research in ontology based M-learning are discussed as related work in section 2. Section 3, describes the Modified Intelligent Recommender System for Effective E-learning Environment Architecture, which encompasses various activities of M-learning in detail. Section 4 explains evaluation and experimental results on the efficiency of the system. Section 5, concludes and guides future work.

2. RELATED WORK

The changes in the educational scenario are wider and fast. Mobile learning is a personalized as well as interactive mode of learning. The implementation of mobile learning using android OS is illustrated in [3].

The meaning of mobile learning, its key issues, solutions and the knowledge transformation due to the development of mobile learning are clearly explained in [6].

E-learning fulfils the user context with the help of semantic web technology like ontology. Ontology based applications improve the understanding of concepts, critical thinking and creative thinking using the semantic learning environment is discussed [9].

IRS-EEE presents the effective E-learning environment using concept oriented, ontological content management. The essentials of semantic web are emphasized in [11].

The cost and portability while using laptops for E-learning are high. This paper tries to overcome the cost and time barriers.

3. MODIFIED IRS-EEE ARCHITECTURE

The Modified IRS-EEE Architecture (Figure 2) is based on the semantic structure, promises a powerful approach to satisfy the M-learning requirements. This Semantic architecture of M-learning has four layers such as User Layer (UL), Service Layer (SL), Content Management Layer (CML) and Database Layer (DBL).

The semantic based IRS-EEE architecture [11] is structured to satisfy E-learning requirements, of the user which is tailored to deliver the content through mobile devices result into the **modified IRS-Architecture** is an extension of the IRS-EEE. This architecture has four layers such as User Layer (UL), Service Layer (SL), Content Management Layer (CML) and Database Layer (DBL).

1. *User layer*
        The two types of users of this layer are Provider and student .This system revolves around the users. The user profile is stored and updated whenever needed.

A. Data Provider
        The role of provider in this system is to monitor user's profile, presenting the content, adding and updating the contents, questions, assessment of outcome and learner's performance and tracking the performance of the entire system. Provider has the facility to convert the web pages into compatible mobile device content.

B. Learner
        The learner is the next stage user. The learners are the Persons/Students using advanced cellular phones or smart phones having the link to internet. Using such phones is regarded as more trendy, fashionable and prestigious among the young education by means of mobile devices is gaining efficiency in its design methods.
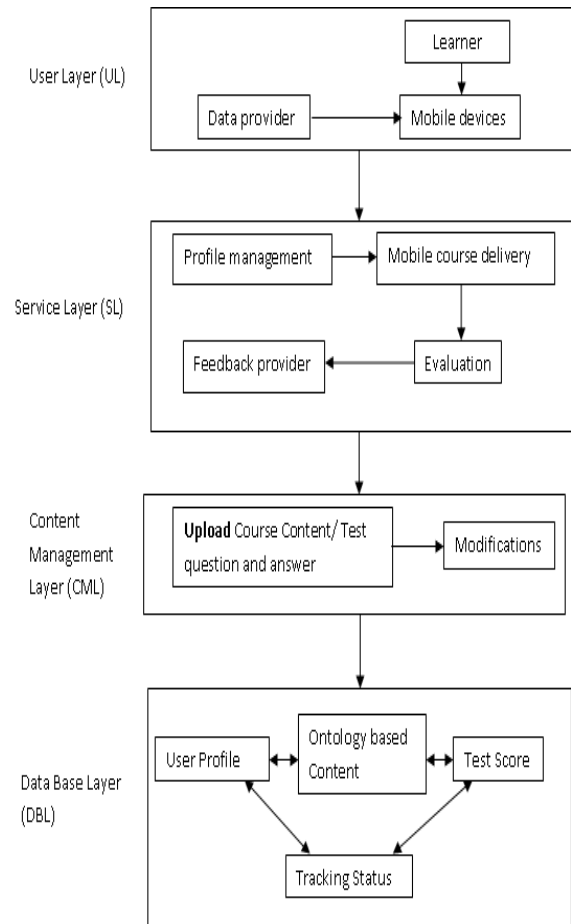

Figure 2. Modified IRS-EEE Architecture

C. Mobile devices
        Typical examples of mobile devices include smart phones, tablets, laptops, and personal media players. We limit our implementation in smart phones and tablets only because they are highly portable (than laptop etc.,) and easy to handle. These mobiles devices have the property to produce unique educational affordances: portability, social interactivity, context sensitivity, connectivity and individuality [4]**.**

2. Service Layer

A. Profile management

The function of the Profile management module is to maintain all the related information about the learners, and there interactions etc. it also, updates and keeps track of the consistency of data by proper updating process.

B. Mobile course delivery

Presently mobile learning is regarded as a core pedagogical activity in higher institution of learning and the instructional technology insist the content transmitted through mobile technology is mostly social, to a lesser extent and economic [6]. The content of a particular concept or sub-concept is observed and learned by the learner. An effective learning environment is provided with the help of ontology and sub-ontology based concepts. The learners should concentrate an assessment before beginning to learn a concept known to be pretest.

C. Evaluation and Feedback Provider

Once the student has finished the course, he/she would take up a post-test. During the test multiple-choice questions related to the topic are presented in slides and answers are gathered using SMS facilities of the mobile phones of the students that are illustrated in Figure 3.The results are compared with pretest to assess the improvement of the user [1] and the skills gained by the user. Test results are Tracked and stored to assess their improvement, and it is used as a measure of input of M-learning. It provides the facility that the learner can give feedback about the presentation of the content and about the ease of access.
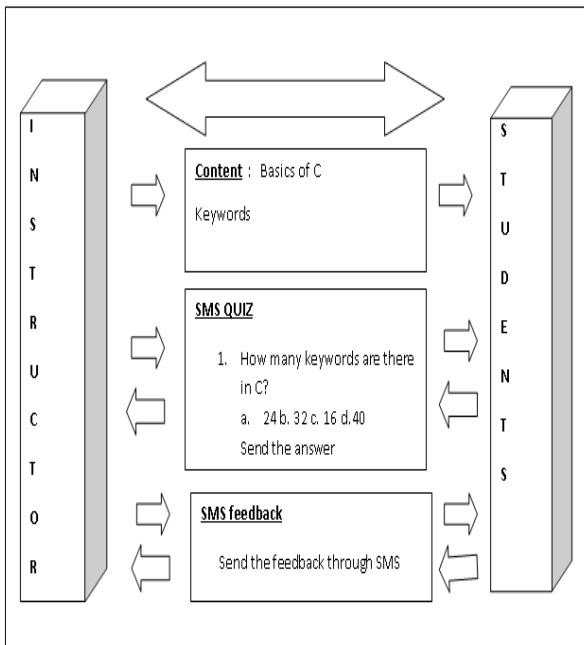

Figure 3. Evaluation and feedback process

The design of CML presents and preserves the hierarchical course structure with their semantic relationship between the concepts.

3. Database layer

The database components of user layer contain all the required information about learners. This layer maintains the databases with users' profile, ontology based content, test score and tracking status of the every learner.

4. EVALUATION AND EXPERIMENTAL RESULTS

The mobile platforms targeted for the study included android, Smartphone platforms provide a mobile web browser with support for HTML5. These direct-touch Smartphone platforms are specifically targeted as they provide a superior user experience compared to non-touch mobile devices. In addition, we need to provide the best possible user experience on mobile to see its confirmation.

The course on CYBER SECURITY is selected as sample course for M-learning to provide awareness of Information Security and give an exposure as a spectrum of security activities, methods, methodologies, and procedure. Our M-learning course includes the topics like security principles, threats, attacks, security models, security policies, overview of authentication, encryption, and certification, security detection, business risk analysis, protection of information assets.

This course is developed and pilot-tested. For this study, Bachelor of Science in computer science students are chosen from different colleges which are geographically distributed from urban, semi-urban and rural colleges of Madurai Kamaraj University and they have participated in this study with the condition that

1. Learner should have knowledge of computers.
2. Learner should have smart phones or tablet Pc linked with internet and sizable storage.

Once the learner enters into modified IRS-EEE he/she has to sign-in and enter his profile. The admin has approved the learner .The learner selects the course. Before the course content is presented there is pretest. The selected course is divided into blocks of related concepts. After careful learning of the concepts to estimate their capture before the course MCQ (Multiple Choice Questions) is given. MCQ assessment is one of the best and often used Formative Assessment tool [7] post-test is conducted to measure the knowledge improvement in the domain and the efficiency of the system.

The efficiency of the system is measured using the parameters like ease of interactivity, independency, instant access, storage and maintenance which are measured against Learners satisfaction in percentage. The results of the study shows the acceptance of mobile learning that is following shown in Figure 4.
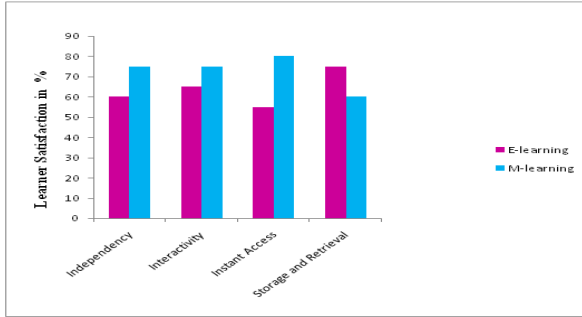
Figure 4. Comparisons of E-learning and M-learning

Compared to traditional learning environment E-learning changes the environment from classroom to computers that to be transferred to just a touch in M-learning.

The new generation prefers much than E-learning for its features like cost effectiveness. Personalization but the system maintenance is less in E-learning than M-learning which is shown in Figure 5.
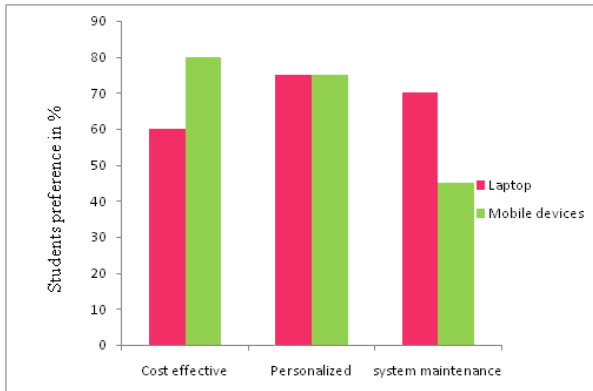

Figure 5. Student Access mobile vs laptops

5. CONCLUSION

As computer and Internet become essential tools for education; technology becomes more mobile, affordable, effective and easy to use. This offers many opportunities to widen participation and access to ICT, particularly the Internet (infoDev, 2010). Mobile devices such as phones and PDAs are much more affordable than desktop computers, and therefore represent a less expensive access to the internet (even if the cost of the connection may be higher) (InfoDev, 2010). The introduction of the Tablet PC can now access mobile internet with much functionality than desktop computers.

Mobile devices can be used anywhere, anytime, including at home, on the train, in hotels-this is invaluable for work-based training.

It is much easier to accommodate several mobile devices in a classroom than several desktop computers.

Future mobile technologies may be able to present textbooks, create database, aid in library utilization, and foster contextual learning. Mobile learning has become an integral part of education in many parts of the world, and new research advances in design and implementation will ensure its increasing importance.

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