Device Independent & LMS Compatibility SCORM Based Hybrid Course Package Auto Generator

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Abstract— *E-learning includes all forms of electronically supported learning and teaching methodology, which confines under educational technology. Course content and package creations are the base for e-learning. More knowledge required for the development of course package, thus package creation is only easy for skilled people. But the "Intelligent tutoring system" research community uses the term authoring system. It is nothing but an authoring tool. It refers to a computer based system that allows a general group (including non-programmers) to create content for intelligent tutoring systems. A few intelligent tutoring systems have been successfully created, but, they are very costly to construct and not supported for all device. For the development of educational application, an authoring tool is an important system which allows a non-programmer to create software with inbuilt features. An authoring system is based on the SCORM (Shareable Content Object Reference Model) standards which defines how content may be packaged into a transferable ZIP (Compressed File) file. All LMS (Learning Management System) will support SCORM package. The programming-free utility features and SCROM standards are built in, so the author does not need to know how to program. Generally Authoring tool provide lots of texts, graphics, interaction, and other utility options. Developing an authoring tool for two different platforms and along with LMS compatibility will be very difficult. Also another challenging task is to develop the course package generation with all LMS compatibility and device independent.*

Keywords— **Course, Device, Generator, Hybrid, LMS, SCORM**

1. INTRODUCTION

Mobile learning (or m-learning) makes learning experience available at anytime and anywhere, just for the right person and just on the right device. It gives combination of e-learning and mobile computing that promises the access to applications. It makes learning even more available and accessible. Authoring tool makes mobile learning as much as convenience to the learners.

A learning management system (LMS) is a software application. It has feature of administration, documentation, tracking, reporting and delivery of education courses or training programs. LMSs used for managing training and educational records to software for distributing online or blended/Hybrid College courses over the Internet with features for online collaboration. Business institutes, Colleges and universities use LMSs to deliver online courses and augment on-campus courses. All Corporate training departments use LMSs to deliver online training, as well as automate record-keeping and employee registration. All LMSs include a primitive authoring tool. It is used for basic content manipulation. For advanced content creation buyers must choose authoring software. It supports and integrates with their LMS in order for their content to be hosted.

Sharable Content Object Reference Model (SCORM) is a collection of standards. It is a specification for web-based e-learning. It defines communications between client side content and a server-side system called the run-time environment, which is commonly supported by a learning management system. SCORM also defines how content may be packaged into a transferable ZIP file. This file is called "Package Interchange Format".

Device independence authoring tool is the process of making a software tool be able to function on a wide variety of devices regardless of the local hardware on which the software is used. Authoring tool brings the powerful education related web based course creation and business course creation. Authoring multimedia contents are not an easy task. It is very difficult to do the development of a course for multiple operating systems as well as device independent support. Generation of SCORM compatibility is the challenging task. This authoring tool will support all these tasks.

This tool helps learners to create and manage their courses. I have focused on the design and development of new applications and tools for both educators and learners to enhance mobile learning without any difficulties.

2. RELATED WORKS:

Learning technology requires time and cost saving method. Authoring tool is the best way to reduce the time and cost for course development and time. Usage of tool, how the course can be edited and the structure of the XML (Extensible Markup

Language) files designed for the storage of the information about courses, interactions analysis shows the importance of an authoring tool development [1]. It gives the over view of e-learning authoring tool development. Authoring tool standards and user interface design recommendations are taken from the existing system [2].

The recent advances in eLearning standards to ensure consistency particularly shareable content object reference model (SCORM) that integrates a collection of eLearning resources, where in the content and the pedagogic approach is to be taken care of by the course author [3]. The SCORM standard of the ADL (Advanced Distributed Learning) initiative and the AICC standard of the AICC (Aviation Industry CBT (Computer-Based Training) Committee organization). Based on the AICC and LOM (Learning Object Metadata) meta-data standards, the SCORM standard stands the chance to become the standard dominating the market [9]. An eAssessment tools and content creation standards, identifies some popular learning platforms, authoring tools and public repositories, and verifies their standards compliance [4]. e-learning and mobile computing that promises the access to applications which

support learning at anytime, any device and anywhere [5].

Mobile learning utilizes handheld devices such as smart phones, PDAs (Personal Digital Assistant) and other similar mobile phones in learning, although there are some debates on the inclusion of tablets and laptops [6]. In, an adaptive mobile learning system proposes an architecture and prototype quiz system based on XML/XSLT (Extensible Markup Language) technologies. This system works on both PCs (Personal Computer) and mobile devices [7]. Design and Development of a Device-Independent System for Mobile Learning can be understand and enhanced the next level of e-learning authoring tool [10]. There is a need for innovative applications and services to enable mobile learning [8].

2.2. Proposed System:

In proposed system that contains the next level of e-learning and mobile learning authoring tool. It has the feature of hybrid operating system multimedia course development and package generation. This package has SCORM compatibility feature which supports all the LMS. This course can be viewable through the desktop, laptop and

mobile devices (Tabs). Programming free, device independent and LMS compatibility multimedia course package generation is the objective of this hybrid OS (Operating System) authoring tool.

3. COURSE GENERATOR:

Authoring tool offers a programming-free environment for creating rich and high-quality interactive e-learning content supports device independent which can be published on any Learning Management Systems (LMS). It is a simple, easy to use tool for creating online courses for multiple devices. Its design allows you to create rich media courses containing text, images, animations, audio and video created with your comfortable media editors. Every course you create will fully conform to the SCORM standard, and will support all LMS.
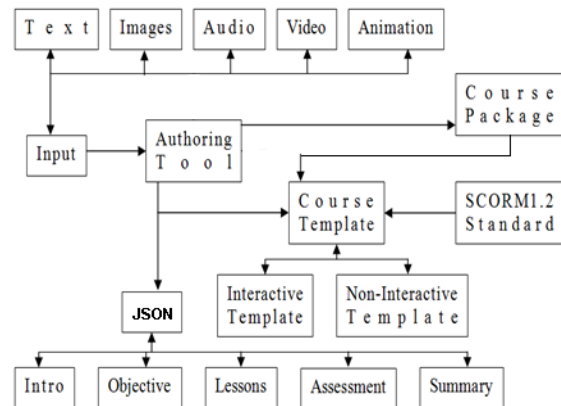

Fig.1 Architecture

Fig. 1 shows an architecture diagram of an authoring tool. There is no programming skill required for the course development. So any one can generate a device independent multimedia course package, which is directly upload and publish to any learning management system.
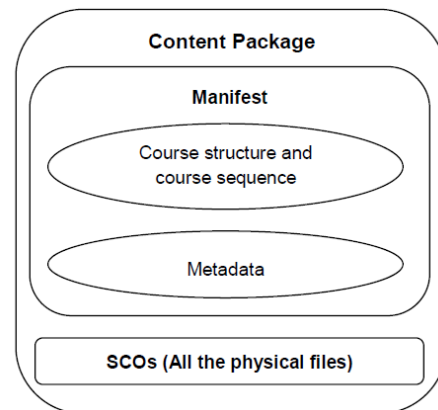

Fig.2 Course Package

Fig. 2 shows the package diagram. It has the auto package generation feature. This

feature reduces the complexity of course content and SCORM interactions.

4. HYBRID COURESE PACKAGE GENERATOR STRUCTURE:

Course project structure is based on e-learning standard. It has two level depths of folder structures. First level folder contains bin files. Bin files are called executable files and next level contains contents.

4.1. JSON (JavaScript Object Notation) Structure

JSON file structure has been created and formatted as per LMS standard. There are two specific JSON files are used. Tool design and course designs are based on the JSON files. Tool related data are structured and stored in "tool.json" file. Course and template related data are structured and stored in "course.json" file.

4.2. LMS Standards

SCORM 1.2 standard is defined in the java script file. There are five main functions are listed in the SCORM standard. List of functions:

- *SCORM Initialize:* The Initialize method defines the LMS begins a communication session.

- *GET Value:* The GetValue method defines the SCO (Sharable Content Object) to get data from the LMS.

- *SET Value:* The SetValue method defines the SCO to keep data to the LMS.

- *Save Value:* The Commit method saves data to the LMS.

- *Terminate SCORM:* The Terminate method defines the LMS ends a communication session.

4.3. Course Integration Screen

The LMS must launch the SCO in a browser window that is a dependent window (i.e., "pop-up" window) or child frame of the browser window that exposes the API instance. A browser window initially shows the course Interaction screen. It is an animation screen. Window size is 800 (width) and 600 (Height). Once the animation has been completed it shows the course home page. Home page shows the list of course templates.

4.4. Course Template

This tool has various ready to use templates. A template has two types:

- Interactive templates
- Non-Interactive templates

So user need to select any template according to their requirement.

In addition we can:

- Add images, audio, video and questions
- Insert slides with additional information
- Organize branching scenarios based on user answers
- Set custom, result-based feedback to each question
- Receive quiz results via email or web server
- Sample quiz created
- Upload to SCORM 1.2 LMS

4.5. Interactive Template

This interactive template has the user interactions with the content. So the user can play and do an activity with the contents. It has two types:

I. *Lessons*: It describes about the course contents. A lesson may be either one section of a textbook or course (which, apart from the printed page, can also include multimedia) or, more frequently, a short period of time during which learners are taught about a particular subject or taught how to perform a particular activity. Lessons are generally trained in a classroom but may instead take place in a situated learning environment. It gives brief introduction about the every topic of the course. It gives both interactive and non-interactive contents. So the leaner can feel the real time of learning. It gives the rich media for lesson interactions. Figure 3 shows tool lesson template selection page:
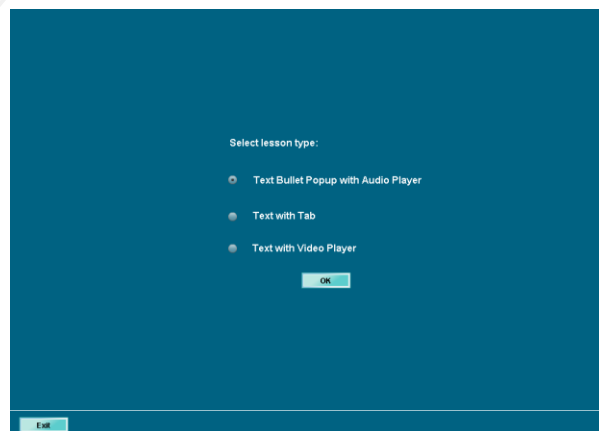

Fig.3 Tool lesson Template Selection Page

II. *Assessments*: Assessment template contains an automated multiple-choice test. Using this assessments feedback can be geared towards a

student's specific mistakes or the computer can navigate the student through a series of questions adapting to what the student appears to have learned or not learned. Figure 4 shows tool assessment template selection page:
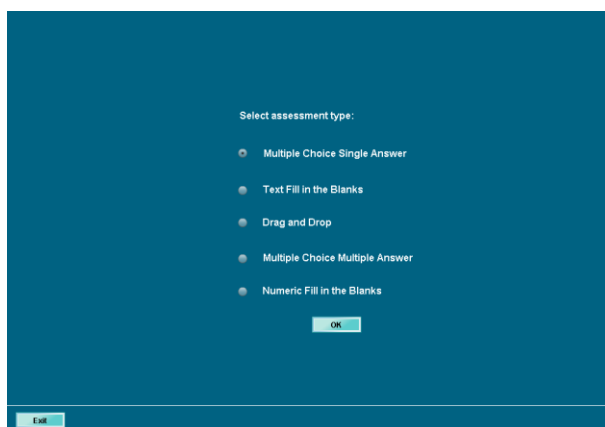

Fig.4 Tool Assessment Template Selection Page

4.6. Non-Interactive Template

This non-interactive template doesn't contain any user interaction or activity with the course contents. It contains only static contents. It has three types.

I. *Intro Template:* It describes about the course introduction. This template name is Text Left Image Right. Template left side contains an introduction text and right side contains an image. The image format is PNG (Portable Network

Graphics). Height of the image is 282 and width of the image is 370. Scrollbar will appear if text is more.

II. *Objective Template:* It describes about the course objective. This template name is Text only. It contains only text. Scrollbar will appear if text is more.

III. *Summary Template:* It describes about the course summary. This template name is Text Left Image Right. Template left side contains a summary ext and right side contains an image. The image format is PNG. Height of the image is 282 and width of the image is 370. Scrollbar will appear if text is more. There are list of bullet points can be shown in the template.

4.7. Assessment Templates

These assessment templates help assessors to design assessment tasks. They cover questioning, observation / demonstration, portfolios, tests, practical projects, and collaborative assessment. It has five types.

I. *Multiple Choice Single Selections (MCSA):* Multiple choice single selections are a form of assessment in which respondents are asked to

select the best possible one answer out of the choices from a list. This template contain question text, instruction text, five options, correct feedback and wrong feedback. User can select any one option and then submit the answer for the validation. Template validates the user answer and shows the feedback. If the answer is correct, it shows the correct feedback, if it's wrong then it shows the wrong feedback. Score value 1 is incremented for the correct answer.

II. *Multiple Choice Multiple Selection (MCMA):* Multiple choice Multiple selections are a form of assessment in which respondents are asked to select the best possible multiple answers out of the choices from a list. This template contain question text, instruction text, five options, correct feedback and wrong feedback. User can select multiple options and then submit the answers for the validation. Template validates the user answers and shows the feedback. If the answer is correct, it shows the correct feedback, if it's wrong then it shows the wrong

feedback. Score value 1 is incremented for the each correct answer.

III. *Numeric Fill-in-Blanks (NFB):* Numeric Fill-in-Blanks are a form of assessment in which respondents are asked to enter the best possible one answer to the text box. This template contain question text, instruction text, answer box, and correct feedback and wrong feedback. User can enter any numeric answer and then submit the answer for the validation. Template validates the user answer and shows the feedback. If the answer is correct, it shows the correct feedback, if it's wrong then it shows the wrong feedback. Score value 1 is incremented for the correct answer.

IV. *Text Fill-in-Blanks (TFB):* Text Fill-in-Blanks are a form of assessment in which respondents are asked to enter the best possible one answer to the text box. This template contain question text, instruction text, answer box, and correct feedback and wrong feedback. User can enter any alphanumeric answer and then submit the answer for the validation.

Template validates the user answer and shows the feedback. If the answer is correct, it shows the correct feedback, if it's wrong then it shows the wrong feedback. Score value 1 is incremented for the correct answer.

V.   *Drag and Drop (DD):* Drag and drop is a pointing device gesture in which the user selects an object by "grabbing" it and dragging it to a different location or onto another virtual object. In general, it can be used to invoke many kinds of actions, or create various types of associations between two abstract objects. This template contain instruction text, five questions in the left, five answers in the right side, five drop area, correct feedback and wrong feedback. User can drag and drop their answers and then submit the answers for the validation. Template validates the user answers and shows the feedback. If the answer is correct, it shows the correct feedback, if it's wrong then it shows the wrong feedback. Score value 1 is incremented for the each correct answer.

4.8.   GUI

User friendly graphical user interface has been created using the rich media software. Template title, text input box, field labels, radio button, combo box, check box, image integrator, audio integrator, and video integrator are some of the GUI used in the course generator. Figure 5 shows tool home page:

Fig.5 Tool Home Page

4.9.   Package

Package is the combination of course content and SCORM interaction files. Course generator automatically creates this SCORM course content package. Packages index created using IMS Manifest file. It is LMS reference file. This file has description of SCOs title, index file of the course, metadata file path, list of resource files and its specified path. Metadata contains course

name, description of its purpose, version number, vendor, and a list of dependencies necessary for the files to run properly. Metadata is stored in a local package database. Figure 6 shows tool package generation page:
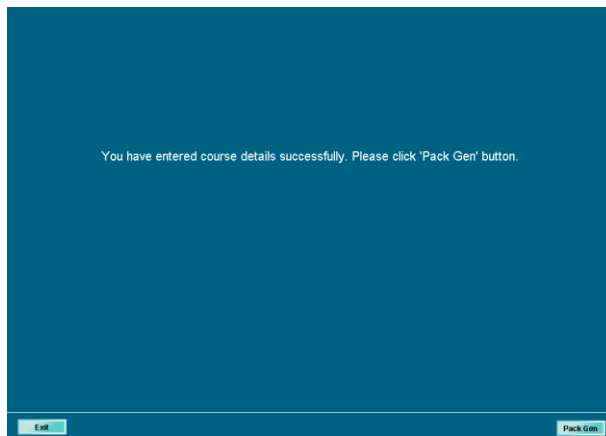

Fig.6 Tool Package Generation

4.10. Package Upload

Now Course package is ready. So we can upload the package to any LMS. Login to LMS and create the SCORM course. There is specified filed in LMS for package upload. Click the upload button to select the course package and upload. Click the save button to save the course. Course is ready for publish.

4.11. Course Publish

Select your course name to publish. It will open the browser window. The window will show the course introduction animation. Once animation will be finished then it will open the home page of course. Any mobile device will able to access the same course.

5. CONCLUSION:

Authoring tool development process can be remarked. It is easy to use. You simply add template to create the structure of your multimedia course. You can select a template in the course structure and specify the template's type plus its multimedia content. The template types include information, lessons, assessments and summary. Course package generation is possible on both operating system (Windows and Mac). Any mobile device supported LMS will support this course package.

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