Impact of Interactive Multimedia in E-Learning Technologies

Chapter · March 2017

DOI: 10.4018/978-1-5225-2489-2.ch007

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Chapter 7
Impact of Interactive Multimedia in E-Learning Technologies:
Role of Multimedia in E-Learning

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ABSTRACT

Multimedia-based technologies have significant impact on our daily life learning activities as they have shifted the education from teacher centered to learner centered. E-learning provides opportunities to people to take course online and provide a virtual classroom environment on the web through teacher learner interactions, course material distribution based on interactive multimedia. Interactive multimedia offers learners different forms of media to match their learning style, provides personalization of adaptive content delivery which enhanced learners learning effectiveness. In this chapter, we have discussed how information quality can be improved by multimedia based authoring tools and approaches, also identified the negative and positive effects of using interactive multimedia for learners in E-learning. Finally, focus was given on current E-learning multimedia technologies, their research challenges and future trends on social networking based technologies.

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INTRODUCTION

E-learning is one of the important fields of research in education. The purpose of E-learning is to automate education. Various authors agreed on different definition for E-learning. (Ghaleb, 2006) defined an E-learning as a means of education that incorporate self-motivation, communication, efficiency, and technology. (Rosenberg, 2000) defined an E-learning as use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is concerned with use of computer and advance technology to support learning and transfer knowledge to learners by guiding them from basic to advanced concepts in particular domain, as it allows learner to learn anytime, anywhere through various process including web based learning, computer based learning, virtual classrooms and digital collaboration. E-learning is suited to distance based and flexible learning, but also suited in conventional based learning where blended learning plays a major role. In higher educational institutes there is a need to create Virtual Learning Environment (VLE) which combined strategic and tactical planning with management information system to create a managed learning environment with help of consistent user interface as a standard throughout the organization. With the rapid deployment of growing number of universities, as well as newer online-only colleges, have begun to offer a select set of academic degree and certificate programs via the Internet at a wide range of levels and in a wide range of disciplines. Most of the orientation sessions require student to attend classroom sessions or many are delivered completely online. Most of the educational institutes offer online student portal services such as online counseling, advising, online purchasing of text books, e-distance learning, e-newspaper for student through various multimedia modes such as telephonic system, caller Id, video conferencing etc.

E-learning technologies are designed to support learning by encompassing a range of media, tools and environments. With an invention of web based and E-learning technologies the education methodology has been shifted from traditional classroom teaching to virtual or blended learning. Multimedia technologies facilitate the presentation of adaptive learning materials in different forms. These enrichments are effective in delivering personalized learning material, effective learning content to learners based on their preferences, skills and learning characteristics. An important characteristic of E-learning is to provide interactivity with help of interactive multimedia. Interactive multimedia facilitates collaborative creation through project-based learning that provides opportunities for authentic collaboration (Mishra & Ramesh, 2005). Lot of media types like collaborative networking technologies, game-based learning has been developed to enhance learner learning effectiveness and experience.

Knowledge management (KM) and E-learning are recognized as self-contained disciplines as they deals with knowledge capture, sharing, application and generation; contribute to building a continuous E-learning culture and can be decomposed into various learning objects. The major goal of E-learning and knowledge management is to promote learning and knowledge transfer. There are several theoretical approaches for connecting both disciplines. They are described in literature as KM and E-learning integration models (Maier 2016; Schmidt 2005; Islam and Kunifiji 2011; Woelk and Agrawal 2002; Sivakumar 2006; Mason 2013; Ungaretti and Webb 2011). To develop practically applicable integration solution for specific organization it is necessary to understand these integration approaches.

PROBLEM STATEMENT

How to promote learning and transfer of knowledge to different e-learning systems with interactive usage of different multimedia based applications.

OBJECTIVES OF STUDY

The objectives or aims of this chapter is

- To analyze current practices and latest trends in E-learning industry regarding the use of interactive &emerging multimedia technologies as a learning tool.
- To establish relationship between knowledge management and E-learning with respect to various integration models.
- To analyses how the quality of E-learning can be improved by effective multimedia learning tools.
- To identify the positive and negative effects of using interactive multimedia in E-learning as they relate to both learners and developers.

LITERATURE REVIEW

Semantic web is used in E-learning systems for different purposes such as: to control the acquired knowledge of learner, to generate learning path sequence, to developing course material on basis of e-resource content available on web and storing and retrieving the learning material. Various types of interactive e-learning system have been developed on basis of interactive multimedia. The effectiveness

of Intelligent Tutoring System (ITS) and Adaptive Hypermedia System (AHS) for multimedia content delivery analyzed by adaptive learning.

Learners ability can be characterized on basis of learners Visual, Auditory or Kinesthetic ability to absorb and process the information. Visual learning is based on gathering information from visual media i.e. charts, diagrams, maps, slides etc. Auditory learning comprise of listening lectures, discussions etc. and kinesthetic is based on practical experience. Activity theory is applicable to E-learning and interactive multimedia which states that learners use interactive multimedia as tool to interact with the world to achieve their goals in work place (Benson & Whitworth, 2007).

Interactive multimedia promotes motivation, which accelerates learning and provides manipulative experiences which are unavailable in regular classroom environment (Aldrich, 2005; Jackson, 2007).

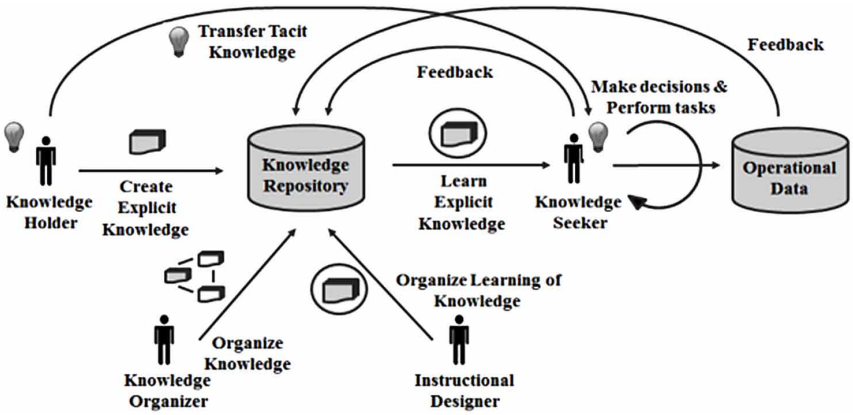
A platform called eMUSE has been developed based on social media and integrated learning environment for collaborative learning which integrates learner tracking functionality, visualization feature and evaluation system support (Popescu, 2012).

There are various approaches to train learners like game based, digital-modeling based learning. Some researchers investigates how lower level students get trained and learned by modeling skills in mathematics through a multiplayer based online game (Araya et al., 2013). A system called DigiMina developed for self and peer assessment of instructors digital competencies based on performance indicators (Poldeja et al., 2012). Interactive multimedia identified path sequences for different activities of learners based on GUI and supports a hybrid recommendation system to recommend learning items based on discovery or filtering and identification of common learning sequence approach during the learning process.

In order to establish the relationship between knowledge management and E-learning some integration models has been suggested by various researchers.

Woelk's and Agarwal's (2013) model helps to understand the E-learning and KM technology integration capabilities with the aim to capture, organize, and deliver traditional courses and large bodies of knowledge. Knowledge management can be analyzed for understanding the role of knowledge management life cycle and the knowledge flow in the organization. Model is based on Nonaka and Takenuchi SECI model (1995) of knowledge conversion with four phases - socialization, externalization, combination and internalization 16. Two more phases are added to SECI model - cognition and feedback. For each of the knowledge management phase e-learning technologies are providing their own improvements. Knowledge management phases with e-Learning enhancements are shown in Fig 1. Knowledge Holder can create explicit knowledge and store it in a knowledge repository or transfer his tacit knowledge to Knowledge Seeker through socialization. The Knowledge Organizer and Instructional Designer are persons or software programs.

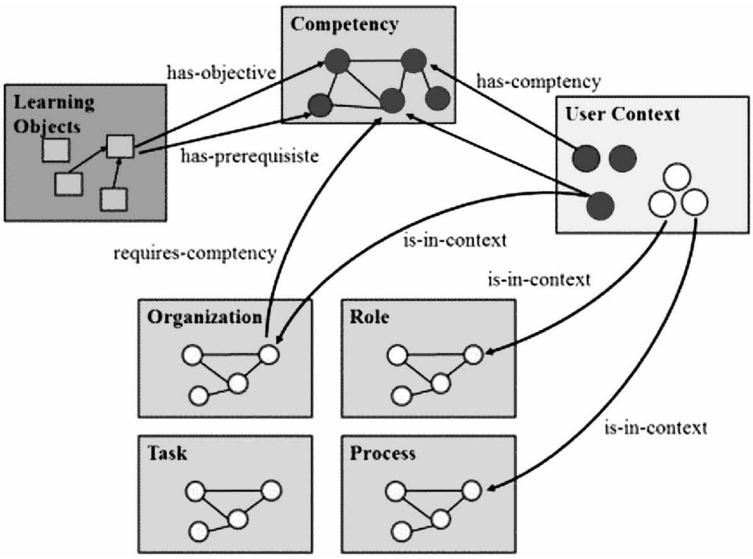
Figure 1. Knowledge management with E-learning enhancements



The Knowledge Organizer is responsible for linking knowledge bodies or other improvements. The Instructional Designer is responsible for preparing knowledge for learning needs by adding assessments and assignments. The Knowledge Seeker gains the explicit knowledge by selecting them from knowledge repository. The Knowledge Seeker uses his knowledge to make decisions and perform tasks. Work performance of knowledge seeker can be measured and returned to knowledge repository as feedback.

Schmidt (2005) believes that both knowledge management and e-learning solves a fundamental problem – encourages learning in organization. However, for the solution of the problem two different paradigms are used that lead to two different types of system use. Reason of the isolation is explained by the lack of attention to the context of employees involved in learning. For practical usage, the employee's context can be described by the personal (current competencies, objectives, desired interactivity), organization (department, role, business processes) and technical specifications (operating system, applications, bandwidth). Learning objects are bind with the user's context using competences from competency catalog (see Figure 2). Competences and individual context are linked directly (as the existing competences and future planned) and indirectly (by linking the organization contextual elements with the competency requirements). Learning objects are described by their objectives (which are described as competencies that are acquired as a result of successful training) and prerequisites (which describe the competencies needed for successful learning). This model demonstrates KM and E-learning integration by using user/learner context as connecting platform. Both KM and E-learning are seen as equally important disciplines. Model has been implemented in some prototype environments and shows relatively high user acceptance. Evaluation of this model

Figure 2. Relationship between Context and Learning resources



shows that this blend of e-learning and knowledge management functionality can help to improve workplace learning. For practical implementation, organization must support general user context management services to deal with user context acquisition and management tasks.

The main interest of Sivakumar (2006) research is the dissemination of knowledge in the organization and how this may be improved with specially adapted e-learning system. For different types of knowledge (tacit and explicit) dissemination it is necessary to choose the appropriate technology, the pedagogical method, the type of communication, interaction and learning styles. E-learning environment development in organization must comply with the three aspects of the design - a technical solution, communication and interaction between the organization and design of training. For each of these aspects certain pedagogical approaches and learning styles need to be selected in accordance with organization's needs and knowledge types. In order to effectively meet the needs of geographically distributed employees, e-learning system providers should provide support for all four Nonaka and Takenuchi SECI model knowledge conversion phases. They also need to adjust the e-course content, teaching methods, architecture and training delivery methods used in their systems. In accordance of this model, integrated e-learning system design framework for knowledge dissemination in the organization must: Promote close interaction between staff, using synchronous and asynchronous communication; Incorporate pedagogical approaches that encourage active, collaborative, self-paced

e-learning for explicit-tacit (explicit) knowledge conversion; Implement effective online mentoring forms for tacit-tacit (explicit) knowledge conversion; Integrate existing employee communication channels to organize practitioners, experts and mentors communications.

Maier un Schmidt (2013) propose integration of E-learning and KM on the basis of a process that explicitly aims at designing the transitions of knowledge along varying degrees of maturity. The authors indicated the following barriers to the successful integration of E-learning and KM: Different fundamental approaches. E-learning is rooted in psychology, didactic and pedagogy, emphasizing importance of structured and personal guidance. In turn, knowledge management focuses on the organization's memory or knowledge base, where individual's knowledge must be transferred and made explicit; Fragmented ICT environment. Organizations use a wide range of systems to improve the knowledge and learning processes. Employees are working in fragmented environment and each system provides only a certain part of the learning and knowledge processes; Fragmented organizational structure. Knowledge and learning processes are distributed among the organization's departments, such as human resources, e-learning, knowledge, innovation, and quality control departments. However, disciplines are using knowledge bodies with different levels of maturity. Maier and Schmidt offered the use of knowledge maturation process as a conceptual framework for organizations to undertake necessary integration processes. Knowledge maturation process is presented as a conceptual model to analyze and explain the disruptions in the organization-individual knowledge flow.

Mason (2013) proposed InterCog sense-making model (ISMM) for analysis and understanding common areas of e-learning and knowledge management. The model can be used to create a strategic approach for planning, development, implementation and use of e-learning standards. This may be achieved by describing e-learning and knowledge management common "problem area" with very general and simple concepts. The main emphasis is placed on interrelationship of learning, knowledge and thinking.

In accordance with personalized learning model proposed by Irfan & Shaikh (2008) e-learning can take place via either explicit or tacit knowledge. Islam & Kunifuji (2011) offers to increase efficiency of e-learning systems by supplementing personalized learning model with knowledge management knowledge conversion methods to convert tacit knowledge to explicit. This approach is described as a theoretical model for knowledge management adoption for e-learning system. Term "adoption" here is understood as the application of certain techniques, i.e. conversion tacit knowledge into explicit knowledge. In the KM an E-learning adoption model knowledge creation, acquisition, evaluation and feedback are displayed as tacit knowledge with corresponding conversion to explicit knowledge. On the other part,

knowledge organization, storage, dissemination and retrieval is shown as explicit knowledge, which can be converted to tacit knowledge.

Ungaretti and Tillberg-Webb (2011) suppose that knowledge management and e-learning are important components of learning allowing integration of both disciplines. Learning may be common ground where KM and EL distinct theoretical approaches can be combined and complement each other. For this goal Dynamic learning system (DLS) model is proposed by combining three components – knowledge management, e-learning and assurance of learning

(AoL). Assurance of learning is described as systemic, intentional process that identifies desired learning and provides a process to measure its achievement and the improvement of both the learning and the process to attain it. AoL is also known as learning outcomes assessment, assessment, the outcomes assessment movement, assessing student learning, assurance of learning. Assurance relates to systemic and multidimensional nature of process – it is not limited to assessment of learning results. Dynamic learning system model is composed from common elements of knowledge management, e-learning and assurance of learning value chains, divided into four groups/ phases: Institutional-level analysis and goal setting; Individual/ group-level needs analysis; Knowledge/ learning design and distribution and Knowledge/ learning increase measurements and analysis.

Each of these three disciplines has their primary goals. KM is focused on organization-level knowledge formed by individuals. EL main aspect is individual learners while considering impact on whole organization. Assurance of learning is focused on achieving certain business goals aligning this with data management, externalization of tacit knowledge, individual learning with explicit knowledge, etc. Together they allow the organization to develop a systemic approach to knowledge and learning. Important part of DLS is evaluation that measures impact to organization produced by KM and EL. In this phase, learning outcomes are analyzed in the level of learning program or organization. Results may suggest improvements for learning system. In that way closed organization's development circle is formed. Main targets of KM systems are on what tacit and explicit knowledge is and how it will be managed: created, organized, shared, preserved, gathered, captured, etc.

Various researchers have identified different models for KM and E-learning integration in the analysed literature as shown in Figure 3.

Analysis of these models showed usage of both approaches – integration (both disciplines are seen as equal) and adoption (approaches and techniques when one discipline is used to enhance other). Adoption approach was used in both directions – EL techniques may be applied in KM and KM approaches may be used to enhance e-learning. Integration approach is looking for common ground of knowledge management and e-learning. Several authors identified learning as a common ground, however they proposed to use additional component (like context,

Figure 3. Comparison of KM and E-learning integrated models

Nr.	Author	Integration model	Practically applied	Description
1.	Woelk, Agarwal	KM and EL technology integration model	Partly	Theoretical model; KM enhanced with EL technologies; Applied to some real world scenarios; Lack applicability support.
2.	Schmidt	KM and EL integration using context-aware corporate learning	Yes	Practical model; KM and EL integration based on user context; Implemented in prototype environment; Need applicability support for generic user context management functionality.
3.	Sivakumar	An integrated EL system-design framework for knowledge dissemination	No	Theoretical model; EL system development based on knowledge type conversion; Lack importance and criticality assessments for system design factors. Need further elaboration and validation.
4.	Maier, Schmidt	Knowledge maturing conceptual process model for integrating EL and KM	No	Theoretical model; KM and EL integration based on knowledge maturity process; Need further applicability support, elaboration and validation.
5.	Mason	InterCog sense-making model	No	Theoretical model; KM and EL integration by adding dimension of knowing; Need applicability support.
6.	Islam, Kunifuji	KM and EL adoption model	No	Theoretical model; Adopt KM approaches to EL to enhance EL performance; Need applicability support, verification and testing.
7.	Ungaretti, Tillberg-Webb	Dynamic learnings system model	No	Theoretical model; KM and EL integration by adding assurance of learning; Need applicability support, elaboration and validation.

knowledge maturity level and assurance of learning) for integration of KM and EL. Dynamic learning system model is best example to base integration on learning as common ground. However, assurance of learning is approach specific to academic environment and it may be problematic to implement it in business environment.

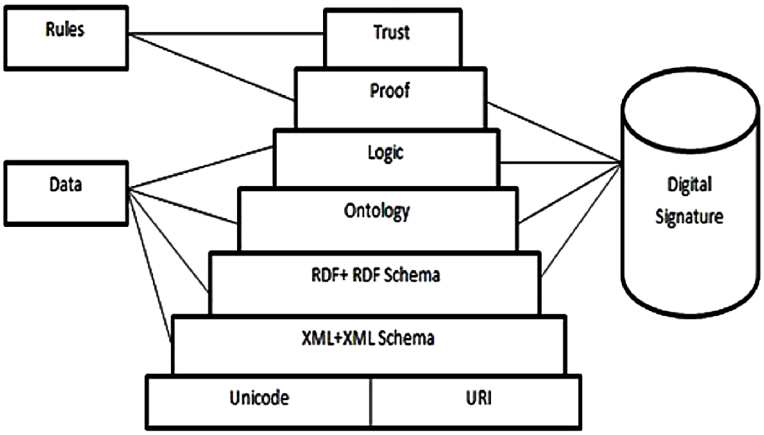
ANALYSIS OF SEMANTIC WEB AND ITS KNOWLEDGE BASED SERVICES

The semantic web is the future generation of web comprises of set of language and standards. It is the extension of the current web, in which information is given well-defined meaning, better enabling computer and people to work in cooperation. The basic aim of semantic web is to create a layer on web that enables automatic processing of dynamic web content so that data can be shared and processed by both humans and software. Semantic web technology will facilitate the intelligent search, structural and semantic definition of documents, query answering instead of information retrieval and provide customize view to documents via ontology mappings with help of its customized architecture.

Architecture of Semantic Web

The semantic web architecture comprised of seven layers. It has been developed step by step with each step building a layer on top of others. A layer in layered semantic web architecture as shown in Figure 4 follows the principle of downward

Figure 4. Description about Semantic web Architecture



compatibility and upward partial understanding. The first layer is URI (Uniform Resource Identifier) and Unicode, the URI is uniquely identifier used to identify the resources. Unicode is standard of encoding international character set and allows all human centric languages to be used on the web. The second layer includes XML (Extensible Mark-up Language) that can be used to write structured web documents with user defined vocabulary. An XML document contains element that can be nested and may have attribute and content. The next layer is composed of RDF (Resource Description Framework) to describe the resource and RDF Schema (RDF-S). The next layer is Ontology vocabulary representing more powerful ontology languages for domain knowledge representation and relationship between web objects. The logic layer represents the further enhancement of ontology languages to allow the writing of application specific declarative languages. The actual deductive process as well as representation of proofs in web language from lower layer and proof validation is involved in next layer. From use of digital signatures and other kind of recommended knowledge or rating of trusted agent and certification agencies, the trust layer is emerged. SWRL (Semantic Web Rule Language) is an extension of OWL that supports Horn rules. It is combination of both OWL-DL and OWL-Lite in which OWL-DL descriptions are used in both head and body of rule.

Functions of Web Services for Knowledge Management

Web services are a kind of framework for creating services for users over the World Wide Web. Web Services consists of three functions: publishing, finding and binding. The service provider describes all the details necessary to interact with service, provide message format that based on standards and formal XML notations with

help of Web Service Description Language (WSDL). Then provider publishes the web service with a service registry using a standard called Universal Description Discovery and Integration (UDDI). The semantic web adds annotations to web service description to facilitate operations like service discovery, publishing, selection, composition, invocation, monitoring and ontology management (Cabral, Domingue, 2004). Different types of operations utilize different functionalities of web services.

Semantic web services are self-sufficient, reliable, supports software reusability which can be used to fulfill a particular task.

Service discovery locates appropriate web services needed to fulfill a given request. Service features include inputs and outputs of the service and also the precondition for running the service and effects of running the service on world. Precondition and input features should be satisfied before service invocation and effect and output features will be satisfied after service invocation. Semantic service discovery can be performed in different ways depending on the service description language, means of service selection and coordination between separate entities. UDDI is a mechanism for recording and discovering web services. It permits how services interact with each other. A web service discovery process can be carried out in three ways; first step is the advertisement on the web, Services by developers, in second step web service is requested by user through some repository, the final step is to select and invocation of retrieved web services. Discovery of Web service mainly depends on how user requirements can be interpreted and how they are matched with available services. Discovery enables flexible matchmaking between service descriptor and requests by using descriptor logics which preferred DAML and OIL languages. Peer to Peer systems support decentralized discovery in which web services are indexed based on the keywords being described. Discovery framework covers the entire task from service mediation, selection and considered as best matchmaker to service invocation.

Service publishing will allow agents or application to discover services based on its goals and capabilities. Service selection is required if there is more than one service matching the request. Non-functional attributes like cost or quality can be used for choosing a service. In agent type of interaction a negotiation process can be started between a requester and provider but for them the service must themselves be knowledge based. Selection of services is based on quality of services, adaptation of context, matchmaking, ontology prediction and agent system. Various types of filtering and different models with specific languages like XSLT, DAML-S and SOAP preferred by several authors to achieve QoS and related parameters. Client requests for service which is selected by service selectors from a repository of services where different web services are stored. After getting feedback from client, repository of non-functional parameters analyzed with desired web services and stored them back in Service repository for better and efficient selection of services.

A response arrived to the service requester to invoke client if desired query feedback is solved on the basis of QoS.

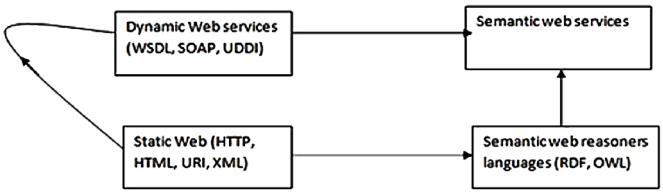
Service composition is required when a single service is not able to produce the desired result for user, so this operation composes atomic services to create a new composite service to fulfill the desired needs. Service composition life cycle involves following phases to improve end to end service composition. It includes specification, planning, validation, discovery, execution and monitoring. Service provider proposes web services to use; service requester consumes information or service offered by a service provider. The translator converts or translates the outward language used by participants, and internal languages used by service generator. If more than one plan found validated validates and evaluates all plans and proposes the best plan for execution. The execution engine executes the plan and returns the result of the service provider. The necessity of composition is to provide validated web service to use on the basis of service specifications mentioned by them. Different web engines are required to execute user requests. Only the translator predicts the internal service specifications and provides to the user as the result in xml or rdf formats.

The purpose of service invocation is to validate the input against the ontology type and invoke the service on basis of required parameters. Service matchmaking takes the form of matching appropriate web services based on syntax and semantic matching. In syntactic matching textual comparison or presence of keyword in the text is matched with known information, whereas in semantic matching relationship between the elements is matched with structured data. Use scenarios like prototyping and composition matchmaking allow searching for services on demand. Various matchmaking approaches like SHADE and FIPA operate over logic based structured text language like open-math and XML. Various matching algorithms are adopted in the context of semantic web services like syntax and ontological match, an algebraic equivalence match, value substitution match and decomposition.

Service monitoring assists during the execution of composite task and give feedback in form of alert to composition agents so that they will adapt to new situation if changes are required The advantage of such monitoring is it can give feedback to the execution or composition agents and they will be able to adapt to the new situation if changes are required.

Ontology management guarantee that semantic web descriptions are created accessed and reused within the semantic web. Ontology describes in the knowledge representation about a specific domain. Relationship among classes and objects is used for semantic composition of services inOntology domain.

Figure 5. realization of semantic web services with web



MULTIMEDIA AND ITS KNOWLEDGE MANAGEMENT FOR E-LEARNING SYSTEMS

Multimedia is powerful tool for making presentations, slides, charts, maps etc. in the field of E-learning. To enhance the educational experience, and deliver the learning material to learners based on sequence of learner's response and request, multimedia applications are used. Multimedia can provide an enhanced or augmented learning experience at low cost per unit through exploration, discovery and experience. With multimedia the communication between instructor and learner can be done in more effective manner and enable the instructor to represent the information in various media like sound, videos, animations, text and images. Multimedia learning tools enable learners to represent information using several different media. Hypermedia based adaptive systems allows learners to organize information in meaningful ways which involves theme based activities, open book assignments, etc. With an invention of multimedia based learning authoring tools learners are motivated to create quality product by taking strong decisions and execution skills.

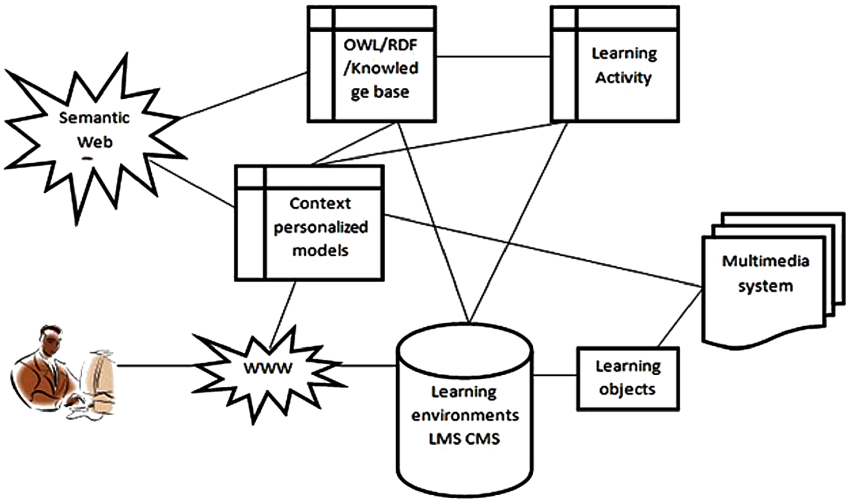
As shown in Figure 6 Multimedia based e-learning system where users interact with semantic web with help of personalized models which correlated with knowledge base and ontology structures. Different types of learning activities are associated with management systems like LMS, CMS etc. which relates individual learning objects to multimedia systems. These systems engaged learning activities according to context of individual needs and preferences.

Advantages and Disadvantages of E-learning

E-learning has various distinct advantages over other learning or conventional approaches like Personality, Flexibility, Interoperability, Collaboration, Source sharing, Reusability, Cost and time effectiveness and performance evaluation.

- **Personality:** The most important feature of E-learning is personalization as it allows selection of learning material according to knowledge level of learner,

Figure 6. Multimedia based e-learning system



preferences, skills and according to their needs provide intended learning material to them.

- **Flexibility:** Variety of learning materials which can be shared and provide add on to developer as ability to add, remove and update the learning material content at any time.
- **Interoperability:** Variety of learning standards allows building new contents with different learning style and can be used as platform independent by various users.
- **Collaboration:** Learner's collaborate together in a group or individual according to their convenience through e-mail, chats, and forums to discuss learning standards and intractability.
- **Source Sharing:** Learning resource or material content available on the web has to share knowledge with peers. Various learners are engaged to demonstrate their concept understanding with peers to reflect their thinking processes.
- **Reusability:** The learning content based on different learning styles can be used without redesign, reconstruction in multiple applications and platforms. Similar concepts can be restructured and reused with adaptive methodology.
- **Cost and Time Effectiveness:** The E-learning tools, methods are much time effective and less costlier than traditional learning. It allows learner to learn anytime, anywhere with any modes.

- **Performance Evaluation:** E-learning has measurable assessments which can be used to evaluate learner's acquired knowledge and performance upon completion of course.

The feeling of isolation experienced by distance learning students is also often cited, although discussion forums and other computer-based communication can in fact help ameliorate this and in particular can often encourage students to meet face-to-face, although meeting face-to-face is often not possible due to the disarray of student's physical locality. Discussion groups can also be formed on-line. Human interaction, faculty-to-student as well as student-to-student, should be encouraged in any form.

E-learning tends to work better for the student when the topic matter consists of self-learned items. When much group collaboration is required, E-learning can cause lag times in collaborative feedback if the students are not disciplined. For example, some student's may only check their online agenda once a week, or even less, making it impossible to achieve goals. Web and software development can be expensive as can systems specifically geared for E-learning. The development of adaptive materials is also much more time-consuming than that of non-adaptive ones.

Multimedia and Knowledge Based E-learning Tools

Now a day, many commercialized and personalized multimedia based E-learning tools available in education sector. These tools can provide training and educating a large number of learners with diverse cultural background and provide sufficient amount of learning content to them based on their knowledge level, preferences, skills and their desired needs. There are varieties of E-learning tools like MOODLE, Blackboard, CMS, WebCT, Udutu and Dokeos etc. available in market for delivering and managing online learning content.

A Course Management System (CMS) is a web based system with back end support feature of database. It assists instructors in obtaining resources on web for learners and to facilitate the management of course activities and tasks. There are mainly three strengths of web based course management system i.e. accessibility of course resources to students, proper time to time communication between instructor and learner and reduction of paper usage by enabling online learning systems. The strength of CMS is a security and privacy. CMS system enabled student access controlled to activities and tasks. It protects the instructor intellectual properties. Student privacy and copyright material has been protected from hackers and crackers. The intended course content is released and updated on timely basis with help of CMS.

Moodle is a web based learning management system used in education, training and knowledge management. It helps instructor and learners as a tool to provide in

creation of quality teaching and learning. Moodle stands for modular object oriented dynamic learning environment. It is easy to install, configure and reuse. It can be installed on many servers and work in different execution platforms without any requires modifications. Moodle supports user authentication in which instructors and students are allowed to log into system with help of username and password to provide security protection mechanism. It has facility to conduct surveys and supports built in template format for questionnaire. Different type of questions has been asked by system to assess the knowledge level of learners at different level of interest. Apart from all these, there are varieties of advantages of the communication in Moodle.

Moodle avoids regularly reminding and repeating learners during lectures. It has been used to provide immediate response to learner queries and issues and solve them with help of messages. It encourages learners to give sufficient time to courses outside the classroom. Very helpful in saving time spent on writing questions which are of long length. The most advantageous thing about Moodle is Just in time delivery of lectures and downloading of course content has been on demand as required by learners. Open house discussion on course topic has been facilitated easily with help of Moodle.

Blackboard is a hybrid kind of instructor tool. It can be used by instructors throughout the lecture sessions to discuss important ideas and brief on main points. It can be useful tool to help learners to visualize their key aspects and learning features of chapters but if like conventional learning in a classroom teaching, if instructor attempt to teach large group them it will be failure to do so. Blackboard comprised of lot of tools like tests, surveys, assignments, software considerations as technical usage, control over quiz and assessment pattern, grading, reporting and alternative form of assessments. There are numerous advantages of blackboard learning system like integrating assessments with teaching material, the learning content has been available on demand basis, it is mainly used to select randomized questions from list of allotted questions. There are several disadvantages of blackboard like it is not desired for testing of all skills and activities of learner regarding the course topic which they studied. Some IT skills need to be incorporated to support fundamental mechanism of blackboard. The biggest hurdle is time require to design questions which is more costly and input requirement is large compared to other learning systems. As per security aspects, it is more vulnerable to security attacks compared to Moodle and other systems. In comparison to functionality, blackboard is far better than Moodle as it permits greater flexibility in designing the course curriculum for regular terms and maintain the study schedule as per learner requirement to continue the education course in successive manner.

Dokeos 2.0 is a web learning based application which is used to manage online courses. It is mainly SCORM compliant, reliable, light weighted and secured

application. It supports different kinds of learning and collaboration activities. Instructors can easily create, manage and publish their course content over the web.

ROLE OF ITS AND KNOWLEDGE MANAGEMENT IN E-LEARNING

An Intelligent Tutoring System (ITS) is a computer system which provides personalized learning content to students based on their performance, needs and background knowledge. ITS may be defined as computer based instructional system with models of instruction content that specify learning strategies i.e. what to teach and how to teach. ITS is web based learning system which are used to teach wide range of topics based on personalized learning.

Knowledge management and training are integral and closely associated parts within a single framework. Knowledge management allows effective control and management of the corporate memory – the knowledge that is within the organization. As a result of corporate knowledge, a virtual classroom evolves, which in addition to the classic "live training program" makes a dialog / interaction possible despite "distance learning." For example the interaction of virtual teams and how they can process information together. Especially the exchange of experience and interaction in form of chats, discussion forums is one of the most efficient ways

of informal training. On the other hand corporate memory that has been collected, managed, organized and has been made accessible to everyone within the company through a KM program, could work proactively pushing knowledge and new information to interested parties (alerting) so that they could better accomplish their job. The training is provided through 4 different media: User Guides (available on knowledge management community of practice), FAQ documents, CBTs and Digital Library.

Computer Based Learning

Computer based learning is commonly abbreviated as CBL, which refers to the use of computer as a key component of the educational course systems. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes. The concept is generally seen as being distinct from the use of computers in ways where learning is at least a peripheral element of the experience (e.g. computer games and web browsing). Common types of Computer Based Learning include CBTs, asynchronous online discussions, or synchronous interactions.

Computer Based Training

Computer-based training (CBT) services are where a student learns by executing special training programs on a computer relating to their occupation. CBT is especially effective for training people to use computer applications because the CBT program can be integrated with the applications so that students can practice using the application as they learn.

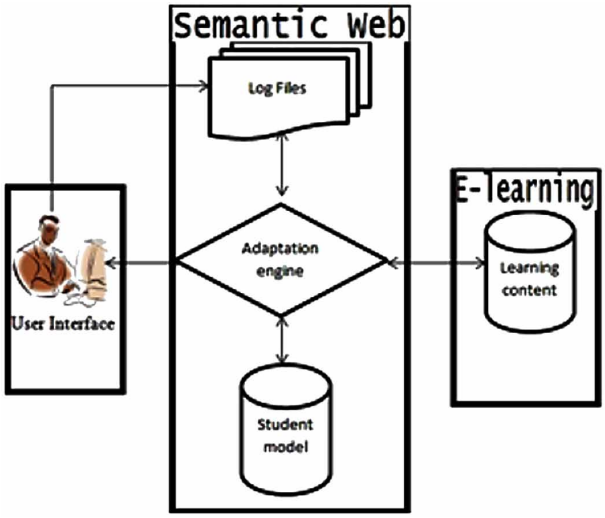
Variety of modules has been integrated into ITS to enable the flexible and efficient delivery of learning materials. They have evaluated the learner on the basis of their skills and requirement of knowledge needs and preferences. Variety of applications has been integrated with ITS to provide flexible, interoperable, secure, plagiarism free environment to support more number of learning web based solutions.

The ITS consist of user interface, the learning content, student model and adaptation engine.

The functionality of ITS can be expressed as:

The user interface delivers the learning content to the student and accepts the students' responses to the questions posed by the ITS. Based on the nature of the ITS, the learning content can be delivered as text, voice, simulation or interactive games. The user interface can be a mobile device (PDA, Mobile, and Laptop) or a desktop. The students' interaction with the ITS, such as response to questions, number of attempts and time taken for various activities (responding, reading and others) is captured in the log file. The log file used to create student model. The learning content of the ITS is stored in a database as topics. The topics are divided into

Figure 7. ITS architecture



learning units to enable the teaching of a specific concept or a fact. Misconceptions and common wrong answers of each learning unit are stored in the database.

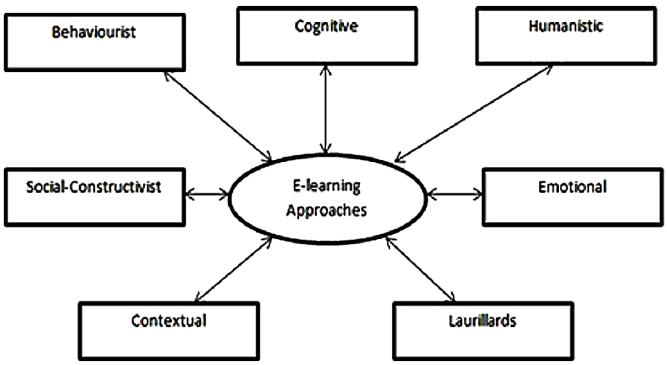
The learning units can be explanations, examples, hints, quizzes, questions and they can be used to teach, demonstrate or test the students. The student model contains general information about student their skills, goals, background knowledge, plans, learning styles and characteristics.

The adaptation engine is an algorithm to select (adapt) the learning content based on the student's input from the user interface (response to the question) and the information from the student model. In ITS, if a student registers for the first time, general information like age, gender and background are collected and stored in the student model. Based on the student's request, the learning content that matches the student's profile is provided in the user interface. The student then interacts with the ITS by solving problems, or playing games or by other ways of interaction. The student's interaction with the ITS is stored in the log file, which is analyzed to identify the student's performance and preferences and is stored in the student model. The adaption engine in ITS tailors the learning content based on the student's request and the data from his/her profile. For example, if the ITS detects that the student has a misconception on a learning unit, the ITS can suggest that the student redo the current learning unit, or redo the previous learning unit or resolve the misconception using remedial content.

Pedagogical Approaches for E-Learning

Learning theory or methodology based upon accepted theories as to how people learn (Aimeur & Frasson, 1996). Not every person learns the material in same way according to given situation, so lot of variants of theories are required to cover specific types of individuals and learning situations. To create such type of E-learning content various pedagogical approaches are need to be evaluated. Simple pedagogical approach can create content easily but lacks flexibility, productivity and purpose behind creation. Complex approaches provide better learning experiences for learners but they require extra effort and time to build system. To incorporate these features there is a need to use various pedagogical approaches for E-learning which includes behaviourist perspective, cognitivist perspective, emotional perspective, contextual perspective, laurillards conversational approach, humanistic approach and social-constructivist approach.

Figure 8. Shows E-learning approaches



E-Learning Problems

Most of the author focused on various e-learning problems classified as learning path generation (LPG), object recommendation (OR), personalization of content (POC), Context learning problem (CLP), Information retrieval (IR), Domain Ontology construction (DOC), Classification of learning styles (CLS).

LPG focused on providing sequence of learning object materials to learners (Helic et al., 2005). OR system advised learner to choose most desired learning object (Wang et al., 2007). POC specifies what learning objects are needed for course established for specific learner requiring a specific subject. CLS is performed on the basis of learner's interest, background knowledge, mental level, skills and preferences (Li and Park, 2007). CLP describes the availability of learning materials from difference courses for different learner at the same time. IR is activity of obtaining intended course from collection of different courses as per need of learner (Chang, 2002). DOC provides best possible information to learner on basis of hypertext structure.

EMERGING MULTIMEDIA TECHNOLOGIES FOR E-LEARNING

Multimedia technologies are used to enhance content visualization, collaborative network technologies and user interaction with help of digital media. The integration of multimedia is key role in present E-learning technologies. Multimedia based technologies induces dynamic course content delivery anytime anywhere, improves learner learning effectiveness and experience based on learning content. Variety of media in form of audio, videos, animation etc. supports E-learning whose purpose is to provide channels for delivery of various forms of learning content.

Now a day communication technologies, social networking, Gaming and virtual learning act as a medium for E-learning. In case of communication technologies electronic gadgets like mobile devices, PDA, laptop etc. provides more convenient way for instructor and learner to interact and collaborate with each other.

Communication technology based media facilitates accessibility, interactivity, adaptive, permanent and situation based learning. The hybridization of communication devices with help of ubiquitous and pervasive computing enrich E-learning environment where learner can use his gadget anywhere for their personalized learning environments. Based on collaborative tools, assessment of learner has been done and if learner can correctly answer the questions they receive further information about course.

Social networking plays a major role in E-learning. It uses internet and mobile networks as communication medium for maintaining social groups and communities like Facebook, Twitter, and Instagram where information sharing and interaction among learner takes place. With growth of such online communities learners are engaged to discuss, formulate and share information based on their experiences. Use of social media strengthens the collaboration and interaction among learner easily with help of multimedia learning tools.

Third important medium called game based learning motivates students to learn new skills with help of gaming and visual effects. This kind of learning is supported by different computing technologies like Human Computer Interaction (HCI), Ubiquitous and Pervasive computing etc. The intent is to turn learning process into visual oriented, entertainment driven, and interacted one which facilitate students to gain insights of learning. There are various criteria's for evaluating the quality in E-learning like explicit pedagogical design principles appropriate to learner types, need and context must be clear and high level of interactivity.

Multimedia Content

Student learning performance and effectiveness can be improved by providing appropriate learning content to them. Multimedia content available in different forms like audio, video, images and animations. Various web based E-learning systems like Moodle, Blackboard, Dokeos conduct online quizzes, test assessment, distribution of learning content to students. Based on pre and post-test analysis, it was observed that learners self-efficacy, personalized learning ability, interactivity and multimodal instructions are dominating factor to learning effectiveness. To enable interactivity video based learning has been formalized which generate learning content in multimodal forms helping students to visualize concept easily. Virtual learning provides graphical simulation environments with dynamic learning content to students. Multimedia instruction requires communication standards to

formulate and produce learning content. Different types of authoring tools are available to construct multimedia information based learning content. SCORM and IMS is popular standard for content authorization, student assessment and schedule learning content delivery to students. Various kind of learning path sequences has been provided to students based on their skills and background experience which motivates them to enhance their learning effectiveness.

Positive Significance of Multimedia on Learners

Interactive multimedia provides several benefits for learners enable them to use multimedia based information content in form of audio, video, images and animations. Interactive multimedia enhance motivation, which accelerates learning power of learners; enables knowledge transfer through retention and provides manipulative experiences unavailable in normal classroom environment (Aldrich, 2005; Jackson, 2007). Effective learning occurs when learner interacts with multimedia content and on basis of activity feedback which they performed to improve their skills. E-learning needs to encourage learner motivation by providing depth learning experience to them and enable knowledge transfer among efficient learners. E-learning is blind to racial, cultural and sexual differences as it offers no more or less learning support to any individual. It promotes disinhibition which enables learners to express themselves openly. It promotes the interaction of shy people because they are more comfort when they have space and time. The accessibility of E-learning content has biggest impact on learners so they can access learning at their own convenience.

Negative Significance of Multimedia on Learners

Interactive multimedia has negative implications on the learners which include the problems resulting from self-guidance, diminished media richness and issues regarding technology compatibility. Variations on learner preferences like lack of self-directed learning, unclear objectives may result in a hesitancy and reluctance to learn among them. Due to instructional systems, E-learning may be time consuming for learners and sometimes due to lack of experience beginners take poor decision to proceed with given information. Media richness associated with face to face communication diminishes when communication goes electronically. It can be resolved by using multimedia content as adding visual to text. If learner gets distracted due to information available on the web or in online environment then desired animated software enhance their interactive skills and provide fun learning environment for others. Lots of technical issues are involved in interactive multimedia as lots of software are required to play multimedia files and computer capabilities affect online speed in web that prevent learners from accessing multimedia efficiently.

Multimedia Based Educational Programs

In education sector, variety of educational programs have been developed and implemented to identify the problems or trouble those are faced by learner and provide better and optimal solutions for them. The combination of multimedia content and distinguished methodologies are used to solve out such issues which academic society is facing now a days. There are various multimedia based educational programs run by several nations to spread awareness among learners and their guardians to improve the literacy rate which can be achieved only when we deliver or impart right education at right time. Here, we have discussed various educational programs like HEADS UP, WIT, ACALPA, KAD and TiM.

HEADS UP stands for Health education and discovering science while unlocking potential. The main purpose of this program is to aware Non-Asian minority students of schools and the goal is to develop their interest in health sciences and motivate them to choose medical science as their career goal options. Various multimedia based technology used in such programs like various lectures and history of scientist from medical health sector, different graphical and animated activities to increase awareness among learners, implant and usage of customized web resources, feedback taken from instructor on the resources available for students.

WIT stands for William Instructional Technology. This program spread awareness among summer interns working on government funded project. The goal of this program is to develop high quality multimedia application based project, which helps instructor to teach course contents to learners according to their needs. The multimedia technology used in this program will be to print publications for advertising WIT as per need, different types of standalone presentations and share individuals experiences with each other, organize digital workshops for the learners to customize their work during training.

ACALPA stands for Affective Computer Aided Learning Platform for Children with Autism. This program is applicable for students who suffered from Autism. The main goal is to examine the educational procedure for students who have autism and can motivate other students of same level. Various multimedia technologies used in program like different usage of sensing techniques with help of color, words helps user interest during game playing. Specific synthesized speech will be delivered in native language of person who suffered from autism. Varieties of animated visual motion are being expressed for identification of student reaction. To achieve personalization, individual instructions are being delivered to different students at different levels.

KAD represents Kino-Ani-Drama and animation therapy. The intention of this program is to provide better improvised learning for blind children or those having several visual impairments. The major purpose is to design, develop and to adapt

simulated computer based games for visually and physically challenged children. Variety of multimedia technologies like boom sound interface for playing through several narrated stories which children feels interactive and interesting, usage of virtual keyboard need to be enhanced and different game playing instruments like maker, joy stick, cards have been used to control the sound interface for small children.

CONCLUSION

In this chapter we have made discussion of relationship between Knowledge management and E-learning with respect to various integration and adoption models, semantic web technologies and E-learning approaches pertaining to different multimedia systems. It contains information on understanding the fundamental concepts of E-learning. The development of knowledge management (KM) and E-learning (EL) naturally brings both disciplines closer and encourages integration. There are several models that offer possible ways of such integration. Model analysis shows several integration ways and approaches, however, these models are not implemented in production environment and lack necessary technical specification and application support. As result of specific organizational goals and needs models employ different adaption and integration approaches. The more general approach is to base integration on common ground, which was identified as learning.

Similarly, availability of multimedia based technologies on web enable distance-independent learning, low cost video telephone service, improved customer relationships through e-commerce and allows new gaming entertainment. We have analyzed current practices and latest trends in E-learning industry regarding the use of interactive & emerging multimedia technologies as a learning tool in form of social learning, emphasize on instruction authoring, game based learning, to integrate multimedia type with database system and its query language and to incorporate reality as learning content. Finally, we have discussed different E-learning approaches and their positive and negative effects of using interactive multimedia in E-learning as they relate to both learners and developers.

FUTURE RESEARCH DIRECTIONS

Based on numerous studies, we visualize a lot of research directions in developing and incorporating multimedia technologies for E-learning. Interactive multimedia has impact towards social learning, emphasize on instruction authoring, game based learning, to integrate multimedia type with database system and its query language and to incorporate reality as learning content.

Conventional E-learning systems delivers learning content material i.e. static or based on predefined knowledge set but not on basis of dynamic and adaptive content. Social learning changes learning paradigm from traditional to online community based system where learners can interact with people with similar common interest. It facilitates learning processes by sharing opinions in discussion forums, writing blogs, and article conversion from text to speech or audio with help of predefined converters. Various social networking platforms like Dokeos, Udutu, Moodle, Elgg, blackboard etc. have been designed for online education. Social networking allows experts of different domain to interact with each other with help of multimedia aids.

A major research area in social learning is to improve interaction among learners. There is a need to identify desired methods which fulfill learner request on basis of learning activities like sharing ideas, comments, content sharing, and post videos in social learning environments. As learning content comprise of various multimedia forms like text, audio, videos etc. there is a need to develop automatic methods for content searching, discovery and delivery of learning content in social networking based learning environment. Student characteristics and their behavior also played a major role in E-learning. By identifying learner characteristics E-learning system can better address their individual needs to improve learning effectiveness and classifies on basis of their knowledge level.

Learning facilitates learners to gain deeper insights in certain knowledge and acquire different skills on basis of learning approaches. Conventional multimedia E-learning systems allow learners to represent knowledge based information through various senses like cognitive, humanistic, emotional but these systems unable to integrate physical context of learners. To achieve the same context or situation and reality based learning come into role. Context aware learning uses sensors which can sense and react based on personalized context or environment. It enables community based learning by wearing wrist gadget and captures personal thoughts, locations, body temperature and feelings of learners. Reality based learning enable vision of augmented reality where learners able to visualize information from both real and virtual world. There is a need to improve accuracy and performance of real world object recognition and design interaction techniques to manipulate real and virtual world objects. Another research challenge in E-learning system is to collect interactive response from learner which includes multimodal information and determines way to analyze and interpret the response which is collected.

Game based learning is another research focus which facilitates game designers and educational professionals to work together. Variety of gaming tools is available to develop such systems. An important research issue is the constructional learning design which carried out easily in game based learning environment. This issue requires collaborative and team based learning. It provides learner a way to use

such gaming based environment based on training information they receive. Game playing has improved learner way of learning and helps them out to be restrained.

Constructing multimedia instruction imposes extra burden on instructors as instructions are complex and takes time to produce. Despite of all such facts, challenge is to produce multimedia learning content as an important research objective. The implementation of producing learning material for learners based on their learning style makes adaptive multimedia instruction authoring difficult. Learner has to choose best possible learning path using path sequencing techniques. Instructors can monitor student learning details based on multimedia based content. Based on learner feedback it allows instructors to review instructions and improve the quality of authoring process. There must be production of unified form of abstractions to learning content constructed by different kind of media and ensure that abstraction produced are pedagogically meaningful.

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KEY TERMS AND DEFINITIONS

ITS: It is computer software designed to simulate a instructor behaviour and learning guidance. It provides customized instruction or feedback to learners without intervention of instructor.

RDF: RDF stands for resource description format. It is a standardized model for data interchange on web. It mainly provides interoperability between applications that exchange machine understandable information on web.

SCORM: It stands for sharable content object reference model. It is designed to meet technical standards like durability, interoperability, accessibility and content validity of systems.

Semantic Web: It is an idea of World Wide Web community to make web more intelligent and adaptive to human needs based on their intuitions.

Web Services: These are client and server based an application which provides a standard means of interoperating between software applications running on variety of platforms and applications.